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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 Amy Tan, *The Bonesetter's Daughter*. ©2001 by Amy Tan.

At last, Old Widow Lau was done haggling with the driver and we stepped inside Father's shop. It was north-facing, quite dim inside, and perhaps this was why Father did not see us at first. He was busy with a customer, a man who was distinguished-looking, like the scholars of two decades before. The two men were bent over a glass case, discussing the different qualities of inksticks. Big Uncle welcomed us and invited us to be seated. From his formal tone, I knew he did not recognize who we were. So I called his name in a shy voice. And he squinted at me, then laughed and announced our arrival to Little Uncle, who apologized many times for not rushing over sooner to greet us. They rushed us to be seated at one of two tea tables for customers. Old Widow Lau refused their invitation three times, exclaiming that my father and uncles must be too busy for visitors. She made weak efforts to leave. On the fourth insistence, we finally sat. Then Little Uncle brought us hot tea and sweet oranges, as well as bamboo latticework fans with which to cool ourselves.

I tried to notice everything so I could later tell GaoLing what I had seen, and tease out her envy. The floors of the shop were of dark wood, polished and clean, no dirty footprints, even though this was during the dustiest part of the summer. And along the walls were display cases made of wood and glass.

The glass was very shiny and not one pane was broken. Within those glass cases were our silk-wrapped boxes, all our hard work. They looked so much nicer than they had in the ink-making studio at Immortal Heart village.

I saw that Father had opened several of the boxes. He set sticks and cakes and other shapes on a silk cloth covering a glass case that served as a table on which he and the customer leaned. First he pointed to a stick with a top shaped like a fairy boat and said with graceful importance, "Your writing will flow as smoothly as a keel cutting through a glassy lake." He picked up a bird shape: "Your mind will soar into the clouds of higher thought." He waved toward a row of ink cakes embellished with designs of peonies and bamboo: "Your ledgers will blossom into abundance while bamboo surrounds your quiet mind."

As he said this, Precious Auntie came back into mind. I was remembering how she taught me that everything, even ink, had a purpose and a meaning: Good ink cannot be the quick kind, ready to pour out of a bottle. You can never be an artist if your work comes without effort. That is the problem of modern ink from a bottle. You do not have to think. You simply write what is swimming on the top of your brain. And the top is nothing but pond scum, dead leaves, and mosquito spawn. But when you push an inkstick along an inkstone, you take the first step to cleansing your mind and your heart. You push and you ask yourself, What are my intentions? What is in my heart that matches my mind?

60 I remembered this, and yet that day in the ink shop, I listened to what Father was saying, and his words became far more important than anything Precious Auntie had thought. “Look here,” Father said to his customer, and I looked. He held up an
 65 inkstick and rotated it in the light. “See? It’s the right hue, purple-black, not brown or gray like the cheap brands you might find down the street. And listen to this.” And I heard a sound as clean and pure as a small silver bell. “The high-pitched tone tells you that
 70 the soot is very fine, as smooth as the sliding banks of old rivers. And the scent—can you smell the balance of strength and delicacy, the musical notes of the ink’s perfume? Expensive, and everyone who sees you using it will know that it was well worth the high
 75 price.”

I was very proud to hear Father speak of our family’s ink this way.

1

Which choice best summarizes the passage?

- A) A character’s arrival at her family’s ink shop sparks fond memories of her favorite aunt.
- B) A character’s surprise visit leads to a happy reunion at her family’s ink shop.
- C) A character comes to understand her father’s ambitions while visiting her family’s ink shop.
- D) A character’s visit to her family’s ink shop deepens her appreciation of her family’s work.

2

A main theme of the passage is that

- A) family relationships should be nurtured.
- B) quality is achieved through deliberate effort.
- C) hard work results in material compensation.
- D) creativity needs to be expressed concretely.

3

Throughout the passage, the narrator is portrayed as someone who is

- A) reserved around unfamiliar people.
- B) attuned to her immediate surroundings.
- C) sympathetic to the needs of others.
- D) anxious about her responsibilities.

4

It can be most reasonably inferred from the passage that Old Widow Lau’s reluctance to stay for tea is

- A) feigned, because she is not genuinely firm in her resolve.
- B) inconsiderate, because the family has been planning her visit.
- C) appropriate, because the shop is unusually busy.
- D) ill-advised, because she is exhausted from the journey.

5

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

- A) Lines 1-4 (“At last . . . first”)
- B) Lines 11-15 (“And he . . . customers”)
- C) Lines 15-18 (“Old . . . leave”)
- D) Lines 19-21 (“Then . . . ourselves”)

6

The narrator indicates that the contrast between the ink-making studio at Immortal Heart village and her family’s ink shop is that the ink shop

- A) displays the family’s ink more impressively.
- B) is more conveniently located for the public.
- C) provides greater individual attention to customers.
- D) offers a larger space for presenting products.

7

Based on the artistic philosophy expressed in the fourth paragraph (lines 46–59), it is reasonable to infer that Precious Auntie would consider a hastily written first draft of a story to be

- A) emotionally raw and powerful.
- B) creatively satisfying for the author.
- C) essentially worthless in and of itself.
- D) inappropriately analytical for a piece of art.

8

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

- A) Lines 46–48 (“As he . . . meaning”)
- B) Lines 49–50 (“Good . . . bottle”)
- C) Lines 52–55 (“You simply . . . spawn”)
- D) Lines 57–59 (“You push . . . mind”)

9

As used in line 59, “matches” most nearly means

- A) competes against.
- B) corresponds with.
- C) runs counter to.
- D) treats equally.

10

As used in line 68, “clean” most nearly means

- A) complete.
- B) skillful.
- C) distinct.
- D) upright.

Questions 11–20 are based on the following passage and supplementary material.

This passage is adapted from “How the Web Affects Memory.” ©2011 by Harvard Magazine Inc.

Search engines have changed the way we use the Internet, putting vast sources of information just a few clicks away. But Harvard professor of psychology
Line Daniel Wegner’s recent research proves that

5 websites—and the Internet—are changing much more than technology itself. They are changing the way our memories function.

Wegner’s latest study, “Google Effects on Memory: Cognitive Consequences of Having 10 Information at Our Fingertips,” shows that when people have access to search engines, they remember fewer facts and less information because they know they can rely on “search” as a readily available shortcut.

15 Wegner, the senior author of the study, believes the new findings show that the Internet has become part of a transactive memory source, a method by which our brains compartmentalize information. First hypothesized by Wegner in 1985, transactive

20 memory exists in many forms, as when a husband relies on his wife to remember a relative’s birthday. “[It is] this whole network of memory where you don’t have to remember everything in the world yourself,” he says. “You just have to remember who 25 knows it.” Now computers and technology as well are becoming virtual extensions of our memory.

The idea validates habits already forming in our daily lives. Cell phones have become the primary location for phone numbers. GPS devices in cars 30 remove the need to memorize directions.

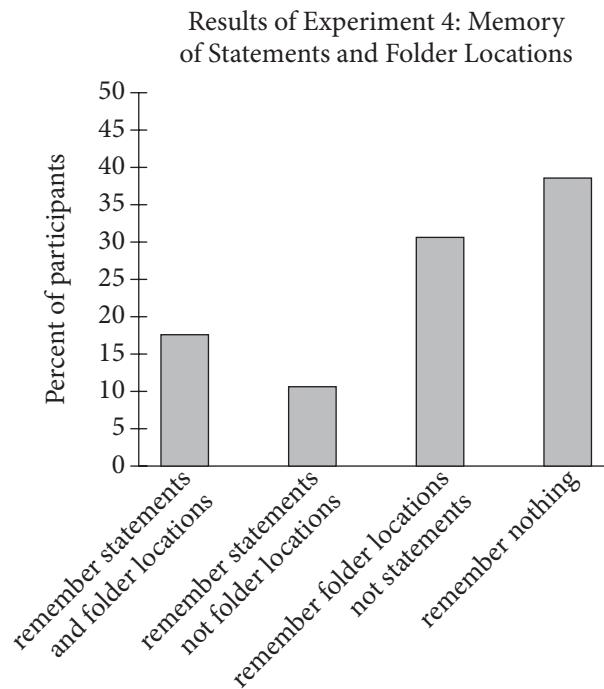
Wegner points out that we never have to stretch our memories too far to remember the name of an obscure movie actor or the capital of Kyrgyzstan—we just type our questions into Google. “We become 35 part of the Internet in a way,” he says. “We become part of the system and we end up trusting it.”

Working with researchers Betsy Sparrow of Columbia University and Jenny Liu of the University of Wisconsin–Madison, Wegner conducted four

40 experiments to demonstrate the phenomenon, using various forms of memory recall to test reliance on computers. In the first experiment, participants demonstrated that they were more likely to think of computer terms like “Yahoo” or “Google” after being 45 asked a set of difficult trivia questions. In two other experiments, participants were asked to type a collection of readily memorable statements, such as “An ostrich’s eye is bigger than its brain.” Half the subjects were told that their work would be saved to a 50 computer; the other half were informed that the statements would be erased. In subsequent memory testing, participants who were told their work would not be saved were best at recalling the statements. In a fourth experiment, participants typed into a 55 computer statements they were told would be saved in specific folders. Next, they were asked to recall the statements. Finally, they were given cues to the wording and asked to name the folders where the statements were stored. The participants proved 60 better able to recall the folder locations than the statements themselves.

Wegner concedes that questions remain about whether dependence on computers will affect memories negatively: “Nobody knows now what the 65 effects are of these tools on logical thinking.” Students who have trouble remembering distinct facts, for example, may struggle to employ those facts in critical thinking. But he believes that the situation overall is beneficial, likening dependence on 70 computers to dependence on a mechanical hand or other prosthetic device.

And even though we may not be taxing our memories to recall distinct facts, we are still using them to consider where the facts are located and how 75 to access them. “We still have to remember things,” Wegner explains. “We’re just remembering a different range of things.” He believes his study will lead to further research into understanding computer dependence, and looks forward to tracing the extent 80 of human *interdependence* with the computer world—pinpointing the “movable dividing line between us and our computers in cyber networks.”



Adapted from Betsy Sparrow et al., “Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips.” ©2011 by American Association for the Advancement of Science.

11

The main purpose of the passage is to

- A) describe a series of experiments on the way technology interferes with critical thinking.
- B) assert that people have become overly dependent on computers for storing information.
- C) discuss the idea that humans’ capacity for memory is much weaker than it once was.
- D) share the findings of a study examining the effect of computer use on memory recall.

12

Which choice best supports the idea that reliance on computers does not necessarily diminish human memory?

- A) Lines 3-6 (“But Harvard . . . itself”)
- B) Lines 31-33 (“Wegner . . . Kyrgyzstan”)
- C) Lines 66-68 (“Students . . . thinking”)
- D) Lines 72-75 (“And even . . . them”)

13

In context, the reference to remembering a relative's birthday mainly serves to

- A) show that people who are closely related tend to have shared memories.
- B) demonstrate how people initially developed external sources of memory.
- C) emphasize the effectiveness and accuracy of transactive memory sources.
- D) illustrate the concept of a transactive memory source using a familiar situation.

14

Based on the information in the passage, which of the following would be considered a transactive memory source?

- A) A souvenir brought home from a memorable trip
- B) A written list of a user's passwords for different websites
- C) A library database that helps users locate specific books
- D) A website that helps users plan and make travel arrangements

15

As used in line 26, "extensions of" most nearly means

- A) delays in.
- B) additions to.
- C) lengths of.
- D) developments of.

16

The discussion of the experiments suggests that people are inclined to think of specific information sources in response to being

- A) required to memorize details that will then be made inaccessible.
- B) directed to develop a system for organizing and saving content.
- C) asked to provide facts that are not already familiar to them.
- D) prompted to identify terms related to dependence on computers.

17

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

- A) Lines 42-45 ("In the . . . questions")
- B) Lines 48-51 ("Half . . . erased")
- C) Lines 51-53 ("In subsequent . . . statements")
- D) Lines 59-61 ("The participants . . . themselves")

18

As used in line 67, "employ" most nearly means

- A) utilize.
- B) enroll.
- C) exert.
- D) assign.

19

According to the graph, approximately what percentage of participants remembered both parts of the information given to them during the fourth experiment?

- A) 7%
- B) 10%
- C) 17%
- D) 30%

20

Based on the description of Wegner's fourth experiment, what is the most likely explanation for the findings for the largest single group of participants represented in the graph?

- A) Those participants focused on remembering the folder locations.
- B) Those participants attempted to remember the statements and the folder locations.
- C) Those participants did not attempt to remember any specific pieces of information.
- D) There is not enough information to determine the cause of the results for those participants.

Questions 21-31 are based on the following passage and supplementary material.

This passage is adapted from Marlene Zuk, *Paleofantasy: What Evolution Really Tells Us about Sex, Diet, and How We Live*. ©2013 by Marlene Zuk.

A female guppy can be sexually mature at two months of age and have her first babies just a month later. This unstinting rate of reproduction makes *Line* guppies ideally suited for studying the rate of evolution, and David Reznick, a biologist at UC Riverside, has been doing exactly that for the last few decades.

People usually think of guppies as colorful aquarium fish, but they also have a life in the real *10* world, inhabiting streams and rivers in tropical places like Trinidad, where Reznick has done his fieldwork. Guppies can experience different kinds of conditions depending on the luck of the draw.

A lucky guppy is born above a waterfall or a set of *15* rapids, which keep out the predatory fish called pike cichlids found in calmer downstream waters. As you might expect, the guppy mortality rate—that is, the proportion of individuals that die—is much higher in the sites with the rapacious cichlids than in those *20* without them.

Reznick has shown that if you bring the fish into the lab and let them breed there, the guppies from the sites with many predators become sexually mature when they are younger and smaller than do *25* the guppies from the predator-free sites. In addition, the litters of baby guppies produced by mothers from the high-risk streams are larger, but each individual baby is smaller than those produced by their counterparts. The disparity makes sense because if *30* you are at risk of being eaten, being able to have babies sooner, and spreading your energy reserves over a lot of them, makes it more likely that you will manage to pass on some of your genes before you meet your fate. Reznick and other scientists also *35* demonstrated that these traits are controlled by the guppies' genes, not by the environment in which they grow up.

How quickly, though, could these differences in how the two kinds of guppies lived their lives have *40* evolved? Because there are numerous tributaries of the streams in Trinidad, with guppies living in some but not all of them, Reznick realized that he could, as he put it in a 2008 paper, "treat streams like giant test tubes by introducing guppies or predators" to places *45* they had not originally occurred, and then watch as

natural selection acted on the guppies. This kind of real-world manipulation of nature is called “experimental evolution,” and it is growing increasingly popular among scientists working with organisms that reproduce quickly enough for humans to be able to see the outcome within our lifetimes.

Along with his students and colleagues, Reznick removed groups of guppies from their predator-ridden lives below the waterfall and released them into previously guppy-free streams above the falls. Although small predatory killifish occurred in these new sites, these fish do not pose anything close to the danger of the cichlids. Then the scientists waited for nature to do its work, and they brought the descendants of the transplanted fish back to the lab to examine their reproduction. After just eleven years, the guppies released in the new streams had evolved to mature later, and have fewer, bigger offspring in each litter, just like the guppies that naturally occurred in the cichlid-free streams. Other studies of guppies in Trinidad have shown evolutionary change in as few as two and a half years, or a little over four generations, with more time required for genetic shifts in traits such as the ability to form schools and less time for changes in the colorful spots and stripes on a male’s body.

Figure 1

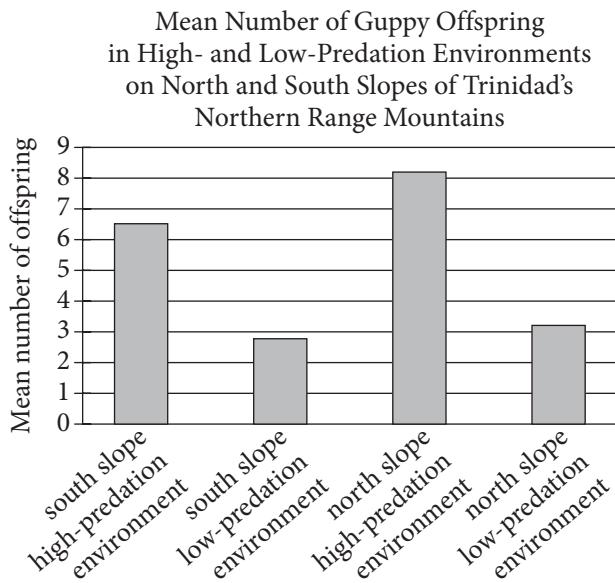
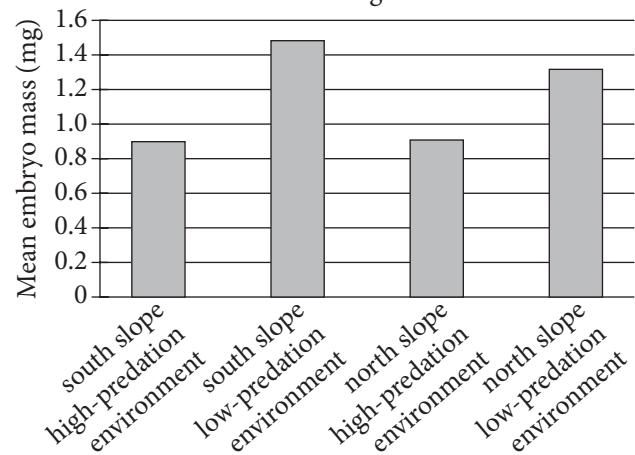


Figure 2

Mean Embryo Mass of Guppy Offspring in High- and Low-Predation Environments on North and South Slopes of Trinidad's Northern Range Mountains



Figures adapted from David N. Reznick, Cameron K. Ghalambor, and Kevin Crooks, “Experimental Studies of Evolution in Guppies: A Model for Understanding the Evolutionary Consequences of Predator Removal in Natural Communities.” ©2007 by Blackwell Publishing Ltd.

21

The first paragraph mainly serves to

- establish the reason why a certain species was selected for scientific observation.
- illustrate the value of studying the offspring of a particular animal shortly after birth.
- introduce a theory at the center of an ongoing scientific debate.
- offer a rationale for the prevalence of a new field of scientific inquiry.

22

In describing the living conditions of guppies, the author indicates that a “lucky guppy” (line 14) is one that

- A) is born in a major river having an established guppy population.
- B) inhabits an environment that provides natural protection from predators.
- C) manages to navigate the risks associated with living near a waterfall.
- D) avoids predatory fish by living in calmer downstream waters.

23

Which choice provides the best evidence for the conclusion that the streams used by Reznick’s team in their real-world study were not entirely free of predators?

- A) Lines 14-16 (“A lucky . . . waters”)
- B) Lines 16-20 (“As you . . . them”)
- C) Lines 46-52 (“This . . . lifetimes”)
- D) Lines 57-59 (“Although . . . cichlids”)

24

In lines 43-44, Reznick uses the phrase “giant test tubes” to suggest that certain streams can

- A) provide suitable experimental conditions.
- B) promote cooperative behaviors in specimens.
- C) expedite the rate of genetic changes.
- D) solve widespread environmental problems.

25

As used in line 49, “popular” most nearly means

- A) accessible.
- B) suitable.
- C) widespread.
- D) likable.

26

Which finding, if accurate, would undermine Reznick’s findings?

- A) Guppies examined in other parts of the globe exhibit genetic shifts in traits at a different rate from that exhibited by the guppies Reznick examined.
- B) The new site into which Reznick released the guppies is inhabited by fish that are found to be as predatory as the cichlids in the original sites.
- C) Experimental evolution is shown to be harmful to the environments where studies like Reznick’s are conducted.
- D) The descendants of Reznick’s transplanted fish are proven to mature later than the guppies living below the waterfall.

27

It can most reasonably be inferred from the passage that the experiments in Trinidad have shown which of the following about guppies?

- A) Some genetic traits will evolve more readily than others.
- B) Some predatory fish are more dangerous to guppies than cichlids are.
- C) Some guppies thrive better in areas below waterfalls than they do in areas above waterfalls.
- D) Some genetic shifts are easier to prevent in a natural environment than in a lab.

28

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

- A) Lines 38-40 (“How quickly . . . evolved”)
- B) Lines 40-46 (“Because . . . the guppies”)
- C) Lines 53-56 (“Along . . . falls”)
- D) Lines 67-72 (“Other . . . body”)

29

According to figure 1, guppies living in the south slope high-predation environment produced a mean number of offspring between

- A) 2 and 3.
- B) 3 and 4.
- C) 5 and 6.
- D) 6 and 7.

30

Which conclusion about the mean mass of guppy embryos is best supported by figure 2?

- A) The slope location was a better indicator of mean embryo mass than was the predation level observed in each environment.
- B) The mean embryo mass of guppies born in the north slope environments exceeded the mean embryo mass of guppies born in the south slope environments.
- C) The predation level observed in each environment had more of an effect on mean embryo mass than did slope location.
- D) The guppies born in the low-predation environments had a mean embryo mass less than that of guppies born in the high-predation environments.

31

The data presented in figures 1 and 2 best support the conclusion that compared with guppies from high-predation environments, guppies from low-predation environments were more likely to

- A) have fewer offspring and reach full maturity sooner.
- B) be part of a smaller litter and have a greater mean embryo mass.
- C) have a higher rate of survival and have less mean embryo mass.
- D) produce a greater number of offspring and have a greater mean embryo mass.

Questions 32-42 are based on the following passage.

This passage is adapted from a speech delivered in 1838 by Sara T. Smith at the Second Anti-Slavery Convention of American Women.

We are told that it is not within the “province of woman,” to discuss the subject of slavery; that it is a “political question,” and we are “stepping out of our *Line sphere*,” when we take part in its discussion. It is not true that it is *merely* a political question, it is likewise a question of justice, of humanity, of morality, of religion; a question which, while it involves considerations of immense importance to the welfare and prosperity of our country, enters deeply into the home-concerns, the every-day feelings of millions of our fellow beings. Whether the laborer shall receive the reward of his labor, or be driven daily to *unrequited* toil—whether he shall walk erect in the dignity of conscious manhood, or be reckoned among the beasts which perish—whether his bones and sinews shall be his own, or another’s—whether his child shall receive the protection of its natural guardian, or be ranked among the live-stock of the estate, to be disposed of as the caprice or interest of the master may dictate. . . . these considerations are all involved in the question of liberty or slavery.

And is a subject comprehending interests of such magnitude, merely a “political question,” and one in which woman “can take no part without losing something of the modesty and gentleness which are her most appropriate ornaments”? May not the “ornament of a meek and quiet spirit” exist with an upright mind and enlightened intellect, and must woman necessarily be less gentle because her heart is open to the claims of humanity, or less modest because she feels for the degradation of her enslaved sisters, and would stretch forth her hand for their rescue?

By the Constitution of the United States, the whole physical power of the North is pledged for the suppression of domestic insurrections, and should the slaves, maddened by oppression, endeavor to shake off the yoke of the taskmaster, the men of the North are bound to make common cause with the tyrant, and put down, at the point of the bayonet, every effort on the part of the slave, for the attainment of his freedom. And when the father, husband, son, and brother shall have left their homes to mingle in the unholy warfare, “to become the executioners of their brethren, or to fall themselves

by their hands,”¹ will the mother, wife, daughter, and sister feel that they have no interest in this subject?

Will it be easy to convince them that it is no concern of theirs, that their homes are rendered desolate, and their habitations the abodes of wretchedness?

Surely this consideration is of itself sufficient to arouse the slumbering energies of woman, for the overthrow of a system which thus threatens to lay in ruins the fabric of her domestic happiness; and she will not be deterred from the performance of her duty to herself, her family, and her country, by the cry of political question.

But admitting it to be a political question, have we no interest in the welfare of our country? May we not permit a thought to stray beyond the narrow limits of our own family circle, and of the present hour? May we not breathe a sigh over the miseries of our countrymen, nor utter a word of remonstrance against the unjust laws that are crushing them to the earth? Must we witness “the headlong rage or heedless folly,” with which our nation is rushing onward to destruction, and not seek to arrest its downward course? Shall we silently behold the land which we love with all the heart-warm affection of children, rendered a hissing and a reproach throughout the world, by this system which is already tolling the death-bell of her decease among the nations? No: the events of the last two years have cast their dark shadows before, overclouding the bright prospects of the future, and shrouding the destinies of our country in more than midnight gloom, and we cannot remain inactive. Our country is as dear to us as to the proudest statesman, and the more closely our hearts cling to “our altars and our homes,” the more fervent are our aspirations that every inhabitant of our land may be protected in his fireside enjoyments by just and equal laws; that the foot of the tyrant may no longer invade the domestic sanctuary, nor his hand tear asunder those whom God himself has united by the most holy ties. Let our course, then, still be *onward!*

¹ A quotation from the Declaration of Independence

32

- Smith's main purpose in the passage is to
- A) accuse fellow abolitionists of overlooking the contributions that women have made to the movement.
 - B) argue that the causes of abolition and women's rights are continuations of the spirit of the American Revolution.
 - C) make the case that women's rights are meaningless while slavery exists.
 - D) encourage women to see their participation in the abolitionist cause as just and important.

33

- Which statement provides the best description of a technique that Smith uses throughout the passage to advance her main point?
- A) She presents claims in the form of rhetorical questions that mostly have implicit negative answers.
 - B) She criticizes her opponents by quoting self-contradictory remarks they have made.
 - C) She illustrates each of her central ideas with an emotionally powerful anecdote.
 - D) She emphasizes the reasonableness of her views by presenting them as though they are universally held.

34

- How does Smith develop her argument about slavery as a “political question” (line 3) over the course of the passage?
- A) She claims the designation is an outdated one and then offers alternative definitions.
 - B) She dismisses the designation as too narrow but then demonstrates its relevance to her audience.
 - C) She contends that the designation has become trite and then invites her audience to revitalize it.
 - D) She describes the meaning the designation has for men and then challenges women to embrace it.

35

- Which choice best summarizes the first paragraph?
- A) Smith explains a conventional viewpoint and presents evidence supporting it.
 - B) Smith rejects a claim and elaborates on her reasons for doing so.
 - C) Smith introduces her subject and provides historical background for understanding it.
 - D) Smith identifies a problem and proposes steps to remedy it.

36

- In the passage, Smith argues that it is possible for women to engage in which activity?
- A) Acting according to humanitarian principles while preserving their femininity
 - B) Adhering to personal morality while being politically neutral
 - C) Contributing to their family's financial security while meeting social expectations
 - D) Resisting calls for war while still opposing slavery

37

- Which choice provides the best evidence for the answer to the previous question?
- A) Lines 26–33 (“May . . . rescue”)
 - B) Lines 42–47 (“And when . . . subject”)
 - C) Lines 51–54 (“Surely . . . happiness”)
 - D) Lines 77–82 (“Our . . . laws”)

38

According to Smith, the US Constitution requires which action on the part of the Northern free states if slaves were to revolt?

- A) The Northern states would have to sever ties with the slave states.
- B) The Northern states would have to give shelter to refugees from the slave states.
- C) The Northern states would have to help the slave states fight the slaves' rebellion.
- D) The Northern states would have to provide financial assistance to the rebelling slaves.

39

In context, what is the main effect of Smith's use of the word "tyrant" in lines 40 and 83?

- A) It identifies a specific individual as oppressive.
- B) It highlights the threat of aggression from abroad.
- C) It critiques the limited roles for women in antislavery movements.
- D) It emphasizes the unjustice of slavery.

40

As used in line 52, "slumbering" most nearly means

- A) lethargic.
- B) drowsy.
- C) dormant.
- D) unconscious.

41

In the passage, Smith most strongly suggests that slavery affects the United States by

- A) lowering the country's reputation in the international community.
- B) leading many women to disavow their allegiance to the country.
- C) causing violent conflicts in many areas of the country.
- D) weakening the authority of the country's government.

42

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

- A) Lines 48-50 ("Will it . . . wretchedness")
- B) Lines 59-61 ("May . . . hour")
- C) Lines 68-73 ("Shall . . . nations")
- D) Lines 73-77 ("No: the . . . inactive")

Questions 43–52 are based on the following passages.

Passage 1 is adapted from Brian Handwerk, “A New Antibiotic Found in Dirt Can Kill Drug-Resistant Bacteria.” ©2015 by Smithsonian Institution. Passage 2 is adapted from David Livermore, “This New Antibiotic Is Cause for Celebration—and Caution.” ©2015 by Telegraph Media Group Limited.

Passage 1

“Pathogens are acquiring resistance faster than we can introduce new antibiotics, and this is causing a human health crisis,” says biochemist Kim Lewis of *Northeastern University*.

Lewis is part of a team that recently unveiled a promising antibiotic, born from a new way to tap the powers of soil microorganisms. In animal tests, teixobactin proved effective at killing off a wide variety of disease-causing bacteria—even those that have developed immunity to other drugs. The scientists’ best efforts to create mutant bacteria with resistance to the drug failed, meaning teixobactin could function effectively for decades before pathogens naturally evolve resistance to it.

Natural microbial substances from soil bacteria and fungi have been at the root of most antibiotic drug development during the past century. But only about one percent of these organisms can be grown in a lab. The rest, in staggering numbers, have remained uncultured and of limited use to medical science, until now. “Instead of trying to figure out the ideal conditions for each and every one of the millions of organisms out there in the environment, to allow them to grow in the lab, we simply grow them in their natural environment where they already have the conditions they need for growth,” Lewis says.

To do this, the team designed a gadget that sandwiches a soil sample between two membranes, each perforated with pores that allow molecules like nutrients to diffuse through but don’t allow the passage of cells. “We just use it to trick the bacteria into thinking that they are in their natural environment,” Lewis says.

The team isolated 10,000 strains of uncultured soil bacteria and prepared extracts from them that could be tested against nasty pathogenic bacteria. Teixobactin emerged as the most promising drug. Mice infected with bacteria that cause upper

respiratory tract infections (including *Staphylococcus aureus* and *Streptococcus pneumoniae*) were treated with teixobactin, and the drug knocked out the infections with no noticeable toxic effects.

It’s likely that teixobactin is effective because of the way it targets disease: The drug breaks down bacterial cell walls by attacking the lipid molecules that the cell creates organically. Many other antibiotics target the bacteria’s proteins, and the genes that encode those proteins can mutate to produce different structures.

Passage 2

Many good antibiotic families—penicillin, streptomycin, tetracycline—come from soil fungi and bacteria and it has long been suspected that, if we could grow more types of bacteria from soil—or from exotic environments, such as deep oceans—then we might find new natural antibiotics. In a recent study, researchers [Kim Lewis and others] found that they could isolate and grow individual soil bacteria—including types that can’t normally be grown in the laboratory—in soil itself, which supplied critical nutrients and minerals. Once the bacteria reached a critical mass they could be transferred to the lab and their cultivation continued. This simple and elegant methodology is their most important finding to my mind, for it opens a gateway to cultivating a wealth of potentially antibiotic-producing bacteria that have never been grown before.

The first new antibiotic that they’ve found by this approach, teixobactin, from a bacterium called *Eleftheria terrae*, is less exciting to my mind, though it doesn’t look bad. Teixobactin killed Gram-positive bacteria, such as *S. aureus*, in the laboratory, and cured experimental infection in mice. It also killed the tuberculosis bacterium, which is important because there is a real problem with resistant tuberculosis in the developing world. It was also difficult to select teixobactin resistance.

So, what are my caveats? Well, I see three. First, teixobactin isn’t a potential panacea. It doesn’t kill the Gram-negative opportunists as it is too big to cross their complex cell wall. Secondly, scaling to commercial manufacture will be challenging, since the bacteria making the antibiotic are so difficult to grow. And, thirdly, it’s early days yet. As with any antibiotic, teixobactin now faces the long haul of clinical trials: Phase I to see what dose you can safely give the patient, Phase II to see if it cures infections,

and Phase III to compare its efficacy to that of 90 “standard of care treatment.” That’s going to take five years and £500 million and these are numbers we must find ways to reduce (while not compromising safety) if we’re to keep ahead of bacteria, which can evolve far more swiftly and cheaply.

43

The first paragraph of Passage 1 primarily serves to

- A) present a claim that is supported and developed over the course of the passage.
- B) introduce a controversy that the study described in the passage is intended to resolve.
- C) identify a problem that the research discussed in the passage may help to address.
- D) offer a theory that is challenged by the findings presented in the passage.

44

The author of Passage 1 suggests that an advantage of the method Lewis’s team used to grow microorganisms is that it

- A) identifies the requirements for soil bacteria to thrive and replicates those features in artificial soil.
- B) enables soil bacteria to take in more nutrients than they typically consume in natural settings.
- C) directly affects the cell walls of bacteria rather than the proteins those bacteria produce.
- D) allows researchers to make use of soil bacteria that they had previously been unable to exploit.

45

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

- A) Lines 17-21 (“But only . . . now”)
- B) Lines 28-32 (“To do . . . cells”)
- C) Lines 32-34 (“We just . . . says”)
- D) Lines 44-47 (“It’s likely . . . organically”)

46

The author of Passage 2 would most likely agree with which statement about the development of teixobactin?

- A) It reveals that some antibiotics are effective against gram-negative bacteria.
- B) It shows that conventional methods can still yield new types of antibiotics.
- C) It casts doubt on the practicality of searching for new antibiotics in exotic environments.
- D) It confirms a long-held belief about a potential source of new antibiotics.

47

As used in line 79, “caveats” most nearly means

- A) exceptions.
- B) restrictions.
- C) misgivings.
- D) explanations.

48

In the last sentence of Passage 2, the author uses the phrase “five years and £500 million” primarily to

- A) emphasize the scale of the effort needed to make teixobactin available for consumer use.
- B) criticize the level of funding that the government has committed to teixobactin development.
- C) underscore the amount of time and money that has already been spent researching teixobactin.
- D) compare the amount of money spent developing teixobactin with the amount spent developing other antibiotics.

49

Which choice best describes the relationship between Passage 1 and Passage 2?

- A) Passage 2 offers an evaluation of the significance of the research discussed in Passage 1.
- B) Passage 2 suggests a modification to the methodology described in Passage 1.
- C) Passage 2 uses concrete examples to illustrate concepts considered in Passage 1.
- D) Passage 2 takes a dismissive stance regarding the findings mentioned in Passage 1.

50

Both passages make the point that teixobactin could be useful in

- A) standardizing the future development of antibiotics produced in laboratory environments.
- B) combating infections that are no longer responding to treatment with other antibiotics.
- C) controlling the spread of pathogenic soil fungi.
- D) shaping a new method of studying the effectiveness of antibiotics.

51

Information in Passage 2 best supports which conclusion about the mice in the experiment described in Passage 1?

- A) Exposure to teixobactin made them less susceptible to subsequent upper respiratory tract infections.
- B) Gram-positive bacteria enhanced the effectiveness of teixobactin against their upper respiratory tract infections.
- C) Their upper respiratory tract infections were likely not caused by gram-negative bacteria.
- D) Teixobactin attacked the proteins of the bacteria that caused their upper respiratory tract infections.

52

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

- A) Lines 51-56 (“Many . . . antibiotics”)
- B) Lines 64-68 (“This . . . before”)
- C) Lines 69-72 (“The first . . . bad”)
- D) Lines 80-82 (“It doesn’t . . . wall”)

STOP

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

Writing and Language Test

35 MINUTES, 44 QUESTIONS

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

DIRECTIONS

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

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

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

Questions 1–11 are based on the following passage.

Survival in the Hostile Environment of NW Rota-1

[1] Sixty miles north of Guam and more than 1,700 feet under the ocean’s surface is the summit of NW Rota-1, an undersea volcano discovered in 2003. [2] Surprisingly, the volcano appears to have been continuously active; it even grew 130 feet in height between 2006 and 2009. [3] Yet despite the hostile environment created by the constant volcanic activity, life is thriving there. [4] Special adaptations are the key to survival. [5] At that depth, water pressure suppresses the explosive force of the volcano’s eruptions, allowing scientists to **1** watch and observe them up close via

1

- A) NO CHANGE
- B) watch
- C) observe to see
- D) visually watch

remotely operated vehicles. **2**

NW Rota-1 is far below the ocean's photic zone where sunlight drives photosynthesis; **3** nevertheless, bacteria supporting a unique food web have adapted to this perpetually dark environment. The bacteria have evolved to use hydrogen sulfide instead of sunlight for the energy that drives their metabolic processes, and hydrothermal venting is the source of the chemical soup necessary to support **4** him or her. Seawater seeping into fissures in the ocean floor is heated by underlying magma, and the heat drives chemical reactions that remove oxygen, sulfates, **5** and remove other chemicals from the water. Once the superheated water (up to 750°F) rises through vents in the ocean floor, additional reactions cause minerals and compounds to precipitate onto the seafloor, where bacteria feed on them.

2

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

- A) where it is now.
- B) after sentence 1.
- C) after sentence 2.
- D) after sentence 3.

3

- A) NO CHANGE
- B) afterward,
- C) furthermore,
- D) similarly,

4

- A) NO CHANGE
- B) one.
- C) them.
- D) it.

5

- A) NO CHANGE
- B) it also removes
- C) also removing
- D) and

Loihi shrimp—originally thought to exist only around an undersea volcano near **6** Hawaii, survive by using tiny, shear-like claws to harvest rapidly growing bacterial filaments covering rocks near NW Rota-1's hydrothermal vents. The Loihi shrimp spend most of their time grazing on the bacteria and evading another, previously unknown, species of shrimp. Shrimp of that species also graze on bacterial filaments as juveniles,

7 resulting from their ability to cope with the noxious environment around the volcano. They feed on the Loihi shrimp and other organisms that are overcome by the toxic plumes of volcanic gas and ash.

6

- A) NO CHANGE
- B) Hawaii;
- C) Hawaii—
- D) Hawaii

7

Which choice most effectively sets up the information in the next sentence?

- A) NO CHANGE
- B) but their adaptations are not yet fully understood by the scientific community.
- C) thriving in an unusual ecosystem that also includes crabs, limpets, and barnacles.
- D) but as adults, their claws are large enough for the shrimp to be predators.

During an underwater eruption, steam quickly **8** condenses. The steam leaves only carbon dioxide bubbles and droplets of molten sulfur. This means that the water near NW Rota-1 is more acidic than **9** that of stomach acid, presenting yet another challenge to life-forms living nearby. As the carbon dioxide level in Earth's atmosphere rises, the **10** worlds' ocean's absorb more carbon **11** dioxide. Organisms flourishing near the volcano may help biologists understand how life adjusts to very acidic conditions. In addition, NW Rota-1 is a natural laboratory where scientists can study conditions that may be similar to those that gave rise to life on Earth and perhaps even other worlds.

8

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

- A) condenses and leaves
- B) condenses, having to leave
- C) condenses, thereafter leaving
- D) condenses, and then, after this, it leaves

9

- A) NO CHANGE
- B) those of stomach
- C) the acid from stomach
- D) stomach

10

- A) NO CHANGE
- B) world's oceans'
- C) world's oceans
- D) worlds oceans

11

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

dioxide, which increases their acidity.

Should the writer make this revision here?

- A) Yes, because it explains the relevance of this sentence to the point made in the paragraph.
- B) Yes, because it helps the reader understand why organisms near NW Rota-1 evolved the way they did.
- C) No, because it merely repeats information provided earlier in the passage without contributing to the paragraph's main idea.
- D) No, because it interrupts discussion of oceanic life-forms with an irrelevant detail.

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

Free Public Transportation

City planners, concerned about vehicle traffic clogging their cities' roadways, are trying to find ways to get people out of their cars and onto buses and trains. One radical proposal some planners have considered is to make public transportation free to passengers. While fare-free policies do increase **12** ridership, but they have not been found to be an effective way to address traffic problems. Moreover, these policies may result in serious budget shortfalls.

Not surprisingly, **13** public transportation is used by more people when people do not have to pay a fare. According to a report by the Center for Urban Transportation Research, public transit systems that abolish fares typically see a short-term increase in ridership of about 50 percent. However, this increase does not necessarily correlate with a decrease in car traffic. Evidence suggests that when buses and subways are free, people often take bus and train trips they would not have taken otherwise while still using their cars nearly as much as they did before. In 2013 Tallinn, Estonia, instituted fare-free rides for city residents (becoming the largest city in the world to do so), but car use in Tallinn has only slightly **14** declined; as a 2014 study by the KTH Royal Institute of Technology in Sweden found that car traffic in Tallinn was down less than 3 percent since **15** it was enacted.

12

- A) NO CHANGE
- B) ridership, and while
- C) ridership,
- D) ridership;

13

Which choice is the most effective version of the underlined portion?

- A) NO CHANGE
- B) more people use public transportation if they do not have to pay a fare.
- C) if people do not have to pay a fare, more of those people use public transportation.
- D) using public transportation is done by more people when they do not have to pay a fare.

14

- A) NO CHANGE
- B) declined:
- C) declined,
- D) declined. As

15

- A) NO CHANGE
- B) that
- C) one
- D) the policy

Instituting a fare-free system **16** can also have a devastating effect on a city's transportation budget. All public transportation systems are subsidized by the government to some extent, but large systems gain a substantial portion of their operating revenue from fares. Since systems that go fare-free see increases in ridership, they often must operate more buses and trains and hire more drivers and other personnel at the same time that they are losing a key source of funding. Advocates of fare-free policies claim that the costs of these policies are largely offset by various **17** savings, however, a recent study comparing projected results of fare-free policies in different cities found this outlook to be **18** way too sunny. For example, in San Francisco, CA, fare-free

16

Which choice best introduces the paragraph?

- A) NO CHANGE
- B) also requires planners to make careful considerations about changes in service.
- C) might also have a negative impact on the environment as more service is added.
- D) also has the drawback of increasing crowding on public transportation.

17

- A) NO CHANGE
- B) savings,
- C) savings, but
- D) savings; and

18

- A) NO CHANGE
- B) looking too much on the bright side.
- C) pretty upbeat.
- D) overly optimistic.

public transit was projected to save \$8.4 million per year in fare collection costs **19** but create a deficit of \$72 million per year in lost fares, on top of capital investments in new equipment and infrastructure. **20**

Projected Yearly Savings and Costs of Implementing a Fare-Free Policy

Transit agency	Savings from eliminating fare collection	Cost in lost fares	Cost of adding service	Total additional operating costs
Lane Transit, Eugene, OR	\$100,000 to \$500,000	\$5 million	not provided	\$5 million
Muni, San Francisco, CA	\$8.4 million	\$112 million	\$72 million*	\$184 million
Public Transit, Hamilton, Canada	not provided	\$900,000	\$30 million	\$30.9 million

*plus \$512 million in capital investments

Adapted from Transportation Research Board, "Implementation and Outcomes of Fare-Free Transit Systems." ©2012 by Transportation Research Board.

19

Which choice provides an accurate interpretation of the chart?

- A) NO CHANGE
- B) and save an additional \$112 million from lost fares,
- C) but result in a total increase of \$184 million per year in operating costs,
- D) and save \$72 million per year in costs related to adding service,

20

The writer is considering adding the following sentence based on information from the chart.

By contrast, Lane Transit in Eugene, OR, would lose only \$5 million in fares if it instituted a fare-free system.

Should the writer make this addition here?

- A) Yes, because it proves how little money Eugene would lose under a fare-free system compared with San Francisco.
- B) Yes, because it reinforces the claim made by advocates of fare-free policies mentioned earlier in the paragraph.
- C) No, because it does not support the argument that fare-free systems cause a substantial loss for governments.
- D) No, because it contradicts a point about fare collection made earlier in the paragraph.

This is not to say that fare-free public transportation is always a bad idea. Some college towns and resort communities embrace the model because buses can go faster when drivers **21** would not have had to collect fares. For large cities looking to reduce automobile traffic, though, **22** research about Tallinn, Estonia, could be instructive.

21

- A) NO CHANGE
- B) do not have
- C) did not have
- D) will not have

22

Which choice provides the best conclusion to the passage?

- A) NO CHANGE
- B) subways will prove to be more important than buses.
- C) public transportation should be cheaper but not free.
- D) fare-free public transportation is not the answer.

Questions 23–33 are based on the following passage.

Wet Plate Photography: An Old Technique Makes a New Splash

[1] Upon the arrival of the digital camera, professional photographers harrumphed that [23] they produced ugly, low-resolution images. [2] Yet eventually the vast majority of them traded film for megapixels. [3] The latest digital cameras take pictures so crisp that the images in them appear to be die-cut. [4] Even today's humblest smartphones snap bright, sharp photos. [5] A few contemporary photographers, however, have embraced an anachronistic method that was state-of-the-art technology when it was invented in 1851: wet plate photography. **24**

23

- A) NO CHANGE
- B) it
- C) one
- D) he or she

24

The writer plans to add the following sentence to this paragraph.

Why wouldn't they?

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

- A) after sentence 1.
- B) after sentence 2.
- C) after sentence 4.
- D) after sentence 5.

Wet plate photographers essentially create their own film. The process can be dangerous, given that it requires the use of several volatile chemicals. **25** To take a wet plate photograph, photographers usually first arrange or pose **26** it's subjects before mixing collodion (a viscous, light-sensitive chemical solution) with bromide, iodide, or chloride and applying the mixture to a clean, polished glass plate. Dried collodion is unusable, **27** so once the photo is snapped with a massive, tripod-mounted

25

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

It's also labor-intensive, involving several intricate steps.

Should the writer make this addition here?

- A) Yes, because it serves as an effective transition by reiterating the main idea of the previous paragraph.
- B) Yes, because it sets up the paragraph's outline of the process of wet plate photography.
- C) No, because it blurs the paragraph's focus on the dangers involved in wet plate photography.
- D) No, because it provides an opinion in a paragraph that is focused on facts.

26

- A) NO CHANGE
- B) its
- C) there
- D) their

27

- A) NO CHANGE
- B) but
- C) and
- D) for

camera, the photographer has **28** nominal minutes to develop it, using more chemicals. When the image appears in the negative, water is used to stop the process. A chemical “fix bath” turns the negative image into a positive one. The photo is then immersed in water and warmed. **29** In conclusion, it is coated with lavender **30** oil to give it (a protective finish).

28

The writer wants to emphasize how quickly wet plate photographers have to work. Which choice most effectively accomplishes this goal?

- A) NO CHANGE
- B) a few
- C) a matter of
- D) mere

29

- A) NO CHANGE
- B) Finally,
- C) Thus,
- D) Nevertheless,

30

- A) NO CHANGE
- B) oil—to give it a protective finish.
- C) oil, to give it, a protective finish.
- D) oil to give it a protective finish.

Wet plate photos are marvelously fine-grained and detailed, and they seem to glow with an ethereal silvery light. One misstep or a speck of dust on the glass plate, though, and flaws appear. Smudges resembling oyster shells **31** swirl around the photos' edges. Sunbursts or streaks emerge where collodion pools unevenly. Since the film requires long exposures, moving subjects blur. **32** A shifting arm or leg might even disappear because of the lengthy exposure time required. The exposure time required explains why people in wet plate photographs often look dour: it's hard to hold a smile for that long.

Prominent among contemporary wet plate photographers is Joni Sternbach, whose work centers, appropriately, on water and people's relationship to it. Sternbach's photo series *Ocean Details*, *Sea/Sky*, and *SurfLand* depict surging surfs, roiling waves, and the surfers who ride them. **33** Her subjects could be nineteenth-century wave riders, if not for the modern board shorts and bikinis they wear. Sternbach characterizes wet plate photography as "one part photography, one part performance art, and one part three-ring circus," a worthwhile endeavor because it produces the unique, haunting images she seeks. "When I look at a digital print," she says, "it might be gorgeous and smooth, but it's on a piece of paper and it's one of many."

31

- A) NO CHANGE
- B) will have swirled
- C) have swirled
- D) swirled

32

- A) NO CHANGE
- B) An arm or a leg, shifting during the long exposure time required by wet plate photography, might even disappear.
- C) A wet plate photographer's subject's arm or leg might even disappear during this long exposure time.
- D) A shifting arm or leg might even disappear.

33

The writer wants to highlight the contrast between Sternbach's techniques and the people Sternbach photographs. Which choice most effectively accomplishes this goal?

- A) NO CHANGE
- B) The subjects of her photos could be ordinary people,
- C) It would be hard to tell her subjects are surfers,
- D) They would appear to come from all walks of life,

Questions 34–44 are based on the following passage.

Digging Up Cities

In 2010, as a construction crew began to tear up sidewalks in New York City’s South Street Seaport to replace a water pipe, Alyssa Loorya and her team watched eagerly, picks and brushes in hand. Loorya, an urban archaeologist, studies the history of **34 cities**. Any New York City construction project using municipal funds **35** are required to consider whether historical artifacts will be affected during construction, and if that possibility **36** exists or is possible, an urban archaeologist must be consulted. Since the South Street Seaport area was a bustling commercial center for early colonists, Loorya anticipated that a rich history lay beneath the pavement. “It’s our job to document and recover that history before it’s lost,” she said.

34

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

cities by excavating artifacts that have accumulated over centuries of land development.

Should the writer make this revision here?

- A) Yes, because it helps set up the rest of the passage by explaining what urban archaeologists do.
- B) Yes, because it identifies the characteristics that make particular cities worthy of archaeological study.
- C) No, because it does not give enough detail about the kinds of artifacts that urban archaeologists typically find.
- D) No, because it does not explain how excavation benefits the study of a city’s history.

35

- A) NO CHANGE
- B) have been
- C) is
- D) were

36

- A) NO CHANGE
- B) exists potentially,
- C) exists, it is necessary that
- D) exists,

As the work continued, **37** therefore, the team faced obstacles. Fieldwork in a city has to be done intermittently: the construction crew had to proceed one block at a time to avoid interrupting traffic, and the archaeology team’s work was periodically **38** halted—by stormy weather and the discovery of toxic materials underground. Moreover, as archaeologists underground attempted to relay information to those at the surface, they had to contend with the noise of construction vehicles, car horns, and **39** pedestrians’ noise on the busy New York City streets.

37

- A) NO CHANGE
- B) though,
- C) meanwhile,
- D) similarly,

38

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

39

- A) NO CHANGE
- B) the noise of pedestrians
- C) pedestrians
- D) that of pedestrians

Despite these setbacks, Loorya and her team eventually began to uncover some interesting artifacts. In 2012, the team discovered a foundation wall, a network of wooden pipes, and several well bases dating to the eighteenth century. In August 2013, the archaeologists discovered thousands of objects in a single fifteen-foot stretch that was likely a garbage disposal **40** site. Including buttons from Revolutionary War uniforms, clay pipes, and an imported mineral water bottle from Germany.

As they cleaned and catalogued the artifacts, the archaeologists took stock of their findings. The team's discoveries provided a snapshot of **41** the various kinds of construction materials that were used in the eighteenth century. Colonial-era New Yorkers went to great lengths to secure fresh drinking water, Loorya noted, given the **42** effort involved in laying wooden pipes to bring in fresh water from surrounding areas, digging very deep wells, brewing alcohol to mask the water's salty taste, and even importing bottled water.

40

- A) NO CHANGE
- B) site, among these were
- C) site, including
- D) site; including

41

Which choice most effectively sets up the example discussed in the following sentence?

- A) NO CHANGE
- B) the numerous rituals associated with hospitality
- C) public utility planning and infrastructure development
- D) how major construction projects were financed

42

Which choice best maintains the style and tone of the passage?

- A) NO CHANGE
- B) blood, sweat, and tears
- C) hassle
- D) feats of strength and fortitude

Through such discoveries, **43** they tell the story of a city's history in a new way. **44** "One of my favorite things is putting together someone's life," Loorya said.

43

- A) NO CHANGE
- B) we
- C) colonial-era New Yorkers
- D) urban archaeologists

44

The writer wants to conclude the passage with a quotation from Loorya that illustrates the broad impact of her team's work. Which choice most effectively accomplishes this goal?

- A) NO CHANGE
- B) "New York City construction has a lot of stops and starts,"
- C) "Finding the bits and pieces that were actually used by the people in the past makes New York City's history real,"
- D) "We call our archaeological technique 'monitoring,' and we work hand-in-hand with the contractors and are a part of their team,"

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.

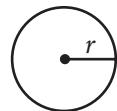
DIRECTIONS

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

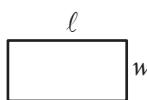
1. The use of a calculator is not permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

REFERENCE

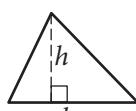


$$A = \pi r^2$$

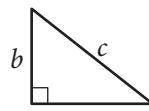
$$C = 2\pi r$$



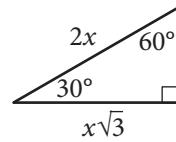
$$A = \ell w$$



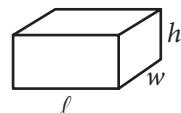
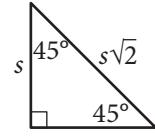
$$A = \frac{1}{2}bh$$



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



Special Right Triangles



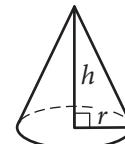
$$V = \ell wh$$



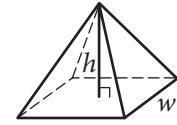
$$V = \pi r^2 h$$



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



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



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

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

The number of radians of arc in a circle is 2π .

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



1

$$2x - y = 8$$

$$x + 2y = 4$$

For the system of equations above, what is the value of $x + y$?

- A) -1
- B) 4
- C) 5
- D) 20

2

Which of the following is equivalent to $2(x^2 - x) + 3(x^2 - x)$?

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

3

Which of the following statements is true about the graph of the equation $2y - 3x = -4$ in the xy -plane?

- A) It has a negative slope and a positive y -intercept.
- B) It has a negative slope and a negative y -intercept.
- C) It has a positive slope and a positive y -intercept.
- D) It has a positive slope and a negative y -intercept.

4

The front of a roller-coaster car is at the bottom of a hill and is 15 feet above the ground. If the front of the roller-coaster car rises at a constant rate of 8 feet per second, which of the following equations gives the height h , in feet, of the front of the roller-coaster car s seconds after it starts up the hill?

- A) $h = 8s + 15$
- B) $h = 15s + \frac{335}{8}$
- C) $h = 8s + \frac{335}{15}$
- D) $h = 15s + 8$



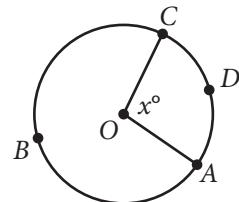
5

$$C = 75h + 125$$

The equation above gives the amount C , in dollars, an electrician charges for a job that takes h hours. Ms. Sanchez and Mr. Roland each hired this electrician. The electrician worked 2 hours longer on Ms. Sanchez's job than on Mr. Roland's job. How much more did the electrician charge Ms. Sanchez than Mr. Roland?

- A) \$75
- B) \$125
- C) \$150
- D) \$275

6



The circle above has center O , the length of arc \widehat{ADC} is 5π , and $x = 100$. What is the length of arc \widehat{ABC} ?

- A) 9π
- B) 13π
- C) 18π
- D) $\frac{13}{2}\pi$

7

If $\frac{8}{x} = 160$, what is the value of x ?

- A) 1,280
- B) 80
- C) 20
- D) 0.05



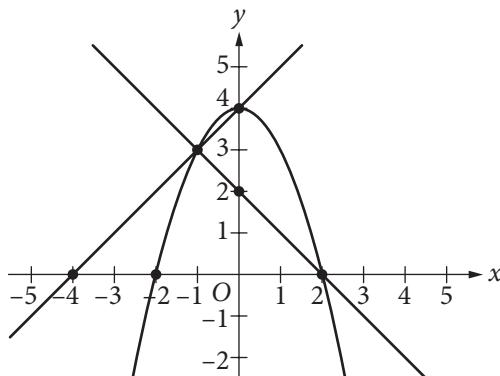
8

$$2ax - 15 = 3(x + 5) + 5(x - 1)$$

In the equation above, a is a constant. If no value of x satisfies the equation, what is the value of a ?

- A) 1
- B) 2
- C) 4
- D) 8

9



A system of three equations is graphed in the xy -plane above. How many solutions does the system have?

- A) None
- B) One
- C) Two
- D) Three

10

$$(ax + 3)(5x^2 - bx + 4) = 20x^3 - 9x^2 - 2x + 12$$

The equation above is true for all x , where a and b are constants. What is the value of ab ?

- A) 18
- B) 20
- C) 24
- D) 40

11

$$\frac{x}{x-3} = \frac{2x}{2}$$

Which of the following represents all the possible values of x that satisfy the equation above?

- A) 0 and 2
- B) 0 and 4
- C) -4 and 4
- D) 4



12

$$\frac{1}{2x+1} + 5$$

Which of the following is equivalent to the expression above for $x > 0$?

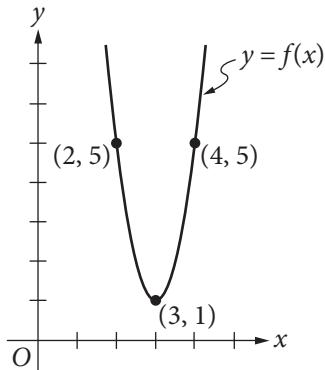
A) $\frac{2x+5}{2x+1}$

B) $\frac{2x+6}{2x+1}$

C) $\frac{10x+5}{2x+1}$

D) $\frac{10x+6}{2x+1}$

13



The graph of the function f in the xy -plane above is a parabola. Which of the following defines f ?

A) $f(x) = 4(x - 3)^2 + 1$

B) $f(x) = 4(x + 3)^2 + 1$

C) $f(x) = (x - 3)^2 + 1$

D) $f(x) = 3(x + 3)^2 + 1$

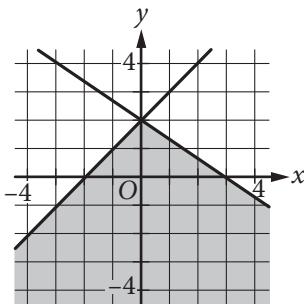


14

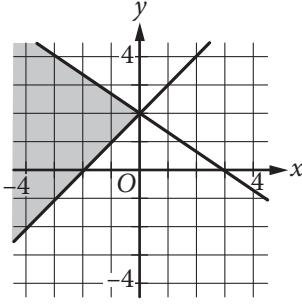
$$\begin{aligned}y &\geq x + 2 \\2x + 3y &\leq 6\end{aligned}$$

In which of the following does the shaded region represent the solution set in the xy -plane to the system of inequalities above?

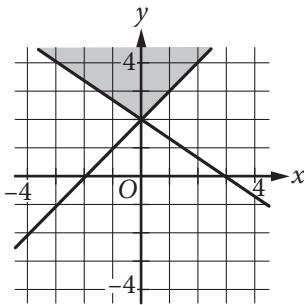
A)



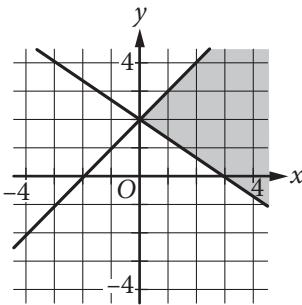
B)



C)



D)



15

What is the set of all solutions to the equation

$$\sqrt{x+2} = -x$$

- A) $\{-1, 2\}$
- B) $\{-1\}$
- C) $\{2\}$
- D) There are no solutions to the given equation.

**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 in result.

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

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

← Fraction line

Answer: 2.5

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

← Decimal point

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

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

.	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

.	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

Answer: 201 – either position is correct

2	0	1
0	0	0
1	1	1
2	●	2
3	3	3

2	0	1
0	0	0
1	1	1
2	●	2
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

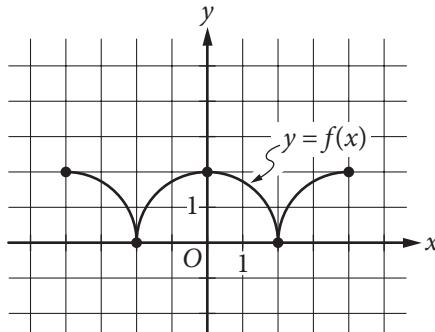
What is the volume, in cubic centimeters, of a right rectangular prism that has a length of 4 centimeters, a width of 9 centimeters, and a height of 10 centimeters?

17

$$4x + 2 = 4$$

If x satisfies the equation above, what is the value of $2x + 1$?

18



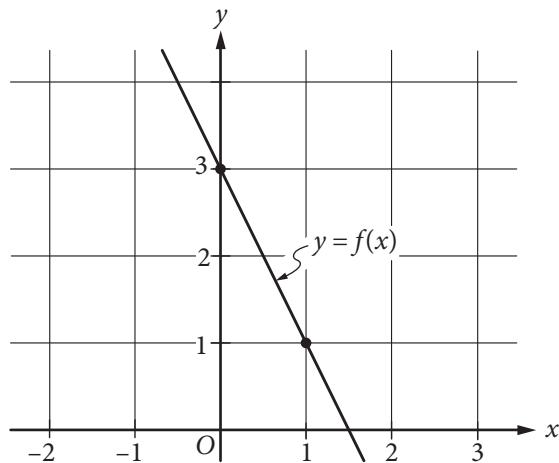
The figure above shows the complete graph of the function f in the xy -plane. The function g (not shown) is defined by $g(x) = f(x) + 6$. What is the maximum value of the function g ?



19

Triangle PQR has right angle Q . If $\sin R = \frac{4}{5}$, what is the value of $\tan P$?

20



The graph of the linear function f is shown in the xy -plane above. The graph of the linear function g (not shown) is perpendicular to the graph of f and passes through the point $(1, 3)$. What is the value of $g(0)$?

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.

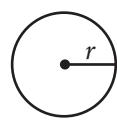
DIRECTIONS

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

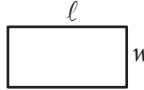
1. The use of a calculator is permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the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

REFERENCE

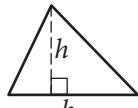


$$A = \pi r^2$$

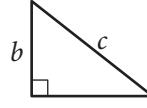
$$C = 2\pi r$$



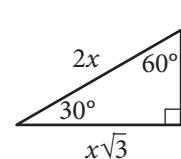
$$A = lw$$



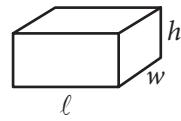
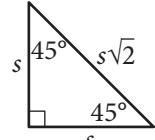
$$A = \frac{1}{2}bh$$



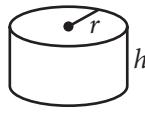
$$c^2 = a^2 + b^2$$



Special Right Triangles



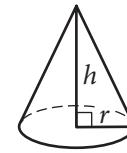
$$V = lwh$$



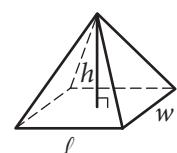
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3} lwh$$

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

The number of radians of arc in a circle is 2π .

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



1

What value of x satisfies the equation $3x + 3 = 27$?

- A) 3
- B) 8
- C) 10
- D) 27

2

Two units of length used in ancient Egypt were cubits and palms, where 1 cubit is equivalent to 7 palms. The Great Sphinx statue in Giza is approximately 140 cubits long. Which of the following best approximates the length, in palms, of the Great Sphinx statue?

- A) 0.05
- B) 20
- C) 140
- D) 980

3

If $\frac{2n}{5} = 10$, what is the value of $2n - 1$?

- A) 24
- B) 49
- C) 50
- D) 99

4

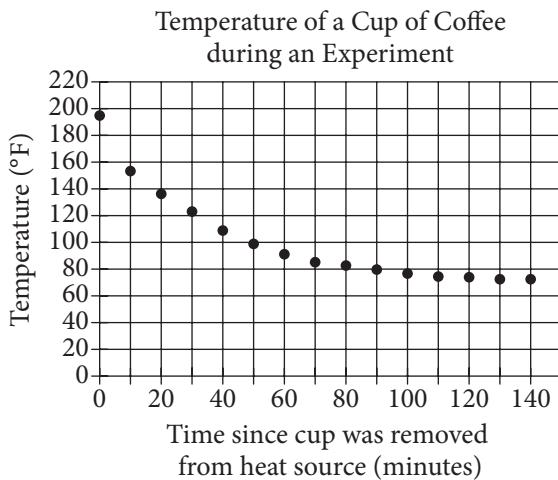
$$\sqrt{x^2} = x$$

Which of the following values of x is NOT a solution to the equation above?

- A) -4
- B) 0
- C) 1
- D) 3



Questions 5 and 6 refer to the following information.



In an experiment, a heated cup of coffee is removed from a heat source, and the cup of coffee is then left in a room that is kept at a constant temperature. The graph above shows the temperature, in degrees Fahrenheit ($^{\circ}\text{F}$), of the coffee immediately after being removed from the heat source and at 10-minute intervals thereafter.

5

Of the following, which best approximates the temperature, in degrees Fahrenheit, of the coffee when it is first removed from the heat source?

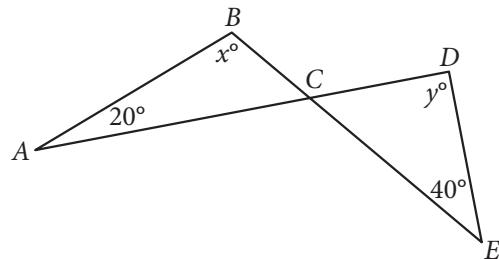
- A) 75
- B) 100
- C) 155
- D) 195

6

During which of the following 10-minute intervals does the temperature of the coffee decrease at the greatest average rate?

- A) Between 0 and 10 minutes
- B) Between 30 and 40 minutes
- C) Between 50 and 60 minutes
- D) Between 90 and 100 minutes

7



Note: Figure not drawn to scale.

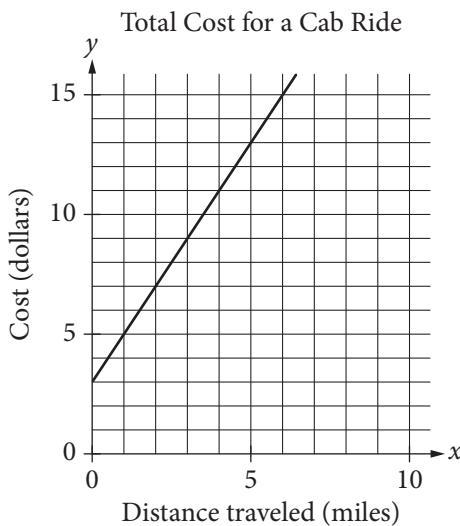
In the figure above, \overline{AD} intersects \overline{BE} at C . If $x = 100$, what is the value of y ?

- A) 100
- B) 90
- C) 80
- D) 60



8

The line graphed in the xy -plane below models the total cost, in dollars, for a cab ride, y , in a certain city during nonpeak hours based on the number of miles traveled, x .



According to the graph, what is the cost for each additional mile traveled, in dollars, of a cab ride?

- A) \$2.00
- B) \$2.60
- C) \$3.00
- D) \$5.00

9

Customer Purchases at a Gas Station

	Beverage purchased	Beverage not purchased	Total
Gasoline purchased	60	25	85
Gasoline not purchased	35	15	50
Total	95	40	135

On Tuesday, a local gas station had 135 customers. The table above summarizes whether or not the customers on Tuesday purchased gasoline, a beverage, both, or neither. Based on the data in the table, what is the probability that a gas station customer selected at random on that day did not purchase gasoline?

- A) $\frac{15}{50}$
- B) $\frac{15}{40}$
- C) $\frac{35}{50}$
- D) $\frac{50}{135}$



10

Washington High School randomly selected freshman, sophomore, junior, and senior students for a survey about potential changes to next year's schedule. Of students selected for the survey, $\frac{1}{4}$ were freshmen and $\frac{1}{3}$ were sophomores. Half of the remaining selected students were juniors. If 336 students were selected for the survey, how many were seniors?

- A) 240
- B) 140
- C) 120
- D) 70

11

Plant A is currently 20 centimeters tall, and Plant B is currently 12 centimeters tall. The ratio of the heights of Plant A to Plant B is equal to the ratio of the heights of Plant C to Plant D. If Plant C is 54 centimeters tall, what is the height of Plant D, in centimeters?

- A) 32.4
- B) 44.0
- C) 62.0
- D) 90.0

12

Biologists found a new species of pale shrimp at the world's deepest undersea vent, the Beebe Vent Field. The vent is 3.1 miles below the sea's surface. Approximately how many kilometers below the sea's surface is the vent? (1 kilometer \approx 0.6214 miles)

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

13

A cargo helicopter delivers only 100-pound packages and 120-pound packages. For each delivery trip, the helicopter must carry at least 10 packages, and the total weight of the packages can be at most 1,100 pounds. What is the maximum number of 120-pound packages that the helicopter can carry per trip?

- A) 2
- B) 4
- C) 5
- D) 6



14

A company purchased a machine valued at \$120,000. The value of the machine depreciates by the same amount each year so that after 10 years the value will be \$30,000. Which of the following equations gives the value, v , of the machine, in dollars, t years after it was purchased for $0 \leq t \leq 10$?

- A) $v = 30,000 - 9,000t$
- B) $v = 120,000 - 9,000t$
- C) $v = 120,000 + 9,000t$
- D) $v = 120,000 - 30,000t$

15

Line m in the xy -plane contains the points $(2, 4)$ and $(0, 1)$. Which of the following is an equation of line m ?

- A) $y = 2x + 3$
- B) $y = 2x + 4$
- C) $y = \frac{3}{2}x + 3$
- D) $y = \frac{3}{2}x + 1$

16

$$(4x + 4)(ax - 1) - x^2 + 4$$

In the expression above, a is a constant. If the expression is equivalent to bx , where b is a constant, what is the value of b ?

- A) -5
- B) -3
- C) 0
- D) 12

17

If $2w + 4t = 14$ and $4w + 5t = 25$, what is the value of $2w + 3t$?

- A) 6
- B) 10
- C) 13
- D) 17

**Questions 18–20 refer to the following information.**

Jennifer bought a box of Crunchy Grain cereal. The nutrition facts on the box state that a serving size of the cereal is $\frac{3}{4}$ cup and provides 210 calories, 50 of which are calories from fat. In addition, each serving of the cereal provides 180 milligrams of potassium, which is 5% of the daily allowance for adults.

18

If p percent of an adult's daily allowance of potassium is provided by x servings of Crunchy Grain cereal per day, which of the following expresses p in terms of x ?

- A) $p = 0.5x$
- B) $p = 5x$
- C) $p = (0.05)^x$
- D) $p = (1.05)^x$

19

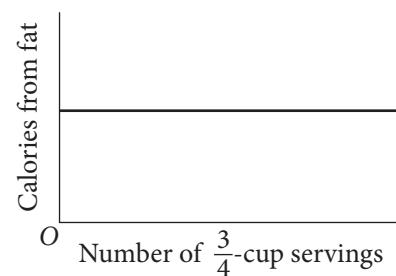
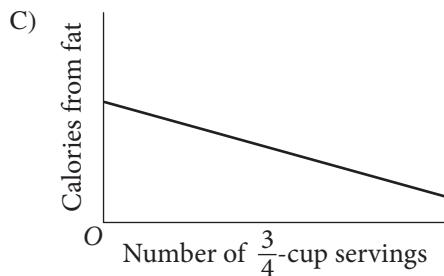
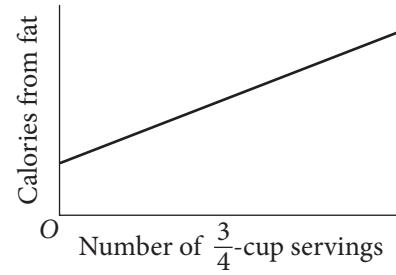
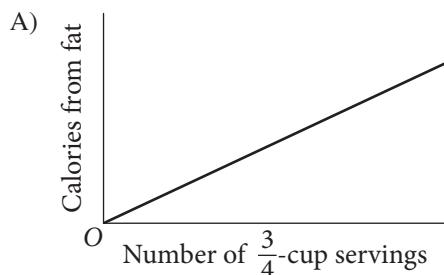
On Tuesday, Jennifer will mix Crunchy Grain cereal with Super Grain cereal for her breakfast. Super Grain cereal provides 240 calories per cup. If the total number of calories in one cup of Jennifer's mixture is 270, how much Super Grain cereal is in one cup of the mixture?

- A) $\frac{1}{8}$ cup
- B) $\frac{1}{4}$ cup
- C) $\frac{1}{3}$ cup
- D) $\frac{1}{2}$ cup



20

Which of the following could be the graph of the number of calories from fat in Crunchy Grain cereal as a function of the number of $\frac{3}{4}$ -cup servings of the cereal?





21

The graph of the exponential function h in the xy -plane, where $y = h(x)$, has a y -intercept of d , where d is a positive constant. Which of the following could define the function h ?

- A) $h(x) = -3(d)^x$
- B) $h(x) = 3(x)d$
- C) $h(x) = d(-x)^3$
- D) $h(x) = d(3)^x$

22

The weights, in pounds, for 15 horses in a stable were reported, and the mean, median, range, and standard deviation for the data were found. The horse with the lowest reported weight was found to actually weigh 10 pounds less than its reported weight. What value remains unchanged if the four values are reported using the corrected weight?

- A) Mean
- B) Median
- C) Range
- D) Standard deviation

23

Near the end of a US cable news show, the host invited viewers to respond to a poll on the show's website that asked, "Do you support the new federal policy discussed during the show?" At the end of the show, the host reported that 28% responded "Yes," and 70% responded "No." Which of the following best explains why the results are unlikely to represent the sentiments of the population of the United States?

- A) The percentages do not add up to 100%, so any possible conclusions from the poll are invalid.
- B) Those who responded to the poll were not a random sample of the population of the United States.
- C) There were not 50% "Yes" responses and 50% "No" responses.
- D) The show did not allow viewers enough time to respond to the poll.

24

If $f(x) = 5x^2 - 3$ and $f(x + a) = 5x^2 + 30x + 42$, what is the value of a ?

- A) -30
- B) -3
- C) 3
- D) 30



25

If $\sin x^\circ = a$, which of the following must be true for all values of x ?

- A) $\cos x^\circ = a$
- B) $\sin(90^\circ - x^\circ) = a$
- C) $\cos(90^\circ - x^\circ) = a$
- D) $\sin(x^2)^\circ = a^2$

26

$$h(x) = -16x^2 + 100x + 10$$

The quadratic function above models the height above the ground h , in feet, of a projectile x seconds after it had been launched vertically. If $y = h(x)$ is graphed in the xy -plane, which of the following represents the real-life meaning of the positive x -intercept of the graph?

- A) The initial height of the projectile
- B) The maximum height of the projectile
- C) The time at which the projectile reaches its maximum height
- D) The time at which the projectile hits the ground

27

In the xy -plane, the graph of the polynomial function f crosses the x -axis at exactly two points, $(a, 0)$ and $(b, 0)$, where a and b are both positive. Which of the following could define f ?

- A) $f(x) = (x - a)(x - b)$
- B) $f(x) = (x + a)(x + b)$
- C) $f(x) = (x - a)(x + b)$
- D) $f(x) = x(x - a)(x - b)$

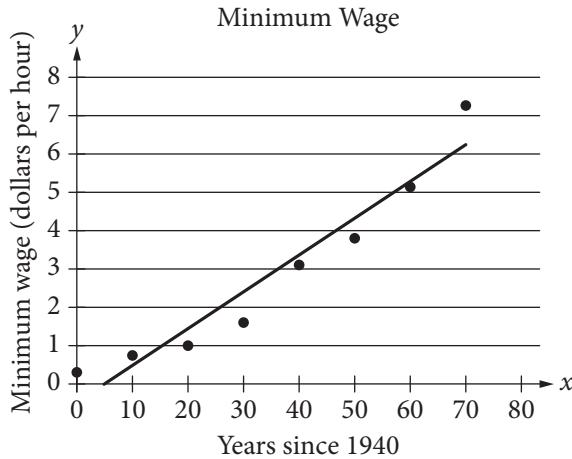
28

If $y = 3x^2 + 6x + 2$ is graphed in the xy -plane, which of the following characteristics of the graph is displayed as a constant or coefficient in the equation?

- A) y -coordinate of the vertex
- B) x -intercept(s)
- C) y -intercept
- D) x -intercept of the line of symmetry



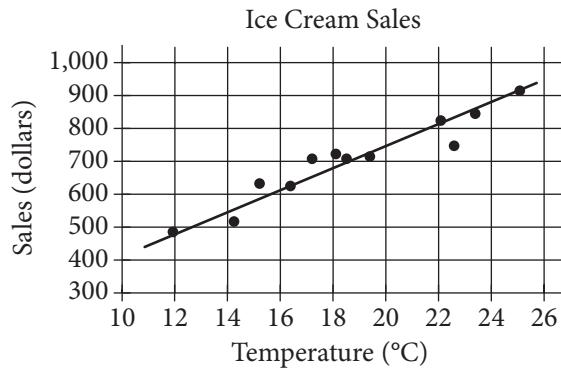
29



The scatterplot above shows the federal-mandated minimum wage every 10 years between 1940 and 2010. A line of best fit is shown, and its equation is $y = 0.096x - 0.488$. What does the line of best fit predict about the increase in the minimum wage over the 70-year period?

- A) Each year between 1940 and 2010, the average increase in minimum wage was 0.096 dollars.
- B) Each year between 1940 and 2010, the average increase in minimum wage was 0.49 dollars.
- C) Every 10 years between 1940 and 2010, the average increase in minimum wage was 0.096 dollars.
- D) Every 10 years between 1940 and 2010, the average increase in minimum wage was 0.488 dollars.

30



The scatterplot above shows a company's ice cream sales d , in dollars, and the high temperature t , in degrees Celsius ($^{\circ}\text{C}$), on 12 different days. A line of best fit for the data is also shown. Which of the following could be an equation of the line of best fit?

- A) $d = 0.03t + 402$
- B) $d = 10t + 402$
- C) $d = 33t + 300$
- D) $d = 33t + 84$

**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 $\frac{7}{2}$. (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 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

Fraction
line

Answer: 2.5

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

Decimal
point

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

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

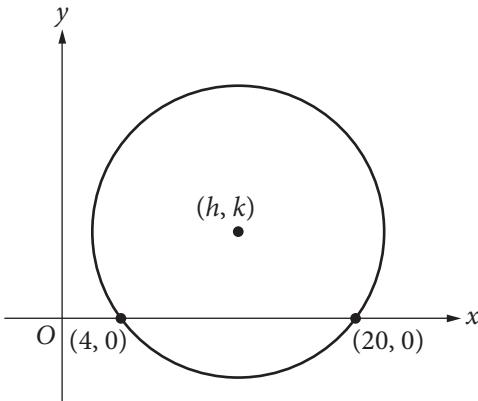
2	0	1
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

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

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



31



In the xy -plane above, the circle has center (h, k) and radius 10. What is the value of k ?

33

	Blood type			
Rhesus factor	A	B	AB	O
+	33	9	3	37
-	7	2	1	x

Human blood can be classified into four common blood types—A, B, AB, and O. It is also characterized by the presence (+) or absence (−) of the rhesus factor. The table above shows the distribution of blood type and rhesus factor for a group of people. If one of these people who is rhesus negative (−) is chosen at random, the probability that the person has blood type B is $\frac{1}{9}$. What is the value of x ?

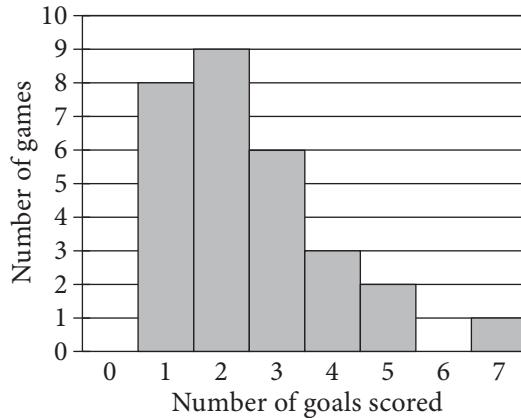
32

In the xy -plane, line ℓ has a y -intercept of -13 and is perpendicular to the line with equation $y = -\frac{2}{3}x$. If the point $(10, b)$ is on line ℓ , what is the value of b ?



34

Number of Goals Scored by
a Soccer Team in 29 Games



Based on the graph above, in how many of the games played did the soccer team score goals equal to the median number of goals for the 29 games?

35

Gisela would owe \$15,500 in taxes each year if she were not eligible for any tax deductions. This year, Gisela is eligible for tax deductions that reduce the amount of taxes she owes by \$2,325.00. If these tax deductions reduce the taxes Gisela owes this year by $d\%$, what is the value of d ?

36

$$\begin{aligned}\frac{3}{4}x - \frac{1}{2}y &= 12 \\ ax - by &= 9\end{aligned}$$

The system of equations above has no solutions. If a and b are constants, what is the value of $\frac{a}{b}$?



Questions 37 and 38 refer to the following information.

International Tourist Arrivals, in millions

Country	2012	2013
France	83.0	84.7
United States	66.7	69.8
Spain	57.5	60.7
China	57.7	55.7
Italy	46.4	47.7
Turkey	35.7	37.8
Germany	30.4	31.5
United Kingdom	26.3	32.2
Russia	24.7	28.4

The table above shows the number of international tourist arrivals, rounded to the nearest tenth of a million, to the top nine tourist destinations in both 2012 and 2013.

38

The number of international tourist arrivals in Russia in 2012 was 13.5% greater than in 2011. The number of international tourist arrivals in Russia was k million more in 2012 than in 2011. What is the value of k to the nearest integer?

37

Based on the information given in the table, how much greater, in millions, was the median number of international tourist arrivals to the top nine tourist destinations in 2013 than the median number in 2012, to the nearest tenth of a million?

STOP

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

Answer Explanations

SAT Practice Test #9

Section 1: Reading Test

QUESTION 1

Choice D is the best answer. Throughout the passage, the narrator describes a visit to her family's ink shop. The narrator's father and uncles are employed at the shop, and in the third and fifth paragraphs the narrator describes her father's interactions with a customer. Her father praises the color, sound, and smell of an ink sample as indicators of the ink's quality. This interaction leads the narrator to conclude in the last paragraph, "I was very proud to hear Father speak of our family's ink this way." Therefore, the passage is best summarized as a character's visit to her family's ink shop that deepens her appreciation of her family's work.

Choice A is incorrect. Although the narrator's arrival at her family's ink shop does spark memories of her Precious Auntie, these memories center on Precious Auntie's beliefs about creativity, including the conviction that inferior ink produces inferior thought. The narrator's thoughts on Precious Auntie occur in the fourth paragraph, so choice A isn't the best summary of the overall passage. Choice B is incorrect. Although the passage describes the narrator's surprise visit to the ink shop and a reunion with her uncles, these events occur in the first paragraph. Therefore, choice B doesn't provide the best summary of the passage as a whole. Choice C is incorrect because the narrator doesn't make any reference to her father's ambitions.

QUESTION 2

Choice B is the best answer. In the fourth paragraph, the narrator recounts her Precious Auntie's belief that "you can never be an artist if your work comes without effort." Her Precious Auntie states that when the physical act of writing is done with an "inkstick along an inkstone," this process requires an artist to "take the first step to cleansing your mind and your heart. You push and you ask yourself, What are my intentions? What is in my heart that matches my mind?" In the following paragraphs, the narrator recalls the pride she felt while listening to her father describe the high quality of the ink that her family had worked hard to produce. Therefore, a main theme of the passage is that quality is achieved through deliberate effort.

Choice A is incorrect. Although family relationships form a backdrop to the passage, the nurturing of these relationships isn't a main theme. Choice C is incorrect. Although the passage does emphasize that hard work produces higher quality writing than that which is produced through minimal work, the passage doesn't mention that hard work results in material compensation. Choice D is incorrect. Although the passage discusses the role of concentrated effort in creative expression, a main theme of the passage isn't that creativity needs to be expressed concretely.

QUESTION 3

Choice B is the best answer. In the first sentence of the second paragraph, the narrator states: "I tried to notice everything so I could later tell GaoLing what I had seen." She then proceeds to describe the floors of the family's ink shop, the walls and display cases, and the various items for sale. According to the third paragraph, these include an inkstick "with a top shaped like a fairy boat," another inkstick with "a bird shape," and a collection of ink cakes "embellished with designs of peonies and bamboo." Therefore, throughout the passage, the narrator is portrayed as someone who is attuned to her immediate surroundings.

Choice A is incorrect. Although the narrator describes herself as shy, the people she interacts with aren't unfamiliar to her because they are members of her family whom she has met before. Choices C and D are incorrect because the narrator isn't portrayed as sympathetic to the needs of others (choice C) or anxious about her responsibilities (choice D).

QUESTION 4

Choice A is the best answer. Big Uncle and Little Uncle offer Old Widow Lau and the narrator a seat at a table reserved for customers upon their arrival at the narrator's family's ink shop. According to the tenth sentence of the first paragraph, "Old Widow Lau refused their invitation three times, exclaiming that my father and uncles must be too busy for visitors." Old Widow Lau's rejection of the uncles' offer is characterized as insincere, as the next sentence of that paragraph shows that she doesn't actually want to leave the shop: "She made weak efforts to leave." Instead, her gestures are intended to inspire exaggerated insistence from the uncles, such that it isn't until the uncles' "fourth insistence, [that Old Widow Lau and the narrator] finally sat." Therefore, it can be most reasonably inferred from the passage that Old Widow Lau's reluctance to stay for tea is feigned because she isn't genuinely firm in her resolve.

Choice B is incorrect because the passage doesn't imply that Old Widow Lau's reluctance is inconsiderate or that the family has been planning her visit. Choice C is incorrect because the shop isn't unusually busy. Instead, only one customer is mentioned in the passage. Choice D is incorrect because the passage doesn't state or imply that Old Widow Lau is exhausted from her journey.

QUESTION 5

Choice C is the best answer. The previous question asks what can be most reasonably inferred from the passage about Old Widow Lau's reluctance to stay for tea. The answer, that her reluctance is feigned because she isn't genuinely firm in her resolve, is best supported by the tenth and eleventh sentences of the first paragraph: "Old Widow Lau refused their invitation three times, exclaiming that my father and uncles must be too busy for visitors. She made weak efforts to leave."

Choices A, B, and D are incorrect because the cited lines don't support the answer to the previous question. Instead, they describe the narrator and Old Widow Lau's arrival at the shop (choice A), their initial reception by the uncles (choice B), and the hospitality the uncles lavish on them once they are seated (choice D).

QUESTION 6

Choice A is the best answer. In the second paragraph, the narrator describes the "shiny" glass display cases at her family's ink shop and how the silk-wrapped boxes of ink inside these cases "looked so much nicer [in the shop] than they had in the ink-making studio at Immortal Heart village." Therefore, the narrator indicates that the contrast between the ink-making studio at Immortal Heart village and her family's ink shop is that the ink shop displays the family's ink more impressively.

Choices B, C, and D are incorrect because the narrator doesn't state or imply that her family's ink shop, in comparison to the ink-making studio at Immortal Heart village, is more conveniently located for the public (choice B), provides greater individual attention to customers (choice C), or offers a larger space for presenting products (choice D).

QUESTION 7

Choice C is the best answer. In the fourth paragraph, the narrator summarizes Precious Auntie's artistic philosophy: when you write without effort, "you do not have to think. You simply write what is swimming on the top of your brain. And the top is nothing but pond scum, dead leaves, and mosquito spawn." In other words, anything written too quickly, and therefore without concerted effort and thought, would be synonymous with the debris floating on top of a pool of water. Therefore, it is reasonable to infer that Precious Auntie would consider a hastily written first draft of a story to be essentially worthless in and of itself.

Choice A is incorrect because Precious Auntie's description of work made without effort is exclusively negative; therefore, it isn't reasonable to infer that she would praise a hastily written story draft as emotionally raw and powerful. Choice B is incorrect because Precious Auntie's artistic philosophy is concerned solely with the quality of the artist's output rather than with the satisfaction the artist experiences. Choice D is incorrect because whether a hastily produced work would be inappropriately analytical isn't discussed in the passage.

QUESTION 8

Choice C is the best answer. The previous question asks what can be reasonably inferred about Precious Auntie’s view of a hastily written first draft of a story, based on the artistic philosophy expressed in the fourth paragraph. The answer, that she would consider such a story to be essentially worthless in and of itself, is best supported by the sixth and seventh sentences of the fourth paragraph, which describe Precious Auntie’s view of writing produced without effort: “You simply write what is swimming on the top of your brain. And the top is nothing but pond scum, dead leaves, and mosquito spawn.”

Choices A, B, and D are incorrect because the cited lines don’t support the answer to the previous question. Instead, they transition between the scene in the ink shop and the narrator’s memories of Precious Auntie (choice A), summarize Precious Auntie’s assessment of ink quality (choice B), and describe the process of creating good writing through concerted effort (choice D).

QUESTION 9

Choice B is the best answer. In the last sentences of the fourth paragraph, the narrator describes Precious Auntie’s artistic philosophy, or, more specifically, the questions that an artist is forced to ask when working with concerted effort: “You push and you ask yourself, What are my intentions? What is in my heart that matches my mind?” With the second question, Precious Auntie highlights how an artist must strive to create work that resembles, or corresponds with, what is in both the artist’s heart and mind. Therefore, the word “matches,” as used in this sentence, most nearly means corresponds with.

Choices A, C, and D are incorrect because in the context of the passage, “matches” means corresponds with, not competes against (choice A), runs counter to (choice C), or treats equally (choice D).

QUESTION 10

Choice C is the best answer. In the fifth paragraph, the narrator’s father demonstrates the quality of an inkstick to a customer. He strikes the inkstick, and the narrator describes “a sound as clean and pure as a small silver bell.” Therefore, the word “clean,” as used in this paragraph to describe a sound that the inkstick produced, most nearly means distinct, or clear.

Choices A, B, and D are incorrect because in the context of the passage, “clean” means distinct, not complete (choice A), skillful (choice B), or upright (choice D).

QUESTION 11

Choice D is the best answer. The first paragraph of the passage introduces research by Harvard psychology professor Daniel Wegner demonstrating that the Internet is changing “the way our

memories function.” One finding of Wegner’s study, as stated in the second paragraph, is that “when people have access to search engines, they remember fewer facts and less information because they know they can rely on ‘search’ as a readily available shortcut.” In the third paragraph, Wegner claims that his study shows how “the Internet has become part of a transactive memory source, a method by which [humans’] brains compartmentalize information,” such that “computers and technology as well are becoming virtual extensions of [human] memory.” The remainder of the passage details Wegner’s experiments and findings. Thus, the main purpose of the passage is to share the findings of a study examining the effect of computer use on memory recall.

Choice A is incorrect. Although the author suggests in the sixth paragraph that technology may interfere with critical thinking, this isn’t the focus of Wegner’s experiments, nor is illustrating this position the main purpose of the passage. Choices B and C are incorrect because the passage doesn’t support the assertion that people have become overly dependent on computers for storing information (choice B) or that humans’ capacity for memory is much weaker than it once was (choice C).

QUESTION 12

Choice D is the best answer. The fifth paragraph details the results of the fourth experiment of Wegner’s study, where participants were more likely to recall digital folder locations where statements they typed were saved than the actual statements themselves. The first sentence of the last paragraph summarizes why this result may not be alarming: “And even though we may not be taxing our memories to recall distinct facts, we are still using them to consider where the facts are located and how to access them.” In this sentence, the author paraphrases Wegner’s view that although human memory is changing as a result of technology, this doesn’t indicate that human memory is declining, as people are relying on their memory to access specific types of information. Therefore, this sentence best supports the idea that reliance on computers doesn’t necessarily diminish human memory.

Choices A, B, and C are incorrect because the cited lines don’t support the idea that reliance on computers doesn’t necessarily diminish human memory. Instead, they introduce the topic of Wegner’s research (choice A), provide examples of the types of information that people may now rely on the Internet to provide (choice B), and concede that the Internet may diminish critical thinking skills (choice C).

QUESTION 13

Choice D is the best answer. In the third paragraph, the author outlines Wegner’s theory of a “transactive memory source.” According to Wegner, transactive memory is a “network of memory,” where an individual can access information that he or she can’t personally

recall from a particular source. The author illustrates this idea in the second sentence of this paragraph, with the example of “a husband [who] relies on his wife to remember a relative’s birthday.” Thus, the reference to remembering a relative’s birthday mainly serves to illustrate the concept of a transactive memory source using a familiar situation.

Choice A is incorrect. Although the situation of a husband relying on his wife’s memory does suggest that closely related people tend to have shared memories, this isn’t the main purpose of this reference in the context of the passage. Choice B is incorrect because the example doesn’t demonstrate how people initially developed external sources of memory. Choice C is incorrect because the function of the example isn’t to emphasize the effectiveness and accuracy of transactive memory sources. Instead, its function is to make the abstract concept of transactive memory more easily understandable.

QUESTION 14

Choice B is the best answer. In the third paragraph, Wegner describes transactive memory as a “network of memory where you don’t have to remember everything in the world yourself.” Instead, the burden of storing information is shifted to transactive memory sources that can function as “extensions of [human] memory.” Examples of sources provided in the fourth paragraph of the passage include cell phones, GPS devices, and search engines. What these examples have in common is that they store information, such as phone numbers, directions, and general knowledge, so that a person doesn’t have to commit this information to memory. A written list of a user’s passwords for different websites serves the same function as these examples. Although remembering a list of passwords for different websites is conceivable without a list, keeping such a list shifts the burden of storing readily memorable information away from the user because the list preserves the information in place of the user’s memory. Therefore, based on the passage, a written list of a user’s passwords for different websites would be considered a transactive memory source.

Choices A, C, and D are incorrect because they don’t accurately exemplify transactive memory sources. A souvenir brought home from a memorable trip (choice A) may evoke memories of that place for the owner. However, it doesn’t preserve actual information in the way the examples provided in the passage do. A library database that helps users locate specific books (choice C) may seem similar to a search engine. However, it doesn’t store information that would otherwise be readily memorable in the way that a search engine can help a user remember an actor’s name or a detail of geography, according to the fourth paragraph of the passage. Instead, it helps a library patron navigate a system that is typically far too vast to be committed to memory. A website that helps users plan and make travel arrangements

(choice D) may help facilitate transactions in the form of ticket purchases or hotel reservations. However, it doesn't store information that the user would otherwise memorize.

QUESTION 15

Choice B is the best answer. In the last sentence of the third paragraph, the author states that “computers and technology . . . are becoming virtual extensions of our memory.” In other words, computers and technology are becoming memory sources that serve as additions to human memory. Thus, “extensions of,” as used in the passage, most nearly means additions to.

Choices A, C, and D are incorrect because in the context of the passage, “extensions of” means additions to, not delays in (choice A), lengths of (choice C), or developments of (choice D).

QUESTION 16

Choice C is the best answer. The fifth paragraph of the passage describes four experiments that Wegner conducted to demonstrate his theory of a transactional memory source. The first experiment, described in the second sentence of this paragraph, found that participants “were more likely to think of computer terms like ‘Yahoo’ or ‘Google’ after being asked a set of difficult trivia questions.” The second, third, and fourth experiments explored participants’ tendency to remember the location of information rather than the information itself. Therefore, the discussion of the experiments, most specifically the first experiment, suggests that people are inclined to think of specific information sources in response to being asked to provide facts that aren’t already familiar to them.

Choice A is incorrect. Although some of the subjects in the second experiment did memorize information that later became inaccessible, this act of memorization didn’t cause the subjects to think of specific information sources. Choice B is incorrect. Although participants in the fourth experiment were told their work would be saved in specific folders, they weren’t directed to develop a system for organizing and saving content. Choice D is incorrect because none of the experiments involved participants being prompted to identify terms related to dependence on computers.

QUESTION 17

Choice A is the best answer. The previous question asks, based on Wegner’s experiments, when people would be inclined to think of specific information sources. The answer, that being asked to provide facts that aren’t already familiar to them provokes this response, is best supported by the second sentence of the fifth paragraph: “In the first experiment, participants demonstrated that they were more likely to think of computer terms like ‘Yahoo’ or ‘Google’ after being asked a set of difficult trivia questions.”

Choices B, C, and D are incorrect because the cited lines don't support the answer to the previous question. Instead, they describe the different parameters for the participants in the second and third experiments (choice B), summarize the results of the second and third experiments (choice C), and summarize the results of the fourth experiment (choice D).

QUESTION 18

Choice A is the best answer. The second sentence of the sixth paragraph states: "Students who have trouble remembering distinct facts, for example, may struggle to employ those facts in critical thinking." In other words, students who find it difficult to remember information may find it challenging to utilize that information to develop logical arguments. Therefore, the word "employ," as used in the context of this sentence, most nearly means utilize.

Choices B, C, and D are incorrect because in the context of the passage, "employ" means utilize, not enroll (choice B), exert (choice C), or assign (choice D).

QUESTION 19

Choice C is the best answer. The passage explains that in the fourth experiment participants were given statements and folder locations where they were told those statements would be saved. On the graph, the bar farthest to the left represents those who remembered both elements of the information given to them during the experiment. This bar rises to a point midway between 15% and 20%. Therefore, according to the graph, approximately 17% of participants remembered both parts of the information given to them during the fourth experiment.

Choice A is incorrect because none of the groups represented on the graph comprised 7% of participants. Choices B and D are incorrect because neither 10% (choice B) nor 30% (choice D) of participants remembered both elements of the information given to them during the fourth experiment. Instead, 10% remembered statements but not folder locations (according to the second bar from the left), while 30% remembered folder locations but not statements (according to the third bar from the left).

QUESTION 20

Choice D is the best answer. The largest single group of participants represented on the graph is composed of those who remembered nothing, as indicated by the bar that is farthest to the right. Why approximately 40% of participants could not remember the statements or the folder locations isn't explained by the description of the fourth experiment in the fifth paragraph of the passage. Therefore, the

most likely explanation for the findings regarding the largest single group of participants represented on the graph is that there isn't enough information to determine the cause of the results for those participants.

Choices A, B, and C are incorrect because these speculations aren't supported by the passage. There isn't enough information provided about the fourth experiment to know whether the participants who could remember nothing focused on remembering the folder locations (choice A), attempted to remember the statements and the folder locations (choice B), or didn't attempt to remember any specific pieces of information (choice C).

QUESTION 21

Choice A is the best answer. Throughout the passage, the author describes experiments conducted on guppies to determine the guppies' rate of and types of evolutionary change. The first paragraph outlines the reason why these fish were an optimal choice for this research: their "unstinting rate of reproduction makes guppies ideally suited for studying the rate of evolution." Therefore, the first paragraph mainly serves to establish the reason why a certain species was selected for scientific observation.

Choice B is incorrect because the purpose of the first paragraph isn't to illustrate the value of studying the offspring of a particular animal shortly after birth. Instead, guppies were selected because of their rapid rate of reproduction and weren't only studied shortly after being born, according to the passage. Choices C and D are incorrect. Although the fourth paragraph does introduce a new method of scientific inquiry (experimental evolution), the first paragraph doesn't mainly serve to introduce a theory at the center of an ongoing scientific debate (choice C) or offer a rationale for the prevalence of a new field of scientific inquiry (choice D).

QUESTION 22

Choice B is the best answer. The third sentence of the second paragraph states, "A lucky guppy is born above a waterfall or a set of rapids, which keep out the predatory fish called pike cichlids found in calmer downstream waters." In other words, pike cichlids normally eat guppies, but waterfalls and rapids can create natural barriers that prevent these predators from entering certain areas where guppies live. Thus, in describing the living conditions of guppies, the author indicates that a "lucky guppy" is one that inhabits an environment that provides natural protection from predators.

Choices A and C are incorrect because the author doesn't indicate that being born in a major river with an established guppy population is an advantage for a guppy (choice A) or that there are risks associated with living near a waterfall or that guppies benefit by avoiding such risks (choice C). Choice D is incorrect because the author doesn't indicate that there is an advantage for guppies living in calmer

downstream waters. Instead, the author notes that calmer downstream waters are where guppies' predators live, making these zones more dangerous for guppies than the areas above waterfalls or rapids.

QUESTION 23

Choice D is the best answer. In the last paragraph, the author describes an experiment in which Reznick's team removed groups of guppies from areas with large populations of pike cichlid predators and relocated them into areas above waterfalls and rapids. According to the second sentence of this paragraph, "Although small predatory killifish occurred in these new sites, these fish do not pose anything close to the danger of the cichlids." This sentence provides the best evidence for the conclusion that the streams used by Reznick's team were not entirely free of predators, as they contained populations of killifish.

Choices A, B, and C are incorrect because the cited lines don't provide the best evidence for the conclusion that the streams used by Reznick's team were not entirely free of predators. Instead, they explain the advantage for guppies living above waterfalls or rapids (choice A), outline the correlation between numbers of pike cichlids and guppy mortality rates (choice B), and explain the growing popularity of "experimental evolution" among scientists (choice C).

QUESTION 24

Choice A is the best answer. According to the fourth paragraph, the existence of streams in Trinidad with populations of guppies and those without guppies led Reznick to the conclusion that he could conduct experiments by altering the guppy populations in various streams. According to the second sentence of the fourth paragraph, Reznick realized he could "treat streams like giant test tubes by introducing guppies or predators" to places they had not originally occurred, and then watch as natural selection acted on the guppies." Reznick uses the phrase "giant test tubes" in this sentence to suggest that certain streams can provide suitable experimental conditions for his guppy research.

Choices B, C, and D are incorrect because the phrase "giant test tubes" serves to characterize certain streams as suitable for experimental research, not to suggest that those streams promote cooperative behaviors among guppies used as subjects in experimental studies (choice B), increase the rate of genetic change among guppies (choice C), or assist scientists in solving environmental problems in the natural habitat of guppies (choice D).

QUESTION 25

Choice C is the best answer. The fourth paragraph describes Reznick's rationale for moving populations of guppies from one body of water to another. The last sentence of the paragraph states, "This kind of real-world manipulation of nature is called 'experimental evolution,'

and it is growing increasingly popular among scientists working with organisms that reproduce quickly enough for humans to be able to see the outcome within our lifetimes.” In other words, the fact that this type of research is “growing increasingly popular” means that it is becoming more widespread. Thus, the word “popular” as used in the passage most nearly means widespread.

Choices A, B, and D are incorrect because in the context of the passage, “popular” means widespread, not accessible (choice A), suitable (choice B), or likable (choice D).

QUESTION 26

Choice B is the best answer. Reznick’s team found that guppies, when moved from predator-ridden environments to a site where there was not the same level of predation, “evolved to mature later, and have fewer, bigger offspring in each litter, just like the guppies that naturally occurred in the cichlid-free streams,” according to the fourth sentence of the last paragraph. If it were discovered that the new site into which Reznick released the guppies were inhabited by fish found to be as predatory as the cichlids in the original sites, this discovery would undermine Reznick’s findings. Such a finding would mean that the pressure of predation on the guppies remained constant from one site to the next. As a consequence, some other factor or factors would be responsible for the developmental changes in the guppies that Reznick’s team recorded.

Choice A is incorrect. If guppies examined in other parts of the globe were found to exhibit genetic shifts in traits at a different rate from the guppies Reznick examined, these findings would not undermine his research because they would have occurred outside the confines of his experimental conditions. Choice C is incorrect. If experimental evolution were shown to be harmful to the environment, this finding, though important, would not undermine Reznick’s findings. Choice D is incorrect. If the descendants of Reznick’s transplanted fish were proven to mature later than the guppies living below the waterfall, this finding would support, rather than undermine, Reznick’s findings.

QUESTION 27

Choice A is the best answer. The last sentence of the passage states, “Other studies of guppies in Trinidad have shown evolutionary change in as few as two and a half years, or a little over four generations, with more time required for genetic shifts in traits such as the ability to form schools and less time for changes in the colorful spots and stripes on a male’s body.” That is, certain traits, such as physical markings, seem to change more quickly than other traits, such as aspects of group behavior. Thus, it can most reasonably be inferred from the passage that the experiments in Trinidad have shown that some genetic traits will evolve more readily than others.

Choices B, C, and D are incorrect because the experiments in Trinidad led to conclusions about guppies' rate of evolutionary changes. These experiments did not lead to an identification of other dangerous predators (choice B), an analysis of how certain guppies thrive better in predator-ridden environments (choice C), or an examination as to how evolutionary changes can be prevented in a natural environment (choice D).

QUESTION 28

Choice D is the best answer. The previous question asks what can most reasonably be inferred about guppies based on the experiments in Trinidad described in the passage. The answer, that some guppy genetic traits will evolve more readily than others, is best supported by the last sentence of the passage: "Other studies of guppies in Trinidad have shown evolutionary change in as few as two and a half years, or a little over four generations, with more time required for genetic shifts in traits such as the ability to form schools and less time for changes in the colorful spots and stripes on a male's body."

Choices A, B, and C are incorrect because the cited lines don't support the answer to the previous question. Instead, they pose a question central to Reznick's research (choice A), describe the conditions that led Reznick to consider conducting experimental evolution tests in Trinidad (choice B), and describe how Reznick's team removed guppies from one area and reintroduced them in another (choice C).

QUESTION 29

Choice D is the best answer. The number of offspring produced by guppies living in the south slope high-predation environment is indicated by the first bar from the left in figure 1. This bar rises to a point midway between 6 and 7 on the graph. Therefore, according to figure 1, guppies living in the south slope high-predation environment produced a mean number of offspring between 6 and 7.

Choice A is incorrect because 2 to 3 offspring were produced by guppies living in the south slope low-predation environment, rather than those living in the high-predation environment, as indicated by the second bar from the left in figure 1. Choice B is incorrect because 3 to 4 offspring were produced by guppies living in the north slope low-predation environment, rather than guppies living in the south slope high-predation environment, as indicated by the bar that is farthest to the right in figure 1. Choice C is incorrect because none of the groups represented in figure 1 produced 5 to 6 offspring.

QUESTION 30

Choice C is the best answer. The graph shows that the mean embryo mass in a low-predation environment for south slope guppies (second bar from the left) is higher than mean embryo mass in a

high-predation environment for south slope guppies (bar farthest to the left). A similar relationship exists for north slope guppies, as the mean embryo mass in a low-predation environment (bar farthest to the right) is higher than the mean embryo mass in a high-predation environment (third bar from the left). Meanwhile, a comparison of south slope high-predation environments (bar farthest to the left) to north slope high-predation environments shows no difference in mean embryo mass.

The graph shows that while there is a slightly lower mean embryo mass in north slope low-predation environments (bar farthest to the right) than in south slope low-predation environments (second bar from the left), this difference is only 0.2 mg, which is considerably less than the difference that results from comparing the low- and high-predation environments in each of the two locations. Therefore, the conclusion about the mean mass of guppy embryos that is best supported by figure 2 is that the predation level observed in each environment had more of an effect on mean embryo mass than did slope location.

Choice A is incorrect because slope location wasn't a better indicator of mean embryo mass than was the predation level observed in each environment. Instead, the mean masses of embryos in the two locations were roughly equivalent. Choice B is incorrect because the mean embryo mass of guppies born in the north slope environments didn't exceed the mean embryo mass of guppies born in the south slope environments. Guppies living in high-predation environments in both north and south slope locations had embryos with the same mass, while those living on the north slope in low-predation environments had embryos with a slightly lower mass than that of south slope guppies in low-predation environments. Therefore, the mean embryo mass of guppies born in the south slope environment exceeded the mean embryo mass of guppies born in the north slope environment. Choice D is incorrect because guppies born in low-predation environments didn't have a mean embryo mass less than that of guppies born in high-predation environments. Instead, these guppies had a greater mass.

QUESTION 31

Choice B is the best answer. Figure 1 shows that guppies from low-predation environments (represented on the graph by second and fourth bars from the left) had smaller litters, or fewer guppy offspring, than did guppies from high-predation environments (represented by the first and third bars from the left). Similarly, figure 2 shows that guppies from low-predation environments (the second and fourth bars from the left) also had embryos with a greater mean mass than did guppies from high-predation environments (the first and third bars from the left).

Choice A is incorrect. Although figure 1 does support the conclusion that guppies from low-predation environments have fewer offspring than those from high-predation environments, neither figure indicates the time required for guppies to reach full maturity. Choice C is incorrect because neither figure indicates the survival rate of guppies,

and figure 2 directly contradicts the conclusion that guppies from low-predation environments have less mean embryo mass than those from high-predation environments. Choice D is incorrect. Although figure 2 supports the conclusion that guppies from low-predation environments have a greater mean embryo mass than those from high-predation environments, figure 1 directly contradicts the conclusion that guppies from low-predation environments produce a greater number of offspring than those from high-predation environments.

QUESTION 32

Choice D is the best answer. In the passage, Sara T. Smith addresses the Second Anti-Slavery Convention of American Women. In the second sentence of the first paragraph, Smith states that confronting slavery is “a question of justice” and that it involves “considerations of immense importance to the welfare and prosperity of our country.” In the third paragraph, Smith argues that women shouldn’t be deterred from participating in the abolitionist cause. In the last paragraph, she argues that women “cannot remain inactive” in confronting slavery as “our country is as dear to us as to the proudest statesman. . . . Let our course, then, still be *onward!*” Therefore, Smith’s main purpose in the passage is to encourage women to see their participation in the abolitionist cause as just and important.

Choices A and C are incorrect because Smith doesn’t accuse fellow abolitionists of overlooking the contributions that women have made to the movement (choice A) or make the case that women’s rights are meaningless while slavery exists (choice C). Choice B is incorrect. Although Smith quotes the Declaration of Independence in the third paragraph, the main purpose of the passage isn’t to argue that the causes of abolition and women’s rights are continuations of the spirit of the American Revolution.

QUESTION 33

Choice A is the best answer. Throughout the passage, Smith poses questions that aren’t answered explicitly until the last paragraph, but the leading tone of the speech makes it clear that the implied answer to these questions is “no.” In the second paragraph, Smith questions her critics’ claim that upholding humanitarian values undermines conventional feminine virtues. In the third paragraph, she wonders how women can “have no interest” in the subject of slavery when it could lead to the destruction of their families through war. In the last paragraph, she asks women numerous questions and then answers them with a “no.” Thus, a technique that Smith uses throughout the passage to advance her main point is to present her claims in the form of rhetorical questions that mostly have implicit negative answers.

Choice B is incorrect. Although Smith questions the assertions that her opponents made, she doesn’t criticize her opponents themselves by quoting self-contradictory remarks they have made. Choice C

is incorrect. Although Smith makes use of vivid language and imagery throughout the passage, she doesn't illustrate each of her central ideas with an emotionally powerful anecdote. Choice D is incorrect. Although it is implied that Smith considers her views to be reasonable, she doesn't present them as universally held.

QUESTION 34

Choice B is the best answer. In the first sentence of the passage, Smith introduces the argument that slavery is a “political question” and therefore not “within the ‘province of woman.’” In the second sentence, Smith voices her opposition to this argument: “It is not true that [slavery] is *merely* a political question, it is likewise a question of justice, of humanity, of morality, of religion.” In other words, slavery is too broad a problem to be classified solely as “political,” in Smith’s view. However, in the fourth paragraph, Smith returns to the political aspect of the argument at hand by addressing how women must engage in the subject of slavery on a political scale. She argues that “admitting [slavery] to be a political question” doesn’t mean that women have “no interest in the welfare of our country,” as women must criticize slavery and its “unjust laws” and seek to stop the nation’s “downward course” by choosing to not “remain inactive.” Therefore, Smith develops her argument about slavery as a “political question” over the course of the passage by dismissing the designation as too narrow but then demonstrates its relevance to her audience.

Choice A is incorrect. Although Smith does offer alternative ways of defining the problem of slavery, she doesn’t claim that the designation of slavery as a “political question” is outdated, but rather that it is insufficient. Choice C is incorrect because Smith doesn’t contend that the designation of slavery as a “political question” has become trite, nor does she invite her audience to revitalize it. Choice D is incorrect. Although Smith’s argument is intertwined with questions of gender roles, she doesn’t describe the meaning the designation of a “political question” has for men and then challenge women to embrace it.

QUESTION 35

Choice B is the best answer. In the first sentence of the passage, Smith relays a claim: “We are told that it is not within the ‘province of woman,’ to discuss the subject of slavery; that it is a ‘political question,’ and we are ‘stepping out of our sphere,’ when we take part in its discussion.” In the next sentence, Smith rejects this claim: “It is not true that it is *merely* a political question, it is likewise a question of justice, of humanity, of morality, of religion.” She then argues that the subject of slavery “involves considerations of immense importance to the welfare and prosperity of our country, enters deeply into the home-concerns, the every-day feelings of millions of our fellow beings” and expands upon this point by providing an example of the difference, under slavery, between laborers who are enslaved and those

who are within the “dignity of conscious manhood.” Therefore, the best summary of the first paragraph is that Smith rejects a claim and elaborates on her reasons for doing so.

Choice A is incorrect. Although Smith may outline a conventional viewpoint in the first paragraph, she doesn’t present evidence to support it. Choice C is incorrect. Although Smith introduces her subject in the first paragraph, she doesn’t provide historical background for understanding it. Choice D is incorrect. Although Smith does identify a problem in the first paragraph, she doesn’t propose steps to remedy it.

QUESTION 36

Choice A is the best answer. In the first sentence of the second paragraph, Smith relays the sentiment, presumably voiced by those opposed to women abolitionists, that “woman ‘can take no part [in the debate over slavery] without losing something of the modesty and gentleness which are her most appropriate ornaments.’” Smith opposes this view in the following sentence: “must woman necessarily be less gentle because her heart is open to the claims of humanity, or less modest because she feels for the degradation of her enslaved sisters, and would stretch forth her hand for their rescue?” The leading tone of this rhetorical question makes it clear that Smith would answer it with a “no.” Thus, Smith argues that it is possible for women to act according to humanitarian principles while preserving their femininity.

Choices B, C, and D are incorrect because Smith doesn’t argue that it is possible for women to adhere to personal morality while being politically neutral (choice B), contribute to their family’s financial security while meeting social expectations (choice C), or resist calls for war while still opposing slavery (choice D).

QUESTION 37

Choice A is the best answer. The previous question asks which activity Smith argues it is possible for women to engage in. The answer, that she argues that women can act according to humanitarian principles while preserving their femininity, is best supported in the last sentence of the second paragraph: “must woman necessarily be less gentle because her heart is open to the claims of humanity, or less modest because she feels for the degradation of her enslaved sisters, and would stretch forth her hand for their rescue?” The leading tone of this rhetorical question makes it clear that Smith would answer it with a “no.” In other words, Smith believes that women can uphold humanitarian principles while maintaining conventional feminine virtues.

Choices B, C, and D are incorrect because the cited lines don’t support the answer to the previous question. Instead, they link women’s conventional domestic concerns with the losses that would be incurred by a war over slavery (choice B), affirm that the potential horrors of

war are enough to stir women out of a state of political inactivity (choice C), and equate women's patriotism with that of male political leaders (choice D).

QUESTION 38

Choice C is the best answer. In the first sentence of the third paragraph, Smith states "by the Constitution of the United States, the whole physical power of the North is pledged for the suppression of domestic insurrections, and should the slaves, maddened by oppression, endeavor to shake off the yoke of the taskmaster, the men of the North are bound to make common cause with the tyrant, and put down, at the point of the bayonet, every effort on the part of the slave, for the attainment of his freedom." In other words, according to Smith, if slaves were to revolt, the US Constitution would require that Northern states help the slave states fight the slaves' rebellion.

Choices A, B, and D are incorrect because Smith doesn't argue that if the slaves were to revolt the US Constitution would require the Northern states to sever ties with the slave states (choice A), give shelter to refugees from the slave states (choice B), or provide financial assistance to the rebelling slaves (choice D).

QUESTION 39

Choice D is the best answer. The word "tyrant" describes a cruel and unfair ruler. It is first used in the first sentence of the third paragraph, when Smith argues that in the event of a slave rebellion in the slave states, "the men of the North are bound to make common cause with the tyrant, and put down, at the point of the bayonet, every effort on the part of the slave, for the attainment of his freedom." The word occurs again in the seventh sentence of the last paragraph, when Smith asserts the strength of women's "aspirations that every inhabitant of our land may be protected . . . by just and equal laws" so that "the foot of the tyrant may no longer invade the domestic sanctuary." In both instances, the word "tyrant" is used to represent slaveholders and their allies. Thus, Smith's use of "tyrant" emphasizes the unjustness of slavery.

Choice A is incorrect because Smith's use of the word "tyrant" doesn't identify a specific individual as oppressive. Instead, it refers to all those individuals who profit from and abet the unjust institution of slavery. Choice B is incorrect because Smith's use of the word "tyrant" doesn't highlight the threat of aggression from abroad. Instead, it highlights national injustice. Choice C is incorrect because Smith's use of the word "tyrant" doesn't critique the limited roles for women in antislavery movements. Smith's use of the word "tyrant" refers to slaveholders and their allies, not those who would discourage women's participation in the antislavery movement.

QUESTION 40

Choice C is the best answer. In the last sentence of the third paragraph, Smith argues that the threat of a war precipitated by slavery “is of itself sufficient to arouse the slumbering energies of woman” to speak out against slavery’s injustice. In other words, women have the potential to protest slavery, but they have been relatively inactive, or dormant, up until now. Therefore, the word “slumbering,” as used in this sentence, most nearly means dormant.

Choices A, B, and D are incorrect because in the context of the passage, “slumbering” means dormant, not lethargic (choice A), drowsy (choice B), or unconscious (choice D).

QUESTION 41

Choice A is the best answer. The fifth sentence of the last paragraph poses the following question: “Shall we silently behold the land which we love with all the heart-warm affection of children, rendered a hissing and a reproach throughout the world, by this system which is already tolling the death-bell of her decease among the nations?” In other words, the continuation of slavery in the United States is being criticized “throughout the world,” such that the existence of slavery affects the United States by lowering the country’s reputation in the international community.

Choice B is incorrect because Smith doesn’t suggest that slavery affects the United States by leading many women to disavow their allegiance to the country. Instead, she suggests that it is partly women’s patriotism that should stir them to protest slavery because it is lowering the reputation of the United States in the international community. Choice C is incorrect. Although Smith speaks ominously in the last paragraph of “the events of the last two years” that are “overclouding the bright prospects of the future,” she doesn’t cite any current violent conflicts in the country. Choice D is incorrect because Smith doesn’t suggest that slavery weakens the authority of the country’s government. Instead, she argues that it damages the country’s reputation abroad.

QUESTION 42

Choice C is the best answer. The previous question asks how Smith most strongly suggests that slavery affects the United States. The answer, that slavery affects the United States by lowering the country’s reputation in the international community, is best supported by the fifth sentence of the last paragraph: “Shall we silently behold the land which we love with all the heart-warm affection of children, rendered a hissing and a reproach throughout the world, by this system which is already tolling the death-bell of her decease among the nations?”

Choices A, B, and D are incorrect because the cited lines don’t support the answer to the previous question. Instead, they suggest that because war affects home life, women are right to concern themselves

with the possibility of war (choice A), imply that women have a right to consider issues that fall outside the domestic sphere (choice B), and issue a call to action for women to voice condemnation of slavery (choice D).

QUESTION 43

Choice C is the best answer. The first paragraph of Passage 1 presents a quote by biochemist Kim Lewis of Northeastern University: “Pathogens are acquiring resistance faster than we can introduce new antibiotics, and this is causing a human health crisis.” The rest of the passage describes Lewis’s research and the experimental antibiotic called teixobactin that her research has produced. According to the second paragraph of the passage, teixobactin has “proved effective at killing off a wide variety of disease-causing bacteria—even those that have developed immunity to other drugs.” Therefore, the first paragraph of Passage 1 primarily serves to identify a problem that the research discussed in the passage may help to address.

Choice A is incorrect because although the first paragraph quotes a claim by Lewis regarding antibiotic resistance, this claim isn’t developed over the course of Passage 1. Choice B is incorrect because the claim made in the first paragraph regarding antibiotic resistance isn’t presented as controversial, nor does Passage 1 attempt to resolve any scientific controversies. Choice D is incorrect because the claim made in Paragraph 1 isn’t presented as a theory; moreover, the findings in Passage 1 support this claim rather than challenge it.

QUESTION 44

Choice D is the best answer. The third paragraph of Passage 1 describes how, historically, the development of antibiotics requires “natural microbial substances,” but this reliance has severe limitations as only about one percent of these microbial substances can be grown in a laboratory. The author goes on to explain how “the rest, in staggering numbers, have remained uncultured and of limited use to medical science, until now.” The paragraph then describes the method Lewis’s team used to grow teixobactin microorganisms “in their natural environment where they already have the conditions they need for growth.” Therefore, the author of Passage 1 suggests that an advantage of the method Lewis’s team used to grow microorganisms is that it allows researchers to make use of soil bacteria that they had previously been unable to exploit.

Choice A is incorrect because although the author of Passage 1 suggests that Lewis’s team identified the requirements for soil bacteria to thrive, the team didn’t replicate those features in artificial soil. Instead, the author suggests in the third and fourth paragraphs of Passage 1 that they used real soil samples. Choice B is incorrect because the author of Passage 1 doesn’t suggest that the method Lewis’s team used to grow microorganisms enabled soil bacteria to

take in more nutrients than they typically consume in natural settings. Instead, it can be inferred from the fourth paragraph of the passage that the bacteria were provided with the same nutrients they consume in natural settings. Choice C is incorrect because the last paragraph of Passage 1 explains that it isn't the method Lewis's team used to grow bacteria but the antibiotic the team created that affects the cell walls of bacteria.

QUESTION 45

Choice A is the best answer. The previous question asks what advantage of the method Lewis's team used to grow microorganisms is suggested by the author of Passage 1. The answer, that this method allows researchers to make use of soil bacteria that they had previously been unable to exploit, is best supported by the first through third sentences of the third paragraph of Passage 1: "Natural microbial substances from soil bacteria and fungi have been at the root of most antibiotic drug development during the past century. But only about one percent of these organisms can be grown in a lab. The rest, in staggering numbers, have remained uncultured and of limited use to medical science, until now."

Choices B, C, and D are incorrect because the cited lines don't support the answer to the previous question. Instead, they describe the gadget that Lewis's team developed to grow microorganisms (choice B), explain how the team's technique affects the bacteria (choice C), and outline how teixobactin attacks harmful bacteria (choice D).

QUESTION 46

Choice D is the best answer. In the first sentence of Passage 2, the author outlines the "long . . . suspected" belief that if researchers could "grow more types of bacteria from soil . . . then we might find new natural antibiotics." The author then explains how Lewis's team's technique that led to the development of teixobactin employed growing bacteria from soil. The author concludes in the last sentence of the first paragraph that Lewis's team's "simple and elegant methodology . . . opens a gateway to cultivating a wealth of potentially antibiotic-producing bacteria." Therefore, the author of Passage 2 would most likely agree with the statement that the development of teixobactin confirms a long-held belief about a potential source of new antibiotics.

Choice A is incorrect because the author of Passage 2 wouldn't likely agree with the statement that the development of teixobactin reveals that some antibiotics are effective against gram-negative bacteria. The author mentions gram-negative bacteria in the third paragraph to highlight teixobactin's ineffectiveness in combating it, not to discuss other antibiotics that are effective against gram-negative bacteria. Choice B is incorrect because the author wouldn't likely agree with the statement that the development of teixobactin shows that conventional methods can still yield new types of antibiotics. Instead, the author

contends that the unconventional method used to produce teixobactin may yield new types of antibiotics. Choice C is incorrect because the author wouldn't likely agree with the statement that the development of teixobactin casts doubt on the practicality of searching for new antibiotics in exotic environments. Rather, in the first paragraph of Passage 2, the author states that exotic environments might yield new antibiotics.

QUESTION 47

Choice C is the best answer. In the first sentence of the last paragraph of Passage 2, the author expresses reservations about the immediate usefulness of teixobactin: "So, what are my caveats? Well, I see three. First, teixobactin isn't a potential panacea. . . . Secondly, scaling to commercial manufacture will be challenging. . . . And, thirdly . . . teixobactin now faces the long haul of clinical trials." The author uses the word "caveats" to introduce skeptical comments about teixobactin's value. Thus, the word "caveats," as used in the first sentence of the last paragraph of Passage 2, most nearly means misgivings.

Choices A, B, and D are incorrect because in the context of the passage, "caveats" means misgivings, not exceptions (choice A), restrictions (choice B), or explanations (choice D).

QUESTION 48

Choice A is the best answer. In the last paragraph of Passage 2, the author expresses reservations regarding teixobactin. One of these reservations is that the drug "now faces the long haul of clinical trials" before teixobactin can be made available for consumers. These clinical trials will be used to discover "what dose you can safely give the patient . . . if it cures infections, and . . . to compare its efficacy to that of 'standard of care treatment,'" and are "going to take five years and £500 million." Thus, the author uses the phrase "five years and £500 million" primarily to emphasize the scale of the effort needed to make teixobactin available for consumer use.

Choices B, C, and D are incorrect because the author of Passage 2 uses the phrase "five years and £500 million" as a reference to the time and financial commitment that will be required to make teixobactin available to the public. That being the case, the phrase doesn't imply criticism of the level of funding that the government has committed to teixobactin development (choice B), address the amount of time and money that has already been spent researching teixobactin (choice C), or compare the amount of money spent developing teixobactin with the amount spent developing other antibiotics (choice D).

QUESTION 49

Choice A is the best answer. Passage 1 discusses research conducted by biochemist Kim Lewis. As described in the second paragraph of the passage, this research explored "a new way to tap the powers of

soil microorganisms” in the laboratory and led to the development of teixobactin, a promising new drug that could “function effectively for decades,” thereby addressing the problem of pathogens’ resistance to antibiotics. The author of Passage 2 critiques the research described in Passage 1. In the first paragraph of Passage 2, the author declares that the methodology Lewis and others developed “is their most important finding . . . for it opens a gateway to cultivating a wealth of potentially antibiotic-producing bacteria.” However, teixobactin “is less exciting” to the author of Passage 2 because it has proved ineffective at combating certain types of bacteria and large investments of time and money will be needed before it can be made available to the public at large, according to the second and third paragraphs of Passage 2. Therefore, the best description of the relationship between Passage 1 and Passage 2 is that Passage 2 offers an evaluation of the significance of the research discussed in Passage 1.

Choice B is incorrect because Passage 2 doesn’t suggest a modification to the methodology described in Passage 1. Instead, the author of Passage 2 embraces the “simple and elegant” methodology described in Passage 1. Choice C is incorrect because Passage 2 doesn’t use concrete examples to illustrate concepts considered in Passage 1. Instead, it evaluates the significance of the research. Choice D is incorrect because Passage 2 doesn’t take a dismissive stance regarding the findings mentioned in Passage 1. The author of Passage 2 endorses the methodology described in Passage 1, and concedes that teixobactin “doesn’t look bad,” while outlining some reservations about the drug’s value.

QUESTION 50

Choice B is the best answer. The first paragraph of Passage 1 quotes biochemist Kim Lewis of Northeastern University: “Pathogens are acquiring resistance faster than we can introduce new antibiotics, and this is causing a human health crisis.” However, research conducted by Lewis has produced a drug called teixobactin, which has “proved effective at killing off a wide variety of disease-causing bacteria—even those that have developed immunity to other drugs,” according to the second sentence of the second paragraph of Passage 1. Similarly, in the third sentence of the second paragraph of Passage 2, the author of the passage states that teixobactin “killed the tuberculosis bacterium, which is important because there is a real problem with resistant tuberculosis in the developing world.” Therefore, both passages make the point that teixobactin could be useful in combating infections that are no longer responding to treatment with other antibiotics.

Choice A is incorrect because Passage 1 outlines the methodology used to produce teixobactin but doesn’t offer it as a model for future development of antibiotics produced in laboratory environments. Passage 2 suggests that future development of antibiotics may draw on the methodology that Lewis and others developed, but the passage doesn’t go so far as to suggest that teixobactin could be used to

standardize this development. Choices C and D are incorrect because neither passage makes the point that teixobactin could be useful in controlling the spread of pathogenic soil fungi (choice C) or in shaping a new method of studying the effectiveness of antibiotics (choice D).

QUESTION 51

Choice C is the best answer. According to the last sentence of the fifth paragraph of Passage 1, “Mice infected with bacteria that cause upper respiratory tract infections . . . were treated with teixobactin, and the drug knocked out the infections with no noticeable toxic effects.” The second paragraph of Passage 2 explains that teixobactin was tested in a laboratory and killed gram-positive bacteria, but, according to the fourth sentence of the third paragraph, it “doesn’t kill the Gram-negative opportunists as it is too big to cross their complex cell wall.” Therefore, since teixobactin was not successful in eradicating gram-negative bacteria as stated in Passage 2, this information best supports the conclusion that the mice described in the experiment in Passage 1 had upper respiratory tract infections that were likely not caused by gram-negative bacteria since these infections were successfully treated by teixobactin.

Choices A, B, and D are incorrect because no information in Passage 2 supports the conclusion that the mice in the experiment described in Passage 1 were less susceptible to subsequent upper respiratory tract infections due to exposure to teixobactin (choice A), the gram-positive bacteria enhanced the effectiveness of teixobactin against the upper respiratory tract infections in the mice (choice B), or the teixobactin attacked the proteins of the bacteria that caused the upper respiratory tract infections in the mice.

QUESTION 52

Choice D is the best answer. The previous question asks which conclusion about the mice in the experiment described in Passage 1 is best supported by information in Passage 2. The answer, that their upper respiratory tract infections were likely not caused by gram-negative bacteria, is best supported by the fourth sentence of the third paragraph of Passage 2: “[Teixobactin] doesn’t kill the Gram-negative opportunists as it is too big to cross their complex cell wall.”

Choices A, B, and C are incorrect because the cited lines don’t support the answer to the previous question. Instead, they provide a historical background to Lewis’s cultivation of soil bacteria (choice A), praise the methodology used by Lewis’s team and others (choice B), and introduce an evaluation of teixobactin (choice C).

Section 2: Writing and Language Test

QUESTION 1

Choice B is the best answer. The verb “watch” clearly and concisely indicates that scientists can view underwater volcanic eruptions “via remotely operated vehicles.”

Choices A, C, and D are incorrect because they’re repetitive. “Observe,” “see,” and “visually” unnecessarily reiterate the idea that scientists can view underwater volcanic eruptions.

QUESTION 2

Choice B is the best answer. Sentence 5 should be placed after sentence 1. The phrase “at that depth” at the beginning of sentence 5 refers to the statement in sentence 1 that NW Rota-1’s summit is located “more than 1,700 feet under the ocean’s surface.” Furthermore, sentence 5 leads into sentence 2, which explains what scientists were able to determine about the volcano’s growth from remotely operated vehicles.

Choices A, C, and D are incorrect because placing sentence 5 anywhere in the paragraph other than after sentence 1 would create an illogical, confusing paragraph.

QUESTION 3

Choice A is the best answer. The adverb “nevertheless” correctly indicates that despite the fact that sunlight doesn’t reach NW Rota-1, the bacteria there have adapted to the “perpetually dark environment” and “use hydrogen sulfide instead of sunlight” for energy.

Choices B, C, and D are incorrect because they don’t indicate the true relationship between the two independent clauses. “Afterward” indicates that one event happens after another. “Furthermore” suggests that additional information about what has been said earlier in the sentence will follow. “Similarly” indicates that a comparison is being made.

QUESTION 4

Choice C is the best answer. The plural pronoun “them” agrees in number with the plural antecedent “bacteria.”

Choices A, B, and D are incorrect because they’re singular pronouns that don’t agree in number with the plural antecedent “bacteria.”

QUESTION 5

Choice D is the best answer. The conjunction “and” followed by “other chemicals” results in a sentence with a parallel series of nouns.

Choices A, B, and C are incorrect because they don’t maintain the sentence’s parallel structure, and they unnecessarily repeat a form of the verb “remove.”

QUESTION 6

Choice C is the best answer. The dashes after “shrimp” and “Hawaii” are used correctly to set off the nonessential information between them.

Choices A and B are incorrect because neither a comma nor a semicolon can be used with a dash to set off nonessential information. Choice D is incorrect because punctuation, in this case a dash, is needed after “Hawaii” to finish setting off the nonessential information.

QUESTION 7

Choice D is the best answer. This choice’s reference to “predators” most effectively sets up the sentence that follows, which explains that, as adults, the previously unknown species of shrimp feeds on the Loihi shrimp.

Choices A, B, and C are incorrect because they don’t effectively set up the information in the sentence that follows. The following sentence doesn’t discuss the idea that the other species of shrimp is able to adapt to its noxious environment. Additionally, it doesn’t address the idea that scientists don’t yet understand the adaptations of the shrimp or that their unusual ecosystem also includes crabs, limpets, and barnacles.

QUESTION 8

Choice A is the best answer. This choice most effectively combines the sentences at the underlined portion by creating a compound predicate using two parallel, singular, present tense verbs (“condenses” and “leaves”) to show that as the steam condenses only “carbon dioxide bubbles and droplets of molten sulfur” are left.

Choices B, C, and D are incorrect because they don’t effectively combine the sentences. The resulting sentences aren’t concise, and the verbs aren’t parallel.

QUESTION 9

Choice D is the best answer. This choice results in a logical comparison between the water near NW Rota-1 and stomach acid.

Choices A and B are incorrect because the demonstrative pronouns “that” and “those” don’t have clear antecedents, leaving unclear what the water near NW Rota-1 is being compared to. Choice C is incorrect because it unnecessarily repeats the word “acid,” resulting in a nonsensical expression (“the acid from stomach acid”).

QUESTION 10

Choice C is the best answer. The singular possessive noun “world’s” is used correctly to indicate that the plural noun “oceans” belongs to one world.

Choice A is incorrect because “worlds” is a plural possessive noun, and there is only one world being referred to. Furthermore, the possessive noun “ocean’s” is incorrect because nothing belongs to the ocean in this sentence. Choice B is incorrect because “oceans” is a possessive noun, and nothing belongs to “oceans” in this sentence. Choice D is incorrect because “worlds” is a plural noun, and this noun needs to be the singular possessive noun “world’s” to show that the oceans belong to one world.

QUESTION 11

Choice A is the best answer. The writer should make the revision because it shows the relevance of the sentence about rising carbon dioxide levels in Earth’s atmosphere to the paragraph’s point about the increasing acidity of the world’s oceans.

Choice B is incorrect because the revision doesn’t help readers to understand why organisms near NW Rota-1 evolved the way they did. Choices C and D are incorrect because the revision should be made. The revision doesn’t repeat information, and it does contribute to the paragraph’s main idea. Furthermore, it doesn’t add an irrelevant detail that interrupts the discussion of oceanic life-forms.

QUESTION 12

Choice C is the best answer. The comma after “ridership” is used correctly to separate the dependent clause that begins with the word “while” from the independent clause that follows “ridership.”

Choice A is incorrect because the conjunction “but” can’t join a dependent clause to an independent clause. Choice B is incorrect because the conjunctions “and while” create a second dependent clause, but an independent clause is needed to make the sentence complete. Choice D is incorrect because a semicolon can’t be used in this way to separate an introductory dependent clause from an independent clause.

QUESTION 13

Choice B is the best answer. This choice is the most effective because it doesn’t repeat the word “people.” Furthermore, this choice’s use of the active voice, which indicates that “more people” (the subject of the sentence) use public transportation, eliminates unnecessary wording.

Choices A and C are incorrect because they unnecessarily repeat the noun “people.” Choice D is incorrect because the use of the passive voice, which changes the subject of the sentence from “more people” to “using public transportation,” creates a wordy sentence.

QUESTION 14

Choice B is the best answer. The colon correctly introduces information that illustrates what has come before it. The independent clause that follows the colon indicates that “car traffic in Tallinn was down less than 3 percent,” which supports the statement before the colon that “car use in Tallinn has only slightly declined.”

Choice A is incorrect because the semicolon awkwardly joins an independent clause with the dependent clause that follows. Choice C is incorrect because it creates a comma splice. Choice D is incorrect because it creates a sentence fragment after the period.

QUESTION 15

Choice D is the best answer. “The policy” clearly indicates what was enacted. The passage indicates that “car traffic in Tallinn was down less than 3 percent” since the policy of fare-free rides was enacted.

Choices A, B, and C are incorrect because the pronouns in these choices don’t have clear antecedents.

QUESTION 16

Choice A is the best answer. This choice best introduces the paragraph; the phrase “devastating effect” sets up the paragraph’s discussion of how fare-free systems can negatively impact a city’s transportation budget.

Choices B, C, and D are incorrect because they don’t introduce the paragraph’s topic, which is the devastating effects of a fare-free system on a city’s budget. The paragraph doesn’t focus on changes in service, negative environmental impact, or increased crowding on public transportation.

QUESTION 17

Choice C is the best answer. The comma after “savings” and the conjunction “but” are used correctly to connect the two independent clauses.

Choices A and B are incorrect because they each create a comma splice. Choice D is incorrect because the conjunction “and” signals additional information rather than the needed contrast.

QUESTION 18

Choice D is the best answer. The expression “overly optimistic” is consistent with the formal tone of the passage.

Choices A, B, and C are incorrect. While “way too sunny,” “looking too much on the bright side,” and “pretty upbeat” all convey optimism, they’re colloquial expressions that don’t fit the formal tone of the passage.

QUESTION 19

Choice C is the best answer. This choice provides an accurate interpretation because the chart indicates that the projected total additional operating costs for implementing a fare-free policy in San Francisco, CA, would be \$184 million per year.

Choices A, B, and D are incorrect because they don't accurately interpret the information provided in the chart for San Francisco, CA. The chart projects a cost of \$112 million in lost fares, not a deficit of \$72 million per year in lost fares (choice A) or a savings of \$112 million from lost fares (choice B). The chart projects a cost of \$72 million per year to add fare-free service, not a savings of \$72 million (choice D).

QUESTION 20

Choice C is the best answer. The sentence shouldn't be added because the fact that Eugene, OR, "would lose only \$5 million" doesn't support the writer's argument that fare-free systems cause large financial losses to governments.

Choices A and B are incorrect. The sentence shouldn't be added because the fact that Eugene, OR, would lose only \$5 million in fares doesn't support the writer's argument against fare-free systems. Furthermore, it doesn't reinforce any claim made earlier in the paragraph by advocates of fare-free policies. Choice D is incorrect because the sentence doesn't contradict any point made earlier in the paragraph about fare collection.

QUESTION 21

Choice B is the best answer. The present indicative verb "do [not] have" is consistent in tense and mood with the present indicative verb "can go" earlier in the sentence.

Choice A is incorrect because "would [not] have had" is a perfect conditional verb. Choice C is incorrect because "did [not] have" is a past indicative verb. Choice D is incorrect because "will [not] have" is a future indicative verb.

QUESTION 22

Choice D is the best answer. This choice provides the best conclusion to the passage, which argues that fare-free transportation policies "have not been found to be an effective way to address traffic problems" and "may result in serious budget shortfalls."

Choices A, B, and C are incorrect because they don't provide the best conclusion to the passage. Choice A is too narrowly focused, and choices B and C make claims that aren't supported by information in the passage.

QUESTION 23

Choice B is the best answer. The singular third person pronoun “it” correctly refers to the singular antecedent “digital camera.”

Choice A is incorrect because the plural pronoun “they” doesn’t agree in number with the singular antecedent “digital camera.” (It wouldn’t make sense here to assume that “they” refers to “professional photographers,” as there’s no clear indication that the photographers referred to used the earliest digital cameras.) Choice C is incorrect because the indefinite pronoun “one” doesn’t refer to a specific noun. Choice D is incorrect because the personal pronouns “he or she” refer to people, not things.

QUESTION 24

Choice B is the best answer. To make the paragraph most logical, the new sentence “Why wouldn’t they?” should be placed after sentence 2. The pronoun “they” in the new sentence refers to the “vast majority” of professional photographers mentioned in sentence 2. Furthermore, the two sentences that follow the new sentence answer the question of why photographers would trade film for digital cameras by stating that the latest digital cameras take pictures that are “crisp,” “bright,” and “sharp.”

Choices A, C, and D are incorrect because placing the new sentence anywhere in the paragraph other than after sentence 2 would create an illogical and confusing paragraph.

QUESTION 25

Choice B is the best answer. The new sentence should be added because its reference to “several intricate steps” sets up the process of wet plate photography discussed in the rest of the paragraph.

Choice A is incorrect. The sentence should be added, but it doesn’t reiterate the previous paragraph’s main idea. Choices C and D are incorrect because the sentence should be added. The new sentence doesn’t blur the paragraph’s focus on the dangers of developing wet plate photographs. It also doesn’t offer an opinion: while “labor-intensive” can be interpreted as an opinion, the description of the steps is factual.

QUESTION 26

Choice D is the best answer. The plural possessive pronoun “their” agrees in number with the plural antecedent “photographers” and correctly indicates that the subjects belong to the photographers.

Choice A is incorrect because “it’s” is a contraction for “it is” and doesn’t make sense in the sentence. Choice B is incorrect because “its” is a singular possessive pronoun and doesn’t agree in number with the plural antecedent “photographers.” Choice C is incorrect because “there” isn’t a possessive pronoun.

QUESTION 27

Choice A is the best answer. The coordinating conjunction “so” is used correctly to indicate that because dried collodion is unusable, a photographer has to work quickly to develop the film once the photo is taken.

Choices B, C, and D are incorrect because they don’t convey the intended cause-and-effect relationship between the two independent clauses. “But” (choice B) indicates that an exception or contrast to what was said previously will follow. “And” (choice C) suggests that the two clauses indicate separate ideas instead of a cause-and-effect relationship. “For” (choice D), used as a conjunction, means “because.” If used in this sentence, “for” would indicate that dried collodion is unusable because the photographer must quickly develop the photograph.

QUESTION 28

Choice D is the best answer. The word “mere” most effectively suggests that the photographer has only a very brief time to develop wet plate photographs.

Choices A, B, and C are incorrect because they don’t accomplish the writer’s goal of emphasizing how quickly wet plate photographers must work. “Nominal” isn’t idiomatic when referring to a short amount of time. “A few” and “a matter of” can be used to describe time, but neither choice emphasizes how quickly wet plate photographers have to work.

QUESTION 29

Choice B is the best answer. The adverb “finally” correctly indicates that the last step in the process of wet plate photography is to coat the photo with a protective finish.

Choices A, C, and D are incorrect because they don’t indicate that the final step in a process will follow. “In conclusion” is used to introduce a summary of what has previously been said. “Thus” indicates that a result of what has been previously stated will follow. “Nevertheless” is used to introduce a contrast to what has been stated earlier.

QUESTION 30

Choice D is the best answer. No punctuation is needed in the sentence except for a period.

Choice A is incorrect because the parentheses indicate that the information between them could be deleted without changing the meaning of the sentence. In this sentence, the information in the parentheses contains the direct object of the verb “give” and is essential. Choice B is incorrect because the dash wrongly indicates that the information following is being emphasized. Choice C is incorrect because the commas indicate that the information between them is nonessential and could be deleted.

QUESTION 31

Choice A is the best answer. The present tense verb “swirl” is consistent with the other present tense verbs in the paragraph’s description of wet plate photographs.

Choices B, C, and D are incorrect because the tenses of these choices are inconsistent with the present tense verbs in the paragraph’s description of wet plate photographs. “Will have swirled” (choice B) is a future perfect tense verb. “Have swirled” (choice C) is a present perfect tense verb. “Swirled” (choice D) is a simple past tense verb.

QUESTION 32

Choice D is the best answer. This choice is clear and concise and doesn’t unnecessarily repeat the idea that long exposure time can cause parts of a subject to disappear in a photo.

Choices A, B, and C are incorrect because they’re repetitive. The previous sentence already mentions the “long exposures,” and this noun phrase doesn’t need to be repeated.

QUESTION 33

Choice A is the best answer. The reference to “nineteenth-century wave riders” accomplishes the writer’s goal of highlighting the contrast between present-day photographer Joni Sternbach’s nineteenth-century techniques and her contemporary subjects.

Choices B, C, and D are incorrect because they don’t highlight a contrast between Sternbach’s techniques and her subjects. The descriptions “ordinary people,” “surfers,” and people “from all walks of life” don’t clearly allude to the old style of her photographic techniques and, therefore, don’t offer a contrast to her subjects who wear “modern board shorts and bikinis.”

QUESTION 34

Choice A is the best answer. The revision should be made because the passage is about how a team of urban archaeologists uncovered the history of New York City’s South Street Seaport, and this revision helps explain the job of urban archaeologists.

Choice B is incorrect because, although the revision should be made, it doesn’t identify the characteristics that make “cities worthy of archaeological study.” Choices C and D are incorrect because the revision should be made. Neither the kinds of artifacts that urban archaeologists find nor how excavation benefits historical study explains what urban archaeologists do.

QUESTION 35

Choice C is the best answer. The singular verb “is required” agrees in number with the singular subject “project.”

Choices A, B, and D are incorrect because the plural verbs “are required,” “have been required,” and “were required” don’t agree in number with the singular subject “project.”

QUESTION 36

Choice D is the best answer. This choice is clear and concise and doesn’t repeat the idea of “possibility” already mentioned in the sentence.

Choices A and B are incorrect because the words “possible” and “potentially” repeat the idea of “possibility” mentioned earlier in the sentence. Choice C is incorrect because “it is necessary that” repeats the idea mentioned later in the sentence that “an urban archaeologist must be consulted.”

QUESTION 37

Choice B is the best answer. The adverb “though” correctly conveys a contrast between the facts that the work continued and the team faced obstacles.

Choices A, C, and D are incorrect because they don’t indicate the true relationship between the progression of the team’s work and the obstacles. “Therefore” suggests that because the work continued, the team faced obstacles. “Meanwhile” is redundant: the dependent clause “as the work continued” already implies that the work was happening when obstacles emerged. “Similarly” suggests that a comparison is being made.

QUESTION 38

Choice D is the best answer. No punctuation is needed between the verb “halted” and the prepositional phrase “by stormy weather and the discovery of toxic materials underground” that follows it.

Choices A, B, and C are incorrect because each introduces unnecessary punctuation between the verb and the prepositional phrase.

QUESTION 39

Choice C is the best answer. The noun “pedestrians” is parallel in form to the nouns “vehicles” and “car horns.”

Choices A, B, and D are incorrect because the repetition of “noise” in choices A and B and the inclusion of the pronoun “that” (which stands in for “noise”) in choice D violate the parallel structure of the series of nouns (“construction vehicles,” “car horns,” “pedestrians”) serving as the objects of the preposition “of.”

QUESTION 40

Choice C is the best answer. The comma is used correctly to separate the independent clause from the participial phrase that begins with “including.”

Choice A is incorrect because the period after “site” results in a rhetorically poor fragment. Choice B is incorrect because the comma after “site” creates a comma splice. Choice D is incorrect because a semicolon can’t be used in this way to connect an independent clause to a participial phrase.

QUESTION 41

Choice C is the best answer. This idea of “public utility planning and infrastructure development” best sets up the example that follows about how colonial-era New Yorkers secured fresh drinking water.

Choices A, B, and D are incorrect because they don’t set up the discussion of colonial-era New Yorkers’ public utility planning and infrastructure development. The example that follows doesn’t deal with construction materials, hospitality rituals, or the financing of construction projects.

QUESTION 42

Choice A is the best answer. The word “effort” is consistent with the formal style and tone of the passage.

Choices B, C, and D are incorrect because they don’t maintain the formal style and tone of the passage. Choices B and C are colloquial, and choices B and D are exaggerations that are inconsistent with the passage’s informative style.

QUESTION 43

Choice D is the best answer. The subject of the sentence, “urban archaeologists,” clearly identifies who makes discoveries and tells the story of a city’s history.

Choices A and B are incorrect because the pronouns “they” and “we” don’t have clear antecedents. Choice C is incorrect because it isn’t true. “Colonial-era New Yorkers” don’t make the discoveries or tell the stories to which the sentence refers.

QUESTION 44

Choice C is the best answer. This choice accomplishes the goal of identifying the broad impact of the urban archaeological team’s work by mentioning that excavation “makes New York City’s history real.”

Choices A, B, and D are incorrect because they don’t illustrate the broad impact of the team’s work. Loorya’s references to one of her favorite things about her work (choice A), New York City construction (choice B), and the archaeological technique of monitoring (choice D) don’t provide an effective concluding statement about her team’s impact.

Section 3: Math Test – No Calculator

QUESTION 1

Choice B is correct. Multiplying both sides of the first equation in the system by 2 yields $4x - 2y = 16$. Adding $4x - 2y = 16$ to the second equation in the system yields $5x = 20$. Dividing both sides of $5x = 20$ by 5 yields $x = 4$. Substituting 4 for x in $x + 2y = 4$ yields $4 + 2y = 4$. Subtracting 4 from both sides of $4 + 2y = 4$ yields $2y = 0$. Dividing both sides of this equation by 2 yields $y = 0$. Substituting 4 for x and 0 for y in the expression $x + y$ yields $4 + 0 = 4$.

Choices A, C, and D are incorrect and may result from various computation errors.

QUESTION 2

Choice A is correct. Since $(x^2 - x)$ is a common term in the original expression, like terms can be added: $2(x^2 - x) + 3(x^2 - x) = 5(x^2 - x)$. Distributing the constant term 5 yields $5x^2 - 5x$.

Choice B is incorrect and may result from not distributing the negative signs in the expressions within the parentheses. Choice C is incorrect and may result from not distributing the negative signs in the expressions within the parentheses and from incorrectly eliminating the x^2 -term. Choice D is incorrect and may result from incorrectly eliminating the x -term.

QUESTION 3

Choice D is correct. To find the slope and y -intercept, the given equation can be rewritten in slope-intercept form $y = mx + b$, where m represents the slope of the line and b represents the y -intercept. The given equation $2y - 3x = -4$ can be rewritten in slope-intercept form by first adding $3x$ to both sides of the equation, which yields $2y = 3x - 4$. Then, dividing both sides of the equation by 2 results in the equation $y = \frac{3}{2}x - 2$. The coefficient of x , $\frac{3}{2}$, is the slope of the graph and is positive, and the constant term, -2 , is the y -intercept of the graph and is negative. Thus, the graph of the equation $2y - 3x = -4$ has a positive slope and a negative y -intercept.

Choice A is incorrect and may result from reversing the values of the slope and the y -intercept. Choices B and C are incorrect and may result from errors in calculation when determining the slope and y -intercept values.

QUESTION 4

Choice A is correct. It's given that the front of the roller-coaster car starts rising when it's 15 feet above the ground. This initial height of 15 feet can be represented by a constant term, 15, in an equation. Each second, the front of the roller-coaster car rises 8 feet, which can

be represented by $8s$. Thus, the equation $h = 8s + 15$ gives the height, in feet, of the front of the roller-coaster car s seconds after it starts up the hill.

Choices B and C are incorrect and may result from conceptual errors in creating a linear equation. Choice D is incorrect and may result from switching the rate at which the roller-coaster car rises with its initial height.

QUESTION 5

Choice C is correct. Since the variable h represents the number of hours a job took, the coefficient of h , 75, represents the electrician's charge per hour, in dollars, after an initial fixed charge of \$125.

It's given that the electrician worked 2 hours longer on Ms. Sanchez's job than on Mr. Roland's job; therefore, the additional charge for Ms. Sanchez's job is $\$75 \times 2 = \150 .

Alternate approach: The amounts the electrician charged for Mr. Roland's job and Ms. Sanchez's job can be expressed in terms of t . If Mr. Roland's job took t hours, then it cost $75t + 125$ dollars. Ms. Sanchez's job must then have taken $t + 2$ hours, so it cost $75(t + 2) + 125 = 75t + 275$ dollars. The difference between the two costs is $(75t + 275) - (75t + 125) = \150 .

Choice A is incorrect. This is the electrician's charge per hour, not the difference between what Ms. Sanchez was charged and what Mr. Roland was charged. Choice B is incorrect. This is the fixed charge for each job, not the difference between the two. Choice D is incorrect and may result from finding the total charge for a 2-hour job.

QUESTION 6

Choice B is correct. The ratio of the lengths of two arcs of a circle is equal to the ratio of the measures of the central angles that subtend the arcs. It's given that arc \widehat{ADC} is subtended by a central angle with measure 100° . Since the sum of the measures of the angles about a point is 360° , it follows that arc \widehat{ABC} is subtended by a central angle with measure $360^\circ - 100^\circ = 260^\circ$. If s is the length of arc \widehat{ABC} , then s must satisfy the ratio $\frac{s}{5\pi} = \frac{260}{100}$. Reducing the fraction $\frac{260}{100}$ to its simplest form gives $\frac{13}{5}$. Therefore, $\frac{s}{5\pi} = \frac{13}{5}$. Multiplying both sides of $\frac{s}{5\pi} = \frac{13}{5}$ by 5π yields $s = 13\pi$.

Choice A is incorrect. This is the length of an arc consisting of exactly half of the circle, but arc \widehat{ABC} is greater than half of the circle.

Choice C is incorrect. This is the total circumference of the circle.

Choice D is incorrect. This is half the length of arc \widehat{ABC} , not its full length.

QUESTION 7

Choice D is correct. Multiplying both sides of the given equation by x yields $160x = 8$. Dividing both sides of the equation $160x = 8$ by 160 results in $x = \frac{8}{160}$. Reducing $\frac{8}{160}$ to its simplest form gives $x = \frac{1}{20}$, or its decimal equivalent 0.05.

Choice A is incorrect and may result from multiplying, instead of dividing, the left-hand side of the given equation by 160. Choice B is incorrect and may result from a computational error. Choice C is incorrect. This is the value of $\frac{1}{x}$.

QUESTION 8

Choice C is correct. Applying the distributive property of multiplication to the right-hand side of the given equation gives $(3x + 15) + (5x - 5)$, or $8x + 10$. An equation in the form $cx + d = rx + s$ will have no solutions if $c = r$ and $d \neq s$. Therefore, it follows that the equation $2ax - 15 = 8x + 10$ will have no solutions if $2a = 8$, or $a = 4$.

Choice A is incorrect. If $a = 1$, then the given equation could be written as $2x - 15 = 8x + 10$. Since $2 \neq 8$, this equation has exactly one solution. Choice B is incorrect. If $a = 2$, then the given equation could be written as $4x - 15 = 8x + 10$. Since $4 \neq 8$, this equation has exactly one solution. Choice D is incorrect. If $a = 8$, then the given equation could be written as $16x - 15 = 8x + 10$. Since $16 \neq 8$, this equation has exactly one solution.

QUESTION 9

Choice B is correct. A solution to the system of three equations is any ordered pair (x, y) that is a solution to each of the three equations. Such an ordered pair (x, y) must lie on the graph of each equation in the xy -plane; in other words, it must be a point where all three graphs intersect. The graphs of all three equations intersect at exactly one point, $(-1, 3)$. Therefore, the system of equations has one solution.

Choice A is incorrect. A system of equations has no solutions when there is no point at which all the graphs intersect. Because the graphs of all three equations intersect at the point $(-1, 3)$, there is a solution. Choice C is incorrect. The graphs of all three equations intersect at only one point, $(-1, 3)$. Since there is no other such point, there cannot be two solutions. Choice D is incorrect and may result from counting the number of points of intersection of the graphs of any two equations, including the point of intersection of all three equations.

QUESTION 10

Choice C is correct. If the equation is true for all x , then the expressions on both sides of the equation will be equivalent.

Multiplying the polynomials on the left-hand side of the equation gives $5ax^3 - abx^2 + 4ax + 15x^2 - 3bx + 12$. On the right-hand side of the equation, the only x^2 -term is $-9x^2$. Since the expressions on both

sides of the equation are equivalent, it follows that $-abx^2 + 15x^2 = -9x^2$, which can be rewritten as $(-ab + 15)x^2 = -9x^2$. Therefore, $-ab + 15 = -9$, which gives $ab = 24$.

Choice A is incorrect. If $ab = 18$, then the coefficient of x^2 on the left-hand side of the equation would be $-18 + 15 = -3$, which doesn't equal the coefficient of x^2 , -9 , on the right-hand side. Choice B is incorrect. If $ab = 20$, then the coefficient of x^2 on the left-hand side of the equation would be $-20 + 15 = -5$, which doesn't equal the coefficient of x^2 , -9 , on the right-hand side. Choice D is incorrect. If $ab = 40$, then the coefficient of x^2 on the left-hand side of the equation would be $-40 + 15 = -25$, which doesn't equal the coefficient of x^2 , -9 , on the right-hand side.

QUESTION 11

Choice B is correct. The right-hand side of the given equation, $\frac{2x}{2}$, can be rewritten as x . Multiplying both sides of the equation $\frac{x}{x-3} = x$ by $x-3$ yields $x = x(x-3)$. Applying the distributive property of multiplication to the right-hand side of the equation $x = x(x-3)$ yields $x = x^2 - 3x$. Subtracting x from both sides of this equation yields $0 = x^2 - 4x$. Factoring x from both terms of $x^2 - 4x$ yields $0 = x(x-4)$. By the zero product property, the solutions to the equation $0 = x(x-4)$ are $x = 0$ and $x - 4 = 0$, or $x = 4$. Substituting 0 and 4 for x in the given equation yields $0 = 0$ and $4 = 4$, respectively. Since both are true statements, both 0 and 4 are solutions to the given equation.

Choice A is incorrect and may result from a sign error. Choice C is incorrect and may result from an error in factoring. Choice D is incorrect and may result from not considering 0 as a possible solution.

QUESTION 12

Choice D is correct. The original expression can be combined into one rational expression by multiplying the numerator and denominator of the second term by the denominator of the first term:

$\frac{1}{2x+1} + 5\left(\frac{2x+1}{2x+1}\right)$, which can be rewritten as $\frac{1}{2x+1} + \frac{10x+5}{2x+1}$. This expression is now the sum of two rational expressions with a common denominator, and it can be rewritten as $\frac{1}{2x+1} + \frac{10x+5}{2x+1} = \frac{10x+6}{2x+1}$.

Choice A is incorrect and may result from a calculation error. Choice B is incorrect and may be the result of adding the denominator of the first term to the second term rather than multiplying the first term by the numerator and denominator of the second term. Choice C is incorrect and may result from not adding the numerator of $\frac{1}{2x+1}$ to the numerator of $\frac{10x+5}{2x+1}$.

QUESTION 13

Choice A is correct. The equation of a parabola in vertex form is $f(x) = a(x - h)^2 + k$, where the point (h, k) is the vertex of the parabola and a is a constant. The graph shows that the coordinates of the vertex

are $(3, 1)$, so $h = 3$ and $k = 1$. Therefore, an equation that defines f can be written as $f(x) = a(x - 3)^2 + 1$. To find a , substitute a value for x and its corresponding value for y , or $f(x)$. For example, $(4, 5)$ is a point on the graph of f . So a must satisfy the equation $5 = a(4 - 3)^2 + 1$, which can be rewritten as $4 = a(1)^2$, or $a = 4$. An equation that defines f is therefore $f(x) = 4(x - 3)^2 + 1$.

Choice B is incorrect and may result from a sign error when writing the equation of the parabola in vertex form. Choice C is incorrect and may result from omitting the constant a from the vertex form of the equation of the parabola. Choice D is incorrect and may result from a sign error when writing the equation of the parabola in vertex form as well as by miscalculating the value of a .

QUESTION 14

Choice B is correct. The solutions of the first inequality, $y \geq x + 2$, lie on or above the line $y = x + 2$, which is the line that passes through $(-2, 0)$ and $(0, 2)$. The second inequality can be rewritten in slope-intercept form by dividing the second inequality, $2x + 3y \leq 6$, by 3 on both sides, which yields $\frac{2}{3}x + y \leq 2$, and then subtracting $\frac{2}{3}x$ from both sides, which yields $y \leq -\frac{2}{3}x + 2$. The solutions to this inequality lie on or below the line $y = -\frac{2}{3}x + 2$, which is the line that passes through $(0, 2)$ and $(3, 0)$. The only graph in which the shaded region meets these criteria is choice B.

Choice A is incorrect and may result from reversing the inequality sign in the first inequality. Choice C is incorrect and may result from reversing the inequality sign in the second inequality. Choice D is incorrect and may result from reversing the inequality signs in both inequalities.

QUESTION 15

Choice B is correct. Squaring both sides of the given equation yields $x + 2 = x^2$. Subtracting x and 2 from both sides of $x + 2 = x^2$ yields $x^2 - x - 2 = 0$. Factoring the left-hand side of this equation yields $(x - 2)(x + 1) = 0$. Applying the zero product property, the solutions to $(x - 2)(x + 1) = 0$ are $x - 2 = 0$, or $x = 2$ and $x + 1 = 0$, or $x = -1$. Substituting $x = 2$ in the given equation gives $\sqrt{4} = -2$, which is false because $\sqrt{4} = 2$ by the definition of a principal square root. So, $x = 2$ isn't a solution. Substituting $x = -1$ into the given equation gives $\sqrt{1} = -(-1)$, which is true because $-(-1) = 1$. So $x = -1$ is the only solution.

Choices A and C are incorrect. The square root symbol represents the principal, or nonnegative, square root. Therefore, in the equation $\sqrt{x + 2} = -x$, the value of $-x$ must be zero or positive. If $x = 2$, then $-x = -2$, which is negative, so 2 can't be in the set of solutions. Choice D is incorrect and may result from incorrectly reasoning that $-x$ always has a negative value and therefore can't be equal to a value of a principal square root, which cannot be negative.

QUESTION 16

The correct answer is 360. The volume of a right rectangular prism is calculated by multiplying its dimensions: length, width, and height. Multiplying the values given for these dimensions yields a volume of $(4)(9)(10) = 360$ cubic centimeters.

QUESTION 17

The correct answer is 2. The left-hand side of the given equation contains a common factor of 2 and can be rewritten as $2(2x + 1)$. Dividing both sides of this equation by 2 yields $2x + 1 = 2$. Therefore, the value of $2x + 1$ is 2.

Alternate approach: Subtracting 2 from both sides of the given equation yields $4x = 2$. Dividing both sides of this equation by 4 yields $x = \frac{1}{2}$. Substituting $\frac{1}{2}$ for x in the expression $2x + 1$ yields $2\left(\frac{1}{2}\right) + 1 = 2$.

QUESTION 18

The correct answer is 8. The graph shows that the maximum value of $f(x)$ is 2. Since $g(x) = f(x) + 6$, the graph of g is the graph of f shifted up by 6 units. Therefore, the maximum value of $g(x)$ is $2 + 6 = 8$.

QUESTION 19

The correct answer is $\frac{3}{4}$, or .75. By definition of the sine ratio, since $\sin R = \frac{4}{5}$, $\frac{PQ}{PR} = \frac{4}{5}$. Therefore, if $PQ = 4n$, then $PR = 5n$, where n is a positive constant. Then $QR = kn$, where k is another positive constant. Applying the Pythagorean theorem, the following relationship holds: $(kn)^2 + (4n)^2 = (5n)^2$, or $k^2n^2 + 16n^2 = 25n^2$. Subtracting $16n^2$ from both sides of this equation yields $k^2n^2 = 9n^2$. Taking the square root of both sides of $k^2n^2 = 9n^2$ yields $kn = 3n$. It follows that $k = 3$. Therefore, if $PQ = 4n$ and $PR = 5n$, then $QR = 3n$, and by definition of the tangent ratio, $\tan P = \frac{3n}{4n}$, or $\frac{3}{4}$. Either $3/4$ or $.75$ may be entered as the correct answer.

QUESTION 20

The correct answer is 2.5. The graph of the linear function f passes through the points $(0, 3)$ and $(1, 1)$. The slope of the graph of the function f is therefore $\frac{1 - 3}{1 - 0} = -2$. It's given that the graph of the linear function g is perpendicular to the graph of the function f . Therefore, the slope of the graph of the function g is the negative reciprocal of -2 , which is $-\frac{1}{-2} = \frac{1}{2}$, and an equation that defines the function g is $g(x) = \frac{1}{2}x + b$, where b is a constant. Since it's given that the graph of the function g passes through the point $(1, 3)$, the value of b can be found using the equation $3 = \frac{1}{2}(1) + b$. Solving this equation for b yields $b = \frac{5}{2}$, so an equation that defines the function g is $g(x) = \frac{1}{2}x + \frac{5}{2}$. Finding the value of $g(0)$ by substituting 0 for x into this equation yields $g(0) = \frac{1}{2}(0) + \frac{5}{2}$, or $\frac{5}{2}$. Either 2.5 or $5/2$ may be entered as the correct answer.

Section 4: Math Test – Calculator

QUESTION 1

Choice B is correct. Subtracting 3 from both sides of the equation yields $3x = 24$. Dividing both sides of this equation by 3 yields $x = 8$.

Choice A is incorrect and may result from finding a common factor among the three given terms instead of finding x . Choice C is incorrect and may result from incorrectly adding 3 to, instead of subtracting 3 from, the right-hand side of the equation. Choice D is incorrect. This is the value of $3x + 3$, not the value of x .

QUESTION 2

Choice D is correct. Since 1 cubit is equivalent to 7 palms, 140 cubits are equivalent to $140(7)$ palms, or 980 palms.

Choice A is incorrect and may result from dividing 7 by 140. Choice B is incorrect and may result from dividing 140 by 7. Choice C is incorrect. This is the length of the Great Sphinx statue in cubits, not palms.

QUESTION 3

Choice B is correct. Multiplying both sides of the given equation by 5 yields $2n = 50$. Substituting 50 for $2n$ in the expression $2n - 1$ yields $50 - 1 = 49$.

Alternate approach: Dividing both sides of $2n = 50$ by 2 yields $n = 25$. Evaluating the expression $2n - 1$ for $n = 25$ yields $2(25) - 1 = 49$.

Choice A is incorrect and may result from finding the value of $n - 1$ instead of $2n - 1$. Choice C is incorrect and may result from finding the value of $2n$ instead of $2n - 1$. Choice D is incorrect and may result from finding the value of $4n - 1$ instead of $2n - 1$.

QUESTION 4

Choice A is correct. The square root symbol represents the principal, or nonnegative, square root. Therefore, the equation $\sqrt{x^2} = x$ is only true for values of x greater than or equal to 0. Thus, -4 isn't a solution to the given equation.

Choices B, C, and D are incorrect because these values of x are solutions to the equation $\sqrt{x^2} = x$. Choosing one of these as a value of x that isn't a solution may result from incorrectly using the rules of exponents or incorrectly evaluating these values in the given equation.

QUESTION 5

Choice D is correct. The x -axis of the graph represents the time, in minutes, after the coffee was removed from the heat source, and the y -axis of the graph represents the temperature, in degrees Fahrenheit, of the coffee. The coffee was first removed from the heat source when $x = 0$. The graph shows that when $x = 0$, the y -value was a little less than 200°F. Of the answer choices given, 195 is the best approximation.

Choice A is incorrect and may result from finding the temperature after 140 minutes. Choice B is incorrect and may result from finding the temperature after 50 minutes. Choice C is incorrect and may result from finding the temperature after 10 minutes.

QUESTION 6

Choice A is correct. The average rate of change in temperature of the coffee in degrees Fahrenheit per minute is calculated by dividing the difference between two recorded temperatures by the number of minutes in the corresponding interval of time. Since the time intervals given are all 10 minutes, the average rate of change is greatest for the points with the greatest difference in temperature. Of the choices, the greatest difference in temperature occurs between 0 and 10 minutes.

Choices B, C, and D are incorrect and may result from misinterpreting the average rate of change from the graph.

QUESTION 7

Choice C is correct. It's given that $x = 100$; therefore, substituting 100 for x in triangle ABC gives two known angle measures for this triangle. The sum of the measures of the interior angles of any triangle equals 180° . Subtracting the two known angle measures of triangle ABC from 180° gives the third angle measure: $180^\circ - 100^\circ - 20^\circ = 60^\circ$. This is the measure of angle BCA . Since vertical angles are congruent, the measure of angle DCE is also 60° . Subtracting the two known angle measures of triangle CDE from 180° gives the third angle measure: $180^\circ - 60^\circ - 40^\circ = 80^\circ$. Therefore, the value of y is 80.

Choice A is incorrect and may result from a calculation error. Choice B is incorrect and may result from classifying angle CDE as a right angle. Choice D is incorrect and may result from finding the measure of angle BCA or DCE instead of the measure of angle CDE .

QUESTION 8

Choice A is correct. The cost of each additional mile traveled is represented by the slope of the given line. The slope of the line can be calculated by identifying two points on the line and then calculating the ratio of the change in y to the change in x between the two points. Using the points $(1, 5)$ and $(2, 7)$, the slope is equal to $\frac{7 - 5}{2 - 1}$, or 2. Therefore, the cost for each additional mile traveled of the cab ride is \$2.00.

Choice B is incorrect and may result from calculating the slope of the line that passes through the points $(5, 13)$ and $(0, 0)$. However, $(0, 0)$ does not lie on the line shown. Choice C is incorrect. This is the y -coordinate of the y -intercept of the graph and represents the flat fee for a cab ride before the charge for any miles traveled is added. Choice D is incorrect. This value represents the total cost of a 1-mile cab ride.

QUESTION 9

Choice D is correct. The total number of gas station customers on Tuesday was 135. The table shows that the number of customers who did not purchase gasoline was 50. Finding the ratio of the number of customers who did not purchase gasoline to the total number of customers gives the probability that a customer selected at random on that day did not purchase gasoline, which is $\frac{50}{135}$.

Choice A is incorrect and may result from finding the probability that a customer did not purchase a beverage, given that the customer did not purchase gasoline. Choice B is incorrect and may result from finding the probability that a customer did not purchase gasoline, given that the customer did not purchase a beverage. Choice C is incorrect and may result from finding the probability that a customer did purchase a beverage, given that the customer did not purchase gasoline.

QUESTION 10

Choice D is correct. It is given that the number of students surveyed was 336. Finding $\frac{1}{4}$ of 336 yields $\left(\frac{1}{4}\right)(336) = 84$, the number of freshmen, and finding $\frac{1}{3}$ of 336 yields $\left(\frac{1}{3}\right)(336) = 112$, the number of sophomores. Subtracting these numbers from the total number of selected students results in $336 - 84 - 112 = 140$, the number of juniors and seniors combined. Finding half of this total yields $\left(\frac{1}{2}\right)(140) = 70$, the number of juniors. Subtracting this number from the number of juniors and seniors combined yields $140 - 70 = 70$, the number of seniors.

Choices A and C are incorrect and may result from calculation errors. Choice B is incorrect. This is the total number of juniors and seniors.

QUESTION 11

Choice A is correct. It's given that the ratio of the heights of Plant A to Plant B is 20 to 12 and that the height of Plant C is 54 centimeters. Let x be the height of Plant D. The proportion $\frac{20}{12} = \frac{54}{x}$ can be used to solve for the value of x . Multiplying both sides of this equation by x yields $\frac{20x}{12} = 54$ and then multiplying both sides of this equation by 12 yields $20x = 648$. Dividing both sides of this equation by 20 yields $x = 32.4$ centimeters.

Choice B is incorrect and may result from a calculation error. Choice C is incorrect and may result from finding the difference in heights between Plant A and Plant B and then adding that to the height of Plant C. Choice D is incorrect and may result from using the ratio 12 to 20 rather than 20 to 12.

QUESTION 12

Choice D is correct. It's given that 1 kilometer is approximately equivalent to 0.6214 miles. Let x be the number of kilometers equivalent to 3.1 miles. The proportion $\frac{1 \text{ kilometer}}{0.6214 \text{ miles}} = \frac{x \text{ kilometers}}{3.1 \text{ miles}}$ can be used to solve for the value of x . Multiplying both sides of this equation by 3.1 yields $\frac{3.1}{0.6214} = x$, or $x \approx 4.99$. This is approximately 5 kilometers.

Choice A is incorrect and may result from misidentifying the ratio of kilometers to miles as miles to kilometers. Choice B is incorrect and may result from calculation errors. Choice C is incorrect and may result from calculation and rounding errors.

QUESTION 13

Choice C is correct. Let a equal the number of 120-pound packages, and let b equal the number of 100-pound packages. It's given that the total weight of the packages can be at most 1,100 pounds: the inequality $120a + 100b \leq 1,100$ represents this situation. It's also given that the helicopter must carry at least 10 packages: the inequality $a + b \geq 10$ represents this situation. Values of a and b that satisfy these two inequalities represent the allowable numbers of 120-pound packages and 100-pound packages the helicopter can transport.

To maximize the number of 120-pound packages, a , in the helicopter, the number of 100-pound packages, b , in the helicopter needs to be minimized. Expressing b in terms of a in the second inequality yields $b \geq 10 - a$, so the minimum value of b is equal to $10 - a$. Substituting $10 - a$ for b in the first inequality results in $120a + 100(10 - a) \leq 1,100$. Using the distributive property to rewrite this inequality yields $120a + 1,000 - 100a \leq 1,100$, or $20a + 1,000 \leq 1,100$. Subtracting 1,000 from both sides of this inequality yields $20a \leq 100$. Dividing both sides of this inequality by 20 results in $a \leq 5$. This means that the maximum number of 120-pound packages that the helicopter can carry per trip is 5.

Choices A, B, and D are incorrect and may result from incorrectly creating or solving the system of inequalities.

QUESTION 14

Choice B is correct. The difference between the machine's starting value and its value after 10 years can be found by subtracting \$30,000 from \$120,000: $120,000 - 30,000 = 90,000$. It's given that the value of the machine depreciates by the same amount each year for 10 years. Dividing \$90,000 by 10 gives \$9,000, which is the amount by which the value depreciates each year. Therefore, over a period of t years,

the value of the machine depreciates by a total of $9,000t$ dollars. The value v of the machine, in dollars, t years after it was purchased is the starting value minus the amount of depreciation after t years, or $v = 120,000 - 9,000t$.

Choice A is incorrect and may result from using the value of the machine after 10 years as the machine's starting value. Choice C is incorrect. This equation shows the amount the machine's value changes each year being added to, rather than subtracted from, the starting value. Choice D is incorrect and may result from multiplying the machine's value after 10 years by t instead of multiplying the amount the machine depreciates each year by t .

QUESTION 15

Choice D is correct. The slope-intercept form of a linear equation is $y = ax + b$, where a is the slope of the graph of the equation and b is the y -coordinate of the y -intercept of the graph. Two ordered pairs (x_1, y_1) and (x_2, y_2) can be used to compute the slope of the line with the formula $a = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the two ordered pairs $(2, 4)$ and $(0, 1)$ into this formula gives $a = \frac{4 - 1}{2 - 0}$, which simplifies to $\frac{3}{2}$. Substituting this value for a in the slope-intercept form of the equation yields $y = \frac{3}{2}x + b$. Substituting values from the ordered pair $(0, 1)$ into this equation yields $1 = \frac{3}{2}(0) + b$, so $b = 1$. Substituting this value for b in the slope-intercept equation yields $y = \frac{3}{2}x + 1$.

Choice A is incorrect. This may result from misinterpreting the change in x -values as the slope and misinterpreting the change in y -values as the y -coordinate of the y -intercept of the graph. Choice B is incorrect and may result from using the x - and y -values of one of the given points as the slope and y -coordinate of the y -intercept, respectively. Choice C is incorrect. This equation has the correct slope but the incorrect y -coordinate of the y -intercept.

QUESTION 16

Choice B is correct. Multiplying the binomials in the given expression results in $4ax^2 + 4ax - 4x - 4 - x^2 + 4$. Combining like terms yields $4ax^2 + 4ax - 4 - x^2$. Grouping by powers of x and factoring out their greatest common factors yields $(4a - 1)x^2 + (4a - 4)x$. It's given that this expression is equivalent to bx , so $(4a - 1)x^2 + (4a - 4)x = bx$. Since the right-hand side of the equation has no x^2 term, the coefficient of the x^2 term on the left-hand side must be 0. This gives $4a - 1 = 0$ and $4a - 4 = b$. Since $4a - 1 = 0$, $4a = 1$. Substituting the value of $4a$ into the second equation gives $1 - 4 = b$, so $b = -3$.

Choices A, C, and D are incorrect and may result from a calculation error.

QUESTION 17

Choice C is correct. Multiplying both sides of $2w + 4t = 14$ by 2 yields $4w + 8t = 28$. Subtracting the second given equation from $4w + 8t = 28$ yields $(4w - 4w) + (8t - 5t) = (28 - 25)$ or $3t = 3$. Dividing both sides of this equation by 3 yields $t = 1$. Substituting 1 for t in the equation $2w + 4t = 14$ yields $2w + 4(1) = 14$, or $2w + 4 = 14$. Subtracting 4 from both sides of this equation yields $2w = 10$, and dividing both sides of this equation by 2 yields $w = 5$. Substituting 5 for w and 1 for t in the expression $2w + 3t$ yields $2(5) + 3(1) = 13$.

Choices A, B, and D are incorrect and may result from incorrectly calculating the values of w and t , or from correctly calculating the values of w and t but finding the value of an expression other than $2w + 3t$. For instance, choice A is the value of $w + t$, choice B is the value of $2w$, and choice D is the value of $2t + 3w$.

QUESTION 18

Choice B is correct. It's given that each serving of Crunchy Grain cereal provides 5% of an adult's daily allowance of potassium, so x servings would provide x times 5%. The percentage of an adult's daily allowance of potassium, p , is 5 times the number of servings, x . Therefore, the percentage of an adult's daily allowance of potassium can be expressed as $p = 5x$.

Choices A, C, and D are incorrect and may result from incorrectly converting 5% to its decimal equivalent, which isn't necessary since p is expressed as a percentage. Additionally, choices C and D are incorrect because the context should be represented by a linear relationship, not by an exponential relationship.

QUESTION 19

Choice B is correct. It's given that a $\frac{3}{4}$ -cup serving of Crunchy Grain cereal provides 210 calories. The total number of calories per cup can be found by dividing 210 by $\frac{3}{4}$, which gives $210 \div \frac{3}{4} = 280$ calories per cup. Let c be the number of cups of Crunchy Grain cereal and s be the number of cups of Super Grain cereal. The expression $280c$ represents the number of calories in c cups of Crunchy Grain cereal, and $240s$ represents the number of calories in s cups of Super Grain cereal.

The equation $280c + 240s = 270$ gives the total number of calories in one cup of the mixture. Since $c + s = 1$ cup, $c = 1 - s$. Substituting $1 - s$ for c in the equation $280c + 240s = 270$ yields $280(1 - s) + 240s = 270$, or $280 - 280s + 240s = 270$. Simplifying this equation yields $280 - 40s = 270$. Subtracting 280 from both sides results in $-40s = -10$.

Dividing both sides of the equation by -40 results in $s = \frac{1}{4}$, so there is $\frac{1}{4}$ cup of Super Grain cereal in one cup of the mixture.

Choices A, C, and D are incorrect and may result from incorrectly creating or solving the system of equations.

QUESTION 20

Choice A is correct. There are 0 calories in 0 servings of Crunchy Grain cereal so the line must begin at the point $(0, 0)$. Point $(0, 0)$ is the origin, labeled O . Additionally, each serving increases the calories by 250. Therefore, the number of calories increases as the number of servings increases, so the line must have a positive slope. Of the choices, only choice A shows a graph with a line that begins at the origin and has a positive slope.

Choices B, C, and D are incorrect. These graphs don't show a line that passes through the origin. Additionally, choices C and D may result from misidentifying the slope of the graph.

QUESTION 21

Choice D is correct. Since the function h is exponential, it can be written as $h(x) = ab^x$, where a is the y -coordinate of the y -intercept and b is the growth rate. Since it's given that the y -coordinate of the y -intercept is d , the exponential function can be written as $h(x) = db^x$. These conditions are only met by the equation in choice D.

Choice A is incorrect. For this function, the value of $h(x)$ when $x = 0$ is -3 , not d . Choice B is incorrect. This function is a linear function, not an exponential function. Choice C is incorrect. This function is a polynomial function, not an exponential function.

QUESTION 22

Choice B is correct. The median weight is found by ordering the horses' weights from least to greatest and then determining the middle value from this list of weights. Decreasing the value for the horse with the lowest weight doesn't affect the median since it's still the lowest value.

Choice A is incorrect. The mean is calculated by finding the sum of all the weights of the horses and then dividing by the number of horses. Decreasing one of the weights would decrease the sum and therefore decrease the mean. Choice C is incorrect. Range is the difference between the highest and lowest weights, so decreasing the lowest weight would increase the range. Choice D is incorrect. Standard deviation is calculated based on the mean weight of the horses. Decreasing one of the weights decreases the mean and therefore would affect the standard deviation.

QUESTION 23

Choice B is correct. In order for the poll results from a sample of a population to represent the entire population, the sample must be representative of the population. A sample that is randomly selected from a population is more likely than a sample of the type described to represent the population. In this case, the people who responded were people with access to cable television and websites,

which aren't accessible to the entire population. Moreover, the people who responded also chose to watch the show and respond to the poll. The people who made these choices aren't representative of the entire population of the United States because they were not a random sample of the population of the United States.

Choices A, C, and D are incorrect because they present reasons unrelated to whether the sample is representative of the population of the United States.

QUESTION 24

Choice C is correct. Substituting $x + a$ for x in $f(x) = 5x^2 - 3$ yields $f(x + a) = 5(x + a)^2 - 3$. Expanding the expression $5(x + a)^2$ by multiplication yields $5x^2 + 10ax + 5a^2$, and thus $f(x + a) = 5x^2 + 10ax + 5a^2 - 3$. Setting the expression on the right-hand side of this equation equal to the given expression for $f(x + a)$ yields $5x^2 + 30x + 42 = 5x^2 + 10ax + 5a^2 - 3$. Because this equality must be true for all values of x , the coefficients of each power of x are equal. Setting the coefficients of x equal to each other gives $10a = 30$. Dividing each side of this equation by 10 yields $a = 3$.

Choices A, B, and D are incorrect and may result from a calculation error.

QUESTION 25

Choice C is correct. The sine of an angle is equal to the cosine of the angle's complement. This relationship can be expressed by the equation $\sin x^\circ = \cos(90^\circ - x^\circ)$. Therefore, if $\sin x^\circ = a$, then $\cos(90^\circ - x^\circ)$ must also be equal to a .

Choices A and B are incorrect and may result from misunderstanding the relationship between the sine and cosine of complementary angles. Choice D is incorrect and may result from misinterpreting $\sin(x^2)^\circ$ as $\sin^2(x)^\circ$.

QUESTION 26

Choice D is correct. The positive x -intercept of the graph of $y = h(x)$ is a point (x, y) for which $y = 0$. Since $y = h(x)$ models the height above the ground, in feet, of the projectile, a y -value of 0 must correspond to the height of the projectile when it is 0 feet above ground or, in other words, when the projectile is on the ground. Since x represents the time since the projectile was launched, it follows that the positive x -intercept, $(x, 0)$, represents the time at which the projectile hits the ground.

Choice A is incorrect and may result from misidentifying the y -intercept as a positive x -intercept. Choice B is incorrect and may result from misidentifying the y -value of the vertex of the graph of the function as an x -intercept. Choice C is incorrect and may result from misidentifying the x -value of the vertex of the graph of the function as an x -intercept.

QUESTION 27

Choice A is correct. Since $(a, 0)$ and $(b, 0)$ are the only two points where the graph of f crosses the x -axis, it must be true that $f(a) = 0$ and $f(b) = 0$ and that $f(x)$ is not equal to 0 for any other value of x . Of the given choices, choice A is the only function for which this is true. If $f(x) = (x - a)(x - b)$, then $f(a) = (a - a)(a - b)$, which can be rewritten as $f(a) = 0(a - b)$, or $f(a) = 0$. Also, $f(b) = (b - a)(b - b)$, which can be rewritten as $f(b) = (b - a)(0)$, or $f(b) = 0$. Furthermore, if $f(x) = (x - a)(x - b)$ is equal to 0, then it follows that either $x - a = 0$ or $x - b = 0$. Solving each of these equations by adding a to both sides of the first equation and adding b to both sides of the second equation yields $x = a$ or $x = b$. Therefore, the graph of $f(x) = (x - a)(x - b)$ crosses the x -axis at exactly two points, $(a, 0)$ and $(b, 0)$.

Choice B is incorrect because $f(a) = (2a)(a + b)$, which can't be 0 because it's given that a and b are positive. Choice C is incorrect because $f(b) = (b - a)(2b)$; its graph could only be 0 if $b = a$, but it would cross the x -axis at only one point, since $(a, 0)$ and $(b, 0)$ would be the same point. Choice D is incorrect because its graph crosses the x -axis at $(0, 0)$ as well as at $(a, 0)$ and $(b, 0)$.

QUESTION 28

Choice C is correct. Substituting 0 for x in the given equation yields $3(0)^2 + 6(0) + 2 = 2$. Therefore, the graph of the given equation passes through the point $(0, 2)$, which is the y -intercept of the graph. The right-hand side of the given equation, $y = 3x^2 + 6x + 2$, displays the constant 2, which directly corresponds to the y -coordinate of the y -intercept of the graph of this equation in the xy -plane.

Choice A is incorrect. The y -coordinate of the vertex of the graph is -1 , not 3 , 6 , or 2 . Choice B is incorrect. The x -coordinates of the x -intercepts of the graph are at approximately -1.577 and -0.423 , not 3 , 6 , or 2 . Choice D is incorrect. The x -coordinate of the x -intercept of the line of symmetry is at -1 , not 3 , 6 , or 2 .

QUESTION 29

Choice A is correct. The given equation is in slope-intercept form, or $y = mx + b$, where m is the value of the slope of the line of best fit. Therefore, the slope of the line of best fit is 0.096. From the definition of slope, it follows that an increase of 1 in the x -value corresponds to an increase of 0.096 in the y -value. Therefore, the line of best fit predicts that for each year between 1940 and 2010, the minimum wage will increase by 0.096 dollar per hour.

Choice B is incorrect and may result from using the y -coordinate of the y -intercept as the average increase, instead of the slope. Choice C is incorrect and may result from using the 10-year increments given on the x -axis to incorrectly interpret the slope of the line of best fit. Choice D is incorrect and may result from using the y -coordinate

of the y -intercept as the average increase, instead of the slope, and from using the 10-year increments given on the x -axis to incorrectly interpret the slope of the line of best fit.

QUESTION 30

Choice D is correct. On the line of best fit, d increases from approximately 480 to 880 between $t = 12$ and $t = 24$. The slope of the line of best fit is the difference in d -values divided by the difference in t -values, which gives $\frac{880 - 480}{24 - 12} = \frac{400}{12}$, or approximately 33. Writing the equation of the line of best fit in slope-intercept form gives $d = 33t + b$, where b is the y -coordinate of the y -intercept. This equation is satisfied by all points on the line, so $d = 480$ when $t = 12$. Thus, $480 = 33(12) + b$, which is equivalent to $480 = 396 + b$. Subtracting 396 from both sides of this equation gives $b = 84$. Therefore, an equation for the line of best fit could be $d = 33t + 84$.

Choice A is incorrect and may result from an error in calculating the slope and misidentifying the y -coordinate of the y -intercept of the graph as the value of d at $t = 10$ rather than the value of d at $t = 0$. Choice B is incorrect and may result from using the smallest value of t on the graph as the slope and misidentifying the y -coordinate of the y -intercept of the graph as the value of d at $t = 10$ rather than the value of d at $t = 0$. Choice C is incorrect and may result from misidentifying the y -coordinate of the y -intercept as the smallest value of d on the graph.

QUESTION 31

The correct answer is 6. Circles are symmetric with respect to any given diameter through the center (h, k) . One diameter of the circle is perpendicular to the x -axis. Therefore, the value of h is the mean of the x -coordinates of the circle's two x -intercepts: $h = \frac{20 + 4}{2} = 12$. The radius of the circle is given as 10, so the point (h, k) must be a distance of 10 units from any point on the circle. The equation of any circle can be written as $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center of the circle and r is the length of the radius of the circle. Substituting 12 for h and 10 for r into this equation gives $(x - 12)^2 + (y - k)^2 = 10^2$. Substituting the x -coordinate and y -coordinate of a point on the circle, $(4, 0)$, gives $(4 - 12)^2 + (0 - k)^2 = 10^2$, or $64 + k^2 = 100$. Subtracting 64 from both sides of this equation yields $k^2 = 36$. Therefore, $k = \pm\sqrt{36}$. Since the graph shows the point (h, k) in the first quadrant, k must be the positive square root of 36, so $k = 6$.

QUESTION 32

The correct answer is 2. It's given that line l is perpendicular to the line with equation $y = -\frac{2}{3}x$. Since the equation $y = -\frac{2}{3}x$ is written in slope-intercept form, the slope of the line is $-\frac{2}{3}$. The slope of line l must be the negative reciprocal of $-\frac{2}{3}$, which is $\frac{3}{2}$. It's also given that

the y -coordinate of the y -intercept of line ℓ is -13 , so the equation of line ℓ in slope-intercept form is $y = \frac{3}{2}x - 13$. If $y = b$ when $x = 10$, $b = \frac{3}{2}(10) - 13$, which is equivalent to $b = 15 - 13$, or $b = 2$.

QUESTION 33

The correct answer is 8. In this group, $\frac{1}{9}$ th of the people who are rhesus negative have blood type B. The total number of people who are rhesus negative in the group is $7 + 2 + 1 + x$, and there are 2 people who are rhesus negative with blood type B.

Therefore, $\frac{2}{(7 + 2 + 1 + x)} = \frac{1}{9}$. Combining like terms on the left-hand side of the equation yields $\frac{2}{(10 + x)} = \frac{1}{9}$. Multiplying both sides of this equation by 9 yields $\frac{18}{(10 + x)} = 1$, and multiplying both sides of this equation by $(10 + x)$ yields $18 = 10 + x$. Subtracting 10 from both sides of this equation yields $8 = x$.

QUESTION 34

The correct answer is 9. The median number of goals scored is found by ordering the number of goals scored from least to greatest and then determining the middle value in the list. If the number of goals scored in each of the 29 games were listed in order from least to greatest, the median would be the fifteenth number of goals. The graph shows there were 8 games with 1 goal scored and 9 games with 2 goals scored. Therefore, the fifteenth number, or the median number, of goals scored must be 2. According to the graph, the soccer team scored 2 goals in 9 of the games played.

QUESTION 35

The correct answer is 15. It's given that the deductions reduce the original amount of taxes owed by \$2,325.00. Since the deductions reduce the original amount of taxes owed by $d\%$, the equation

$$\frac{2,325}{15,500} = \frac{d}{100}$$

can be used to find this percent decrease, d .

Multiplying both sides of this equation by 100 yields $\frac{232,500}{15,500} = d$, or $15 = d$. Thus, the tax deductions reduce the original amount of taxes owed by 15%.

QUESTION 36

The correct answer is 1.5. It's given that the system of linear equations has no solutions. Therefore, the lines represented by the two equations are parallel. Each of the equations can be written in slope-intercept form, or $y = mx + b$, where m is the slope of the line and b is the y -coordinate of the line's y -intercept. Subtracting $\frac{3}{4}x$ from both sides of $\frac{3}{4}x - \frac{1}{2}y = 12$ yields $-\frac{1}{2}y = -\frac{3}{4}x + 12$. Dividing both sides of

this equation by $-\frac{1}{2}$ yields $y = \frac{\frac{3}{4}}{-\frac{1}{2}}x + \frac{12}{-\frac{1}{2}}$, or $y = \frac{3}{2}x - 24$. Therefore, the

slope of the line represented by the first equation in the system is $\frac{3}{2}$.

The second equation in the system can be put into slope-intercept form by first subtracting ax from both sides of $ax - by = 9$, then dividing

both sides of the equation by $-b$, which yields $y = \frac{a}{b}x - \frac{9}{b}$. Therefore, the slope of the line represented by the second equation in the system

is $\frac{a}{b}$. Parallel lines have equal slopes. Therefore, $\frac{a}{b} = \frac{3}{2}$. Either $3/2$ or 1.5 may be entered as the correct answer.

QUESTION 37

The correct answer is 1.3. The median number of tourists is found by ordering the number of tourists from least to greatest and determining the middle value from this list. When the number of tourists in 2012 is ordered from least to greatest, the middle value, or the fifth number, is 46.4 million. When the number of tourists in 2013 is ordered from least to greatest, the middle value, or the fifth number, is 47.7 million. The difference between these two medians is $47.7 \text{ million} - 46.4 \text{ million} = 1.3 \text{ million}$.

QUESTION 38

The correct answer is 3. Let y be the number of international tourist arrivals in Russia in 2012, and let x be the number of these arrivals in 2011. It's given that y is 13.5% greater than x , or $y = 1.135x$. The table gives that $y = 24.7$, so $24.7 = 1.135x$. Dividing both sides of this equation by 1.135 yields $\frac{24.7}{1.135} = x$, or $x \approx 21.8$ million arrivals. The difference in the number of tourist arrivals between these two years is $24.7 \text{ million} - 21.8 \text{ million} = 2.9 \text{ million}$. Therefore, the value of k is 3 when rounded to the nearest integer.