

The SAT Practice Test #7

Exam Materials
Pages 2 - 48

Answer Key Materials
Pages 49 - 94



The SAT®

Practice

Test #7



Make time to take the practice test.
It is one of the best ways to get ready
for the SAT.

After you have taken the practice test, score it
right away at sat.org/digital-practice.

This version of the SAT Practice Test is for students who will be taking
the digital SAT in nondigital format.

The SAT®

GENERAL DIRECTIONS

- You may work on only one module at a time.
- If you finish a module before time is called, check your work on that module only.
You may NOT turn to any other module.

TIMING

Reading and Writing, Module 1: 39 minutes

Reading and Writing, Module 2: 39 minutes

10-minute break

Math, Module 1: 43 minutes

Math, Module 2: 43 minutes

The above are standard times. If you are approved for accommodations involving additional time, you should give yourself that time when you practice.

MARKING YOUR ANSWERS

- Be sure to answer your questions properly in this book.
- Circle only one answer to each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled, or for questions with no answers circled.

USING YOUR TEST BOOK

- You may use the test book for scratch work.
- You may not fold or remove pages or portions of a page from this book, or take the book from the testing room.

Reading and Writing

33 QUESTIONS

DIRECTIONS

The questions in this section address a number of important reading and writing skills. Each question includes one or more passages, which may include a table or graph. Read each passage and question carefully, and then choose the best answer to the question based on the passage(s).

All questions in this section are multiple-choice with four answer choices. Each question has a single best answer.

1

On the basis of extensive calculations and models, astronomers in the 1990s predicted that the collision of two neutron stars or a neutron star and a black hole could release a massive burst of gamma rays in an event called a kilonova. This _____ was confirmed with observations in 2017.

Which choice completes the text with the most logical and precise word or phrase?

- A) theory
- B) evidence
- C) constant
- D) experiment

2

The following text is from John Muir's 1913 autobiography *The Story of My Boyhood and Youth*. Muir describes being on a boat.

The water was so clear that it was almost invisible, and when we floated slowly out over the plants and fishes, we seemed to be miraculously sustained in the air while exploring a veritable fairyland.

As used in the text, what does the word "clear" most nearly mean?

- A) Simple
- B) Understandable
- C) Obvious
- D) Transparent

3

At the turn of the twentieth century, Black residents of Richmond, Virginia, had few formal options for banking and other financial services. To _____ this situation, Maggie Lena Walker chartered the St. Luke Penny Savings Bank in 1903. The bank went on to provide home loans and savings opportunities to thousands of Black families over the following decades.

Which choice completes the text with the most logical and precise word or phrase?

- A) prolong
- B) rectify
- C) retain
- D) highlight

4

The results of randomized clinical trials testing the efficacy of common medical interventions sometimes fail to _____ conclusions that practitioners reach based on their real-world observations of patients. While there are several possible reasons for this, one is that practitioners may overlook confounding variables that account for the results they attribute to the interventions in question.

Which choice completes the text with the most logical and precise word or phrase?

- A) circumvent
- B) corroborate
- C) disseminate
- D) implement

5

Diadromous fish migrate between freshwater and marine biomes during their life cycle. The migration's obligate nature is why diadromous fish can be _____ those that are merely euryhaline (able to tolerate high salinity): the euryhaline blackchin tilapia can survive high salinity, but its life cycle does not involve relocation to a different biome, as does that of the diadromous wild salmon.

Which choice completes the text with the most logical and precise word or phrase?

- A) demarcated from
- B) reconstituted as
- C) conflated with
- D) derived from

6

The following text is from Joan Didion's memoir *The Year of Magical Thinking*. In the text, the author discusses her home life.

[I]n California we heated our houses by building fires. We built fires even on summer evenings, because the fog came in. Fires said we were home, we had drawn the circle, we were safe through the night.

©2005 by Joan Didion

Which choice best describes the function of the underlined portion in the text as a whole?

- A) It illustrates that a fire provides comfort beyond physical warmth.
- B) It summarizes the information that came before it in the text.
- C) It explains that the house remains cold even in summer.
- D) It suggests that the author feels comfortable in her home with or without a fire.

7

The majority of plastics today wind up in landfills or are, at best, recycled into materials that have a very limited range of applications. To address this problem, chemist Guoliang Liu and colleagues designed a reactor that melts polyethylene and polypropylene—two widely used plastics—into a wax. The wax can then be transformed into a surfactant (a chemical compound usable as a detergent). With this promising new method, plastic waste could be turned into a range of useful cleaning products.

Which choice best states the function of the underlined portion of the text?

- A) It clarifies the meaning of a scientific term.
- B) It describes an environmental concern.
- C) It explains the significance of a scientific discovery.
- D) It identifies a result that confused the team.

8

The following text is from H.D.'s 1916 poem "Mid-Day." In the poem, the speaker is on a path in an outdoor setting.

A slight wind shakes the seed-pods—
my thoughts are spent
as the black seeds.
My thoughts tear me,
I dread their fever.
I am scattered in its whirl.
I am scattered like
the hot shrivelled seeds.

Which choice best describes the function of the underlined portion in the text as a whole?

- A) It illustrates a change in the natural environment that the speaker implies is responsible for the growing misgivings described in the text.
- B) It establishes an example of consistency in the natural landscape that the speaker then contrasts with the unpredictability of human emotions.
- C) It presents an observation of an occurrence in the natural world that the speaker then expands on to convey a sense of a turbulent interior state.
- D) It evokes the ordinariness of an event in nature to suggest that the critical self-evaluation the speaker engages in is a common pursuit.

9

In 2023 literary scholar Jeremy Douglass cautioned technology investors and enthusiasts who predict conventional books' ultimate displacement by newer forms of media. Douglass observed that the concept of an “interactive” text is much older than technologists assume, extending back to the first time readers scratched notes into a text’s margins. In addition, newer media, such as video games, haven't replaced older forms of entertainment, such as comic books, but rather exist alongside them. Douglass believes that rather than supplanting books, technology is simply making new forms of expression possible.

Which choice best describes the function of the underlined portion in the text as a whole?

- A) It challenges the stance of the investors and enthusiasts who are mentioned earlier in the text.
- B) It explains the basis for the claim made by the technologists mentioned in the text.
- C) It suggests that academics are better suited than investors to see the potential uses of contemporary interactive texts.
- D) It provides a historical anecdote about the technological challenges involved in reading the earliest interactive texts.

10

In 2018, scientists discovered an immense aggregation of *Muusoctopus robustus* (pearl octopuses) along a hydrothermal vent 3,200 meters beneath the ocean's surface. Water temperatures at this site—named the Octopus Garden—climb as high as 11°C, much warmer than the ambient 1.6°C typical at this depth. Based on observations made over three years, scientists concluded that temperatures at the site likely confer reproductive benefits and that the site is used exclusively for reproduction—6,000 *M. robustus* adults, hatchlings, and eggs were observed at the garden, but no juveniles were present.

Which statement about *M. robustus* and the Octopus Garden is best supported by the text?

- A) *M. robustus* leave the Octopus Garden upon reaching an intermediary stage of development.
- B) The *M. robustus* population at the Octopus Garden remains stable despite variations in water temperature.
- C) *M. robustus* nests in the Octopus Garden contain on average fewer but larger eggs than nests at similar ocean depths.
- D) The Octopus Garden provides an ideal feeding ground for *M. robustus* hatchlings.

11

The following text is from Thomas Mann's 1924 novel *The Magic Mountain*, translated by John E. Woods in 1995.

The story of Hans Castorp that we intend to tell here—not for his sake (for the reader will come to know him as a perfectly ordinary, if engaging young man), but for the sake of the story itself, which seems to us to be very much worth telling (although in Hans Castorp's favor it should be noted that it is *his* story, and that not every story happens to everybody)—is a story that took place long ago, and is, so to speak, covered with the patina of history and must necessarily be told with verbs whose tense is that of the deepest past.

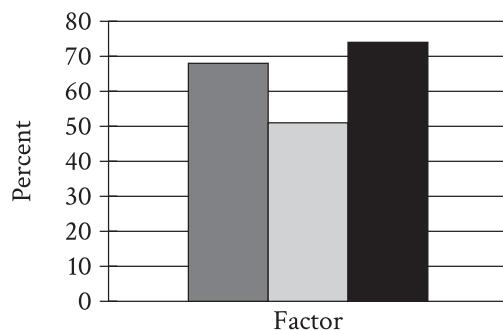
©1995 by Alfred A. Knopf, Inc.

What does the text most strongly suggest about the story of Hans Castorp?

- A) Though it is true that stories of even the most uninteresting people are themselves interesting because all people are unique, the reason this story is interesting is nonetheless difficult to understand because of the passage of time.
- B) Even though it is a story of a person of no particular importance, its age and the manner in which it therefore must be told are both indicators that the story itself is important.
- C) Like all stories about the lives of inconsequential people, this story must necessarily be related in a particular way if the reason the story is consequential is to be made evident to the audience.
- D) It is a remarkable story that happened to an unremarkable person, though one could plausibly argue that because the story is valuable, some of its value accrues to the person at its center.

12

Percentage of Participants Who Mentioned Factors



- convenience
- costs
- established behaviors

Researcher Judith Hilton and her team interviewed 55 people about which factors would make them switch from using single-use plastic containers to reusable containers. The graph shows three of the factors mentioned in the interviews and the percentage of participants who mentioned them.

According to the graph, about what percentage of participants mentioned costs in the interviews?

- A) 10%
- B) 95%
- C) 25%
- D) 50%

13

A student in a political science course is writing a paper on Aristotle's *The Politics*, in which Aristotle offers his opinion on political instability and gives advice on how constitutions can be preserved. Aristotle observes that different forms of government can fall in different ways—for example, oligarchies might grant power to military leaders during wartime who refuse to relinquish that power during peacetime—but some methods of preserving order apply across all forms of government. The student claims that in particular Aristotle asserts that in a healthy state obedience to law must be as close to absolute as possible and that even minor infractions should not be ignored.

Which quotation from a philosopher's analysis of *The Politics* would best support the student's claim?

- A) "When constructing his argument regarding the characteristics of a well-functioning government, Aristotle asserts that 'Transgression creeps in unperceived and at last ruins the state,' illustrating this idea with a comparison to frequent small expenditures slowly and almost imperceptibly chipping away at a fortune until it is ultimately depleted."
- B) "When Aristotle writes on the necessity of avoiding corruption in government, he proposes that 'every state should be so administered and so regulated by law that its magistrates cannot possibly make money.' In particular, he thinks oligarchies are particularly susceptible to corruption through bribery."
- C) "When Aristotle considers the health of constitutions, he states that 'Constitutions are preserved when their destroyers are at a distance, and sometimes also because they are near, for the fear of them makes the government keep in hand the constitution.' He holds that rulers who wish to see constitutions preserved must continually remind the populace of the dangers that would result from a constitutional collapse."
- D) "When contrasting different forms of government, Aristotle holds that 'oligarchies may last, not from any inherent stability in such forms of government, but because the rulers are on good terms both with the unenfranchised and with the governing classes.' That is, oligarchic leaders who wish to hold on to power will introduce members of disenfranchised classes into government in a participatory role."

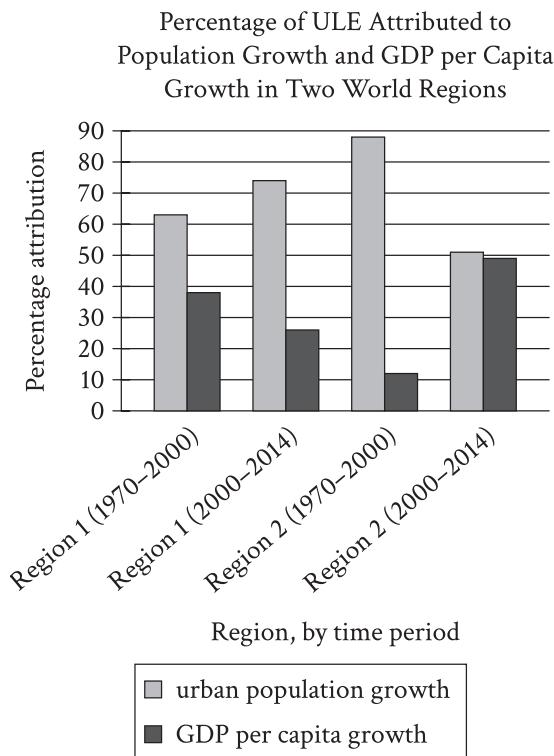
14

Almost all works of fiction contain references to the progression of time, including the time of day when events in a story take place. In a 2020 study, Allen Kim, Charuta Pethe, and Steven Skiena claim that an observable pattern in such references reflects a shift in human behavior prompted by the spread of electric lighting in the late nineteenth century. The researchers drew this conclusion from an analysis of more than 50,000 novels spanning many centuries and cultures, using software to recognize and tally both specific time references—that is, clock phrases, such as 7 a.m. or 2:30 p.m.—and implied ones, such as mentions of meals typically associated with a particular time of day.

Which finding from the study, if true, would most directly support the researchers' conclusion?

- A) Novels published after the year 1800 include the clock phrase 10 a.m. less often than novels published before the year 1800 do.
- B) Novels published after 1880 contain significantly more references to activities occurring after 10 p.m. than do novels from earlier periods.
- C) Among novels published in the nineteenth century, implied time references become steadily more common than clock phrases as publication dates approach 1900.
- D) The time references of noon (12 p.m.) and midnight (12 a.m.) are used with roughly the same frequency in the novels.

15

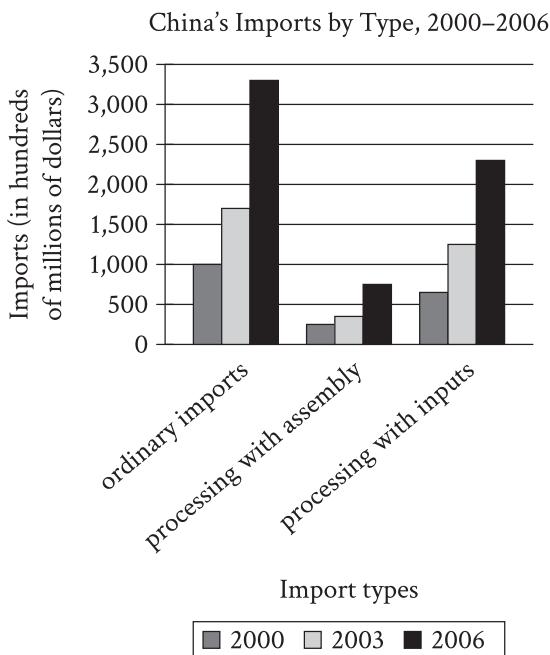


In a study of urban physical expansion, Richa Mahtta et al. conducted a meta-analysis of more than 300 cities worldwide to determine whether urban land expansion (ULE) was more strongly influenced by urban population growth or by growth in gross domestic product (GDP) per capita, a measure of economic activity. Because efficient national government is necessary to provide urban services and infrastructure that attract economic investment, Mahtta et al. propose that absent other factors, the importance of GDP per capita growth to ULE would likely increase relative to the importance of population growth as governments become more efficient. If true, this suggests the possibility that _____.

Which choice most effectively uses data from the graph to complete the statement?

- A) national governments of countries in Region 1 experienced declines in efficiency in the period from 2000 to 2014, relative to the period from 1970 to 2000.
- B) countries in Region 1 experienced a slower rate of economic growth in the period from 2000 to 2014 than countries in Region 2 did, despite increasing national government efficiency in Region 1.
- C) national governments of most countries in Region 2 became more efficient in the period from 2000 to 2014 than they had been in the period from 1970 to 2000, but those of several countries in this region did not.
- D) national governments of countries in Region 1 and in Region 2 generally became more efficient in the period from 2000 to 2014 than they had been in the period from 1970 to 2000, but at different rates.

16



A student is researching the Chinese government's 1992 shift to a market economy that emphasizes trade liberalization. One means of trade liberalization involves expanding from ordinary imports into an emphasis on processing imports, which have two types: processing with assembly (in which a firm obtains raw materials from a foreign trading partner without payment and sells the final goods to that partner, charging for assembly) and processing with inputs (in which a firm expends capital to buy raw materials from a trading partner, processes them into final goods, and sells those goods to whichever trading partner it chooses). The student asserts that while initial efforts at trade liberalization were shaped by Chinese firms' limited capital, this situation resolved during the 2000s.

Which choice best describes data from the graph that support the student's assertion?

- A) Processing imports with inputs were greater than both ordinary imports and processing imports with assembly in 2006.
- B) From 2000 to 2006, processing imports with inputs rose much more sharply than processing imports with assembly did.
- C) From 2000 to 2006, neither processing imports with inputs nor processing imports with assembly were greater than ordinary imports.
- D) Processing imports with assembly were greater in 2006 than processing imports with inputs in 2000.

17

Narwhals are shy whales that live in the remote Arctic Ocean. Some of them have a long tusk, like a unicorn horn, with sensitive nerves. Narwhals are known for this tusk, but many actually don't have one and its purpose is unknown. One group of scientists came up with a possible purpose in 2014. The scientists suggested that the tusk may help narwhals determine when water around them is likely to start freezing and become dangerous for them. Marine biologist Kristin Laidre disagrees with that idea, though. She reasons that if the narwhal's tusk serves such an important purpose, then it's most likely that _____.

Which choice most logically completes the text?

- A) some narwhals would seek a new habitat.
- B) fewer marine animals would also have tusks.
- C) more narwhals would have a tusk.
- D) narwhals would become less shy over time.

18

To address the susceptibility of materials used in components of high-performance machinery, such as aircraft engines, to creep (deformation that is induced by persistent mechanical stress and that often occurs at elevated temperatures), materials researchers have developed silicon carbide (SiC) fibers for producing aerospace composites. Testing the thermomechanical properties of several commercially available SiC fibers, Ramakrishna T. Bhatt et al. found that in comparison with two polymer-derived SiC fibers, a nitrogen-treated SiC fiber exhibited a lower minimum creep rate, a measure of the rate at which a stress-exposed material deforms at a constant temperature and uniaxial load. The finding suggests that _____.

Which choice most logically completes the text?

- A) unlike the two polymer-derived SiC fibers, the nitrogen-treated SiC fiber can substantially inhibit creep, provided that temperatures and loads are consistent.
- B) the two polymer-derived SiC fibers likely hold similar potential for reducing the creep resistance of materials exposed to stress and elevated temperatures, thus prolonging the life span of aerospace machinery.
- C) composites based on the two polymer-derived SiC fibers have chemical properties that may improve the mechanical and thermal stability of aerospace equipment to a greater extent than do composites based on the nitrogen-treated SiC fiber.
- D) aerospace composites containing the nitrogen-treated SiC fiber may have the ability to withstand mechanical stress for a longer period of time than can aerospace composites containing either of the two polymer-derived SiC fibers.

19

One of the earliest known maps is a Babylonian clay tablet thought to be almost 4,500 years old. The map _____ the area of a plot of land, shows a river valley, and includes the cardinal directions.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) describes
- B) describe
- C) have described
- D) are describing

20

Eighteen letters written by Louisa May Alcott, author of the popular novel *Little Women* (1868), can be found at the New York Historical Society. _____ letters demonstrate Alcott's keen business sense in her interactions with publishers.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) One
- B) That
- C) This
- D) These

21

The Dust Bowl was a period of severe drought that plagued the Great Plains of the US during the 1930s. During this time, dust storms _____ over 100 million acres of land. They even reached as far east as New York City.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) are affecting
- B) will have affected
- C) will affect
- D) affected

22

Many mechanical calculators were powered by a notched cylinder mechanism called the Leibniz wheel. Leibniz wheel calculators were popular in the first half of the twentieth _____ these ingenious devices were eventually replaced by electronic calculators.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) century
- B) century,
- C) century, but
- D) century that

23

Featuring jagged peaks of black ink surrounded by hazy swirls of blue and green paint, Zhang Daqian's 1983 painting *Panorama of Mount Lu* is inspired by the tradition of *qinglü shanshui*, a type of Chinese landscape painting _____ by the use of blue and green hues to depict ethereal, otherworldly landscapes.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) has been characterized
- B) will be characterized
- C) characterized
- D) is characterized

24

Increasing the heat on an uncovered boiling pot of water does not increase the temperature of the water. What increases is the rate at which the water turns to _____ a pressure cooker pot, though, an airtight seal traps the vapor in the pot, creating pressure that allows the temperature of the water to increase past its boiling point.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) vapor. With
- B) vapor with
- C) vapor, with
- D) vapor and with

25

Wanting to celebrate the 100th anniversary of the Alaska Purchase, _____ up with a motto that best captured the state's unique character. The commission selected "North to the Future," submitted by Juneau journalist Richard Peter, as its winning entry.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) a contest sponsored by the Alaska Centennial Commission would award \$300 to an individual who came
- B) an award of \$300 would go to an individual in a contest sponsored by the Alaska Centennial Commission for coming
- C) \$300 would be awarded to an individual by the Alaska Centennial Commission in a contest for coming
- D) the Alaska Centennial Commission sponsored a contest that would award \$300 to an individual who came

26

Recently unearthed Neronian tools in France dating to 54,000 years ago and attributed to *Homo sapiens* may provide evidence that interactions between Neanderthals and modern humans occurred 10,000 years earlier than was previously _____ finding that, if true, would overturn current theories about *H. sapiens* migration during the Upper Paleolithic.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) supposed; a
- B) supposed. A
- C) supposed a
- D) supposed, a

27

Guard cells are specialized cells that are part of a plant's pores. These cells help regulate the amount of carbon dioxide a plant takes in. _____ they help regulate a plant's water loss.

Which choice completes the text with the most logical transition?

- A) Additionally,
- B) Previously,
- C) In conclusion,
- D) Instead,

28

While researching a topic, a student has taken the following notes:

- Angana Chaudhuri is a scientist.
- Chaudhuri studies sedimentary rocks.
- A scientist who studies sedimentary rocks is called a sedimentologist.
- Shale, chalk, and sandstone are examples of sedimentary rocks.

The student wants to identify what type of scientist Chaudhuri is. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) Chalk is a type of sedimentary rock.
- B) Some scientists study shale, chalk, and sandstone.
- C) There are scientists who study sedimentary rocks.
- D) Chaudhuri is a sedimentologist.

29

While researching a topic, a student has taken the following notes:

- “Raymond’s Run” is a short story.
- It was written by African American author Toni Cade Bambara.
- It was first published in her book *Gorilla, My Love* in 1972.
- It is told from a first person perspective.
- It takes place in Harlem.

The student wants to indicate where the short story takes place. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) “Raymond’s Run” takes place in Harlem.
- B) “Raymond’s Run” was published in *Gorilla, My Love*.
- C) “Raymond’s Run” is told from a first person perspective.
- D) “Raymond’s Run” was written by Toni Cade Bambara.

30

While researching a topic, a student has taken the following notes:

- The Royal Alcázar of Seville is a historic royal palace in Andalucía, Spain.
- The palace is famous for its intricate tilework.
- The palace features majolica and arista tiles.
- In the majolica style, designs are painted directly on the ceramic tiles.
- In the arista style, designs are stamped into the ceramic tiles.

The student wants to contrast the two styles of tiles. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) Tiles in the majolica and arista styles can be found in the Royal Alcázar of Seville in Andalucía, Spain.
- B) Featuring tiles in the majolica and arista styles, the Royal Alcázar of Seville in Spain is famous for its intricate tilework.
- C) In the arista style, designs are stamped into the ceramic tiles, whereas in the majolica style, the designs are painted directly on them.
- D) Among the famous tilework of the Royal Alcázar of Seville are majolica style tiles, made by painting designs directly on the ceramic tiles.

31

While researching a topic, a student has taken the following notes:

- Musicians around the world have used protest songs to raise awareness about human rights violations.
- US folk singer Aunt Molly Jackson released the protest song “Poor Miner’s Farewell” in 1932.
- It exposed the unlivable wages and dangerous working conditions coal miners faced in Kentucky during the 1920s and 1930s.
- South African singer-songwriter Hugh Masekela released the protest song “Bring Him Back Home” in 1987.
- It called on the South African government to free Nelson Mandela, an anti-apartheid leader who’d been unjustly imprisoned.

The student wants to contrast the song “Poor Miner’s Farewell” with the song “Bring Him Back Home.” Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) The songs “Poor Miner’s Farewell” and “Bring Him Back Home” both raised awareness about human rights violations.
- B) While both are protest songs, “Poor Miner’s Farewell” is about coal miners in Kentucky, whereas “Bring Him Back Home” is about the anti-apartheid leader Nelson Mandela.
- C) Hugh Masekela’s song “Bring Him Back Home,” released in 1987, called on the South African government to free Nelson Mandela.
- D) Released in 1932 by Aunt Molly Jackson, the song “Poor Miner’s Farewell” was a protest against the unlivable wages and dangerous working conditions faced by Kentucky coal miners.

32

While researching a topic, a student has taken the following notes:

- Political scientist Graham Allison is known for his Thucydides trap theory.
- Allison's theory states that whenever "a rising power is threatening to displace a ruling power," conflict is likely.
- The theory is based on Thucydides's explanation of the conflict between Athens and Sparta.
- Thucydides wrote that "the rise of Athens and the fear this instilled in Sparta" made conflict "inevitable."
- History professor Edmund Stewart recently challenged the historical basis of the theory.
- Stewart claimed that Athens was not a rising power and that the rivals experienced a "clash of cultures" instead.

The student wants to use a quotation to challenge Thucydides's explanation of the conflict between Athens and Sparta. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) According to Allison's Thucydides trap theory, whenever "a rising power is threatening to displace a ruling power," conflict is likely.
- B) Thucydides wrote that conflict between the two powers was "inevitable," although Stewart later challenged the historical basis of this claim.
- C) According to Stewart, a "clash of cultures" between Athens and Sparta caused the conflict, not Athens's rise.
- D) Thucydides explained that conflict was caused by "the rise of Athens and the fear this instilled in Sparta," but Allison disagreed, seeing the conflict as an example of the Thucydides trap.

33

While researching a topic, a student has taken the following notes:

- Researchers in a 2021 study wanted to determine the rate at which 17 languages conveyed both information and syllables.
- They calculated the bits of information conveyed per second (the IR, or information rate).
- The IR was found to be approximately consistent across the 17 languages (an average of 39 bits per second).
- They calculated the number of syllables spoken per second (the SR, or syllable rate).
- Spanish had the second-fastest SR (7.7 syllables per second).
- Vietnamese had the sixteenth-fastest SR (5.3 syllables per second).

The student wants to present an overview of the study's findings. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) The 2021 study determined the information rate (IR) of 17 languages in bits of information conveyed per second.
- B) Researchers found that information was conveyed more quickly in Spanish, at 7.7 syllables per second, than in Vietnamese, at 5.3 syllables per second.
- C) Vietnamese had the sixteenth-fastest syllable rate, lower than that of Spanish, which had the second-fastest; however, Spanish had the lower information rate of the two.
- D) Though some of the languages differed in number of syllables spoken per second, all 17 conveyed information at roughly the same rate.

STOP

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

Reading and Writing

33 QUESTIONS

DIRECTIONS

The questions in this section address a number of important reading and writing skills. Each question includes one or more passages, which may include a table or graph. Read each passage and question carefully, and then choose the best answer to the question based on the passage(s).

All questions in this section are multiple-choice with four answer choices. Each question has a single best answer.

1

Taking photographs in the mid-1800s was complicated and expensive, but this changed with the 1854 invention of the *carte de visite*, a small photo that cost little to make. *Carte de visite* photos helped to _____ photography: they made it easy and enjoyable for everyday people to have their pictures taken, and people at the time loved exchanging these small photos with friends and family.

Which choice completes the text with the most logical and precise word or phrase?

- A) weaken
- B) praise
- C) popularize
- D) isolate

2

Painter Alma W. Thomas was fascinated by the colors and shapes found in nature. The flowers and trees in the garden at her home in Washington, DC, _____ her work. For example, Thomas's use of broken brushstrokes was inspired by the way that light would shine through the leaves of a tree in front of her house.

Which choice completes the text with the most logical and precise word or phrase?

- A) restricted
- B) announced
- C) distracted
- D) influenced

3

In the 1990s, conservationists began planting more than 500,000 native trees in the habitat of the Azores bullfinch to boost the bird’s numbers. This approach was apparently _____: the Azores bullfinch’s population size increased from as few as 100 birds at the end of the 1980s to around 1,300 in 2023.

Which choice completes the text with the most logical and precise word or phrase?

- A) amusing
- B) costly
- C) successful
- D) disastrous

4

The recently observed gamma ray burst GRB 230307A lasted for 200 seconds, _____ for a burst generated by the merger of neutron stars. Bursts caused by neutron mergers typically last fewer than 2 seconds.

Which choice completes the text with the most logical and precise word or phrase?

- A) a coincidence
- B) a reprieve
- C) an incident
- D) an oddity

5

In 1776, the United States sent Benjamin Franklin to France to try to win the country’s support in the United States’ fight for independence from Great Britain. Franklin was very popular in France. This _____ surely helped him to convince France to assist the United States.

Which choice completes the text with the most logical and precise word or phrase?

- A) thoughtfulness
- B) esteem
- C) controversy
- D) sincerity

6

In the 1950s, scientists didn’t know much about the ocean floor. Many scientists at the time believed that the ocean floor was mostly flat. But geologists Marie Tharp and her research partner, Bruce Heezen, proved that this idea was wrong. Using sonar data collected from the Atlantic Ocean, Tharp and Heezen showed that the floor was filled with canyons, mountains, and valleys.

Which choice best describes the function of the underlined sentence in the text as a whole?

- A) It identifies a scientific belief that Tharp and Heezen showed to be wrong.
- B) It describes the design of Tharp and Heezen’s experiment.
- C) It emphasizes a disagreement between Tharp and Heezen.
- D) It presents data to support a claim that Tharp and Heezen made.

7

In the early days of television in the 1940s, many people thought that US television programs would rely on the financial support of ad agencies and commercial sponsors, much like radio did. But advertisers hesitated to jump into a new space, particularly at a time when the manufacturing of new television sets was stalled due to the US's involvement in World War II. Broadcasters, like the National Broadcasting Company (NBC), needed to persuade advertisers to support their programming despite not knowing whether there would be a robust television audience to begin with.

Which choice best describes the function of the underlined phrase in the text as a whole?

- A) It compares the beginnings of radio programming with the beginnings of television programming in the United States.
- B) It identifies a specific reason behind some advertisers' hesitance to support television.
- C) It describes how broadcasters attempted to convince advertisers to support television.
- D) It explains why a type of television programming was popular at the time.

8

The Bayeux Tapestry, from eleventh-century France, depicts 75 scenes over 250 feet of fabric. It was likely produced by workers embroidering in sections and then joining the resulting panels together. It's plausible that the workshop that produced the tapestry had never produced one so large, and some researchers claim that a close examination of the joins—the places where the panels are stitched together—suggests that the workers developed and refined their joining process over the course of production. For example, the first join the workers completed exhibits a clear misalignment of the borders of the two panels, whereas the later joins are virtually invisible.

Which choice best describes the function of the underlined sentence in the text as a whole?

- A) It identifies the people and events depicted in the Bayeux Tapestry.
- B) It supports an argument about the workers who produced the Bayeux Tapestry.
- C) It compares the Bayeux Tapestry with other tapestries from eleventh-century France.
- D) It describes how researchers determined where the Bayeux Tapestry was produced.

9

Text 1

Little is known about how plate tectonics—wherein slabs of Earth’s crust move over, under, away from, and against one another—began. Some researchers contend that tectonic movements began around 3 billion years ago, often noting that computer models of Earth’s mantle temperature at the time indicate that the mantle would have been sufficiently molten to enable the plates to move.

Text 2

Ultimately, any plausible claim about the inception of tectonic movement must rest on empirical evidence from the geological record. Researcher Wriju Chowdhury and his team analyzed the geochemistry of zircon crystals to gain insight into the chemical composition of the magma from which the crystals formed and, based on the data, compellingly argue that plate tectonics may have been occurring as early as 4.2 billion years ago.

Based on the texts, how would the author of Text 2 most likely respond to what “some researchers contend” as described in Text 1?

- A) By suggesting that the temperature of Earth’s mantle 3 billion years ago was likely insufficient to allow for the level of tectonic movement predicted by computer models
- B) By distinguishing between computer models of Earth’s mantle temperature that reliably predict the onset of plate tectonics and those that do not
- C) By indicating that computer models of Earth’s mantle temperature are still being improved such that new models tend to be much more reliable than their predecessors
- D) By asserting that a more definitive form of evidence than the computer models suggests a different timeline for the onset of plate tectonics on Earth

10

Hevea brasiliensis, a tree in the Amazon rainforest, is the world’s main source of natural rubber. The tree produces a milky substance called latex that is used to make rubber. The bark of *Hevea brasiliensis* is helpful for the process of making rubber because it has a unique structure that makes it easy to collect latex. A network of tubes in the tree’s inner bark helps the latex to flow out easily when people make small cuts into the bark.

What feature of *Hevea brasiliensis* does the text say is helpful for the process of making rubber?

- A) Its latex produces rubber of an especially high quality.
- B) Its bark has a unique structure that makes it easy to collect latex.
- C) It is able to grow in a wide variety of climates around the world.
- D) It is one of only two trees in the Amazon that produce latex.

11

Conservationists worldwide are working to protect ecosystems from habitat destruction and biodiversity loss, and in many cases, initiatives that rely on natural features or processes can help address such challenges. In response to a rapidly dwindling population of blueback salmon, the Quinault Indian Nation (a tribe in Washington State) partnered with the conservation organization Wild Salmon Center to restore naturally occurring logjams in the Quinault River. The logjams create shady pools where the blueback salmon can rest and spawn, thus promoting blueback population recovery.

Which choice best states the main idea of the text?

- A) A partnership between the Quinault Indian Nation and Wild Salmon Center shows the importance of collaborative approaches to preserving biodiversity.
- B) Nature-based approaches can be effective ways to achieve conservation goals.
- C) As indicated by a recent project, logjams help the blueback salmon thrive and reproduce.
- D) Scientists now realize that nature-based conservation methods offer better long-term solutions to environmental issues than methods that are not nature-based do.

12

Percentage of Bus Shelters with Shade in a County by Areas' Highest Average Summer Surface Temperature

Highest average surface temperature (Fahrenheit)	Percentage of bus stops with shaded shelter
90.2°	15%
97.7°	22%
102.7°	24%
111.2°	28%
125.6°	29%

A student is researching a bus system in a large county where surface temperatures vary by area and are hot in the summer. The student claims that all areas of the county should have more bus stops with shaded shelter, noting that the highest percentage of bus stops with shaded shelter for any area is only _____.

Which choice most effectively uses data from the table to complete the student's claim?

- A) 50%.
- B) 15%.
- C) 90%.
- D) 29%.

13

Total Areas and 2022 Populations of Smallest Arabian Peninsula Countries

Country	Total area (square miles)	Population
Kuwait	6,880	4,268,873
Bahrain	304	1,472,233
Qatar	4,471	2,695,122

In terms of area and population, the three smallest Arabian Peninsula countries are Bahrain, Qatar, and Kuwait.

According to the table, what is the total area of Bahrain?

- A) 4,268,873 square miles
- B) 4,471 square miles
- C) 304 square miles
- D) 6,880 square miles

14

Janet Echelman is a sculptor and fiber artist. She has installed giant sculptures all over the world. Echelman uses bright and flowing materials, which mimic the wind. However, while her sculptures appear as delicate as a breeze, they are actually very durable.

Which quotation from an article about Echelman's sculptures, if true, would most effectively illustrate the underlined claim?

- A) "Echelman uses a special program that makes a 3D model of the sculpture."
- B) "The first part of planning a new sculpture is done using paper and pencil, and then a digital program is used to finalize the design."
- C) "The materials that Echelman uses to build her sculptures are both flexible and strong."
- D) "Each sculpture is designed to reflect local landmarks from the area in which it is eventually installed."

15

Early Earth is thought to have been characterized by a stagnant lid tectonic regime, in which the upper lithosphere (the outer rocky layer) was essentially immobile and there was no interaction between the lithosphere and the underlying mantle. Researchers investigated the timing of the transition from a stagnant lid regime to a tectonic plate regime, in which the lithosphere is fractured into dynamic plates that in turn allow lithospheric and mantle material to mix. Examining chemical data from lithospheric and mantle-derived rocks ranging from 285 million to 3.8 billion years old, the researchers dated the transition to 3.2 billion years ago.

Which finding, if true, would most directly support the researchers' conclusion?

- A) Among rocks known to be older than 3.2 billion years, significantly more are mantle derived than lithospheric, but the opposite is true for the rocks younger than 3.2 billion years.
- B) Mantle-derived rocks older than 3.2 billion years show significantly more compositional diversity than lithospheric rocks older than 3.2 billion years do.
- C) There is a positive correlation between the age of lithospheric rocks and their chemical similarity to mantle-derived rocks, and that correlation increases significantly in strength at around 3.2 billion years old.
- D) Mantle-derived rocks younger than 3.2 billion years contain some material that is not found in older mantle-derived rocks but is found in older and contemporaneous lithospheric rocks.

16

The Uto-Aztec language family is divided into a northern branch, which includes the Shoshone language of present-day Idaho and Utah, and a southern one, whose best-known representative is Nahuatl, the language of the Aztec Empire in Mexico. Lexical similarities across the family, including of botanical terms, confirm descent from a single language spoken millennia ago, and the family's geographical distribution suggests an origin in what is now the US Southwest. However, vocabulary pertaining to maize isn't shared between northern and southern branches, despite the crop's universal cultivation among Uto-Aztec tribes. Given archaeological evidence that maize originated in Mexico and diffused northward into what became the US Southwest, some linguists reason that _____.

Which choice most logically completes the text?

- A) northern Uto-Aztec tribes likely obtained the crop directly from a southern Uto-Aztec tribe rather than from a non-Uto-Aztec tribe.
- B) variation in maize-related vocabulary within each branch of the Uto-Aztec family likely reflects regionally specific methods for cultivating the crop.
- C) southern Uto-Aztec tribes likely acquired maize at roughly the same time as northern Uto-Aztec tribes did, though from different sources.
- D) the family's division into northern and southern branches likely preceded the acquisition of the crop by the Uto-Aztec tribes.

17

Data collected by the Mars rover *Curiosity* at the Gale Crater's Murray Formation are suggestive of hydrological deposition of sediment in the distant past. To characterize the nature of the depositional environment, Frances Rivera-Hernández et al. analyzed the grain size of Murray Formation sediment, finding that although there are intervals of coarse grains, most of the sediment consists of fine grains that show signs of cracking due to episodic desiccation. Rivera-Hernández et al. concluded that the coarse grains are sandstone, which tends to be deposited by flowing water, whereas the fine grains are mudstone, which is slowly deposited by settling out of suspension in low-flow water, leading the researchers to posit that _____.

Which choice most logically completes the text?

- A) although the area of the Murray Formation experienced a prolonged period of dryness that prevented a lake from forming, water flowing from a distant source was present.
- B) a lake existed at the Murray Formation for a prolonged period, though the lake occasionally experienced drying and there were periods in which one or more streams were present.
- C) one or more streams existed at the Murray Formation for an extended period until being replaced by a lake that persisted for only a brief period before permanently drying.
- D) a stream-fed lake was present at the Murray Formation for an extended period, and although the streams experienced occasional drying, the lake did not.

18

An analysis by Alain Elayi and colleagues of coins minted in Sidon in the fifth and fourth centuries BCE reveals a change in their composition over time: while a coin from circa 450 BCE contains about 98% silver and 1% copper, a coin from 367 BCE (the end of Ba'alšillem II's reign) contains 74.2% silver and 24.7% copper, giving it a relatively yellowish appearance that traders would have noticed. Because coins with a silver content below 80% were widely considered unsuitable for trade, Elayi et al. speculate that a crisis in confidence in the currency occurred in Sidon around 367 BCE, which was likely relieved—despite Sidon's persistent oppressive financial obligations—as a result of Ba'alšillem II's successor Abd'aštart I's decision to _____.

Which choice most logically completes the text?

- A) proclaim that the percentage of silver in coins suitable for trade would be raised to a threshold higher than 80%.
- B) keep the amount of silver in Sidonian coins consistent with that in coins minted in 367 BCE but decrease their weight.
- C) begin minting heavier coins with a proportion of silver to copper similar to that in coins minted in 367 BCE.
- D) fund the mining of some copper deposits that were not available to Ba'alšillem II.

19

Nowadays, tug-of-war is usually seen as an informal game one might play at a picnic or in gym class. Surprisingly, the Olympic committee once decided _____ tug-of-war as an official Olympic event! Nations competed in the event at the Olympic Games from 1900 to 1920.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) included
- B) including
- C) include
- D) to include

20

The Globe Theatre in London is a reconstruction of the famed venue where many of Shakespeare's plays were first performed. In 1613, a prop cannon _____ during a performance and ignited the Globe's thatched roof. No one was hurt, but in two hours the original Globe was gone.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) malfunctions
- B) will malfunction
- C) has malfunctioned
- D) malfunctioned

21

Nigerian American artist Toyin Ojih Odutola uses black-ink pens to create highly detailed drawings of human figures. Her portrait of novelist Zadie _____ is displayed in the National Portrait Gallery in London.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) Smith:
- B) Smith—
- C) Smith
- D) Smith,

22

When a given industry—water and electricity are two well-known examples—carries high infrastructural start-up costs and other barriers that discourage competition, _____ of just one or two suppliers per municipality. Such industries are known as natural monopolies.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) these often consist
- B) they often consist
- C) it often consists
- D) this often consists

23

As the fourteenth US librarian of Congress, Carla Hayden has many responsibilities. These include overseeing the Library of Congress's collections, which boast more than 162 million _____ the US Copyright Office, which registers copyright claims and advises Congress on copyright law; and appointing the US poet laureate.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) items managing
- B) items, managing
- C) items; managing
- D) items. Managing

24

Digital artist Jung (Lulu) Chen primarily uses a suite of software tools to create illustrations for children's books. To manifest the warm and welcoming atmospheres that are a signature of her _____ she occasionally relies on more traditional art techniques, such as painting with watercolors.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) work, though,
- B) work, though
- C) work; though,
- D) work, though;

25

Chondrites are stony meteorites that are undifferentiated—that is, their contents have not melted and separated into distinct layers. They are hardly _____. Many chondrites experience aqueous alteration as a result of exposure to fluids, as well as fracturing, veining, and localized melting due to collisions with other objects.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) pristine, though
- B) pristine, though;
- C) pristine; though
- D) pristine, though,

26

That the geographic center of North America lay in the state of North Dakota was conceded by all _____ establishing its precise coordinates proved more divisive.

Which choice completes the text so that it conforms to the conventions of Standard English?

- A) involved:
- B) involved,
- C) involved
- D) involved;

27

Famous for its four-degree tilt, the leaning Garisenda Tower is a popular attraction in Bologna's city center. However, measurements taken in 2023 showed that the tower was rotating in a concerning way. _____ city officials closed the area around the tower so experts could explore solutions to stabilize the historical twelfth-century structure.

Which choice completes the text with the most logical transition?

- A) Similarly,
- B) As a result,
- C) For example,
- D) In comparison,

28

In 2021, a model developed by astrophysicist Catherine Zucker and her research team revealed that the same supernovas responsible for the creation and ongoing expansion of the Local Bubble—a 14-million-year-old cavity in the Milky Way—are likely responsible for the formation of new stars.

_____ this model detailed how the bubble's expansion trapped interstellar clouds of gas and dust that became stars upon their eventual collapse.

Which choice completes the text with the most logical transition?

- A) Hence,
- B) However,
- C) Admittedly,
- D) Specifically,

29

Following the American Revolutionary War, North American foodways underwent a radical transformation, fueled in large part by spiking consumer demand for certain grains. The cultivation, trade, and transportation of maize and wheat, _____ reconfigured the continent's existing regional foodways into a globally oriented food system.

Which choice completes the text with the most logical transition?

- A) in particular,
- B) alternatively,
- C) by comparison,
- D) second of all,

30

When, in 2017, Cambridge University students Lucy Moss and Toby Marlow decided they wanted to develop a musical together, one of their goals was for their female actor friends to have good parts to play. _____ they created the show *Six*, a retelling of the history of King Henry VIII's wives in which each of the six queens has a starring role.

Which choice completes the text with the most logical transition?

- A) In other words,
- B) In summary,
- C) For example,
- D) To that end,

31

Mountain climbing routes that incorporate metal rungs and cables are known as via ferratas, from the Italian phrase for "iron path." As climbing these routes has shifted from a mode of travel to a sporting activity, modern via ferratas are rarely designed to simply reach a summit. _____ new routes favor recreation over utility, aiming to provide a challenging climb or showcase dramatic scenery.

Which choice completes the text with the most logical transition?

- A) Additionally,
- B) On the other hand,
- C) More often,
- D) Nonetheless,

32

While researching a topic, a student has taken the following notes:

- Samuel Delany is a US writer known for his science fiction.
- Delany's science fiction novel *Babel-17* was published in 1966.
- The novel won a Nebula Award in 1967.
- The Nebula Awards are given each year to the best works of science fiction published in the US.

The student wants to indicate the title of a novel that won a Nebula Award. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) *Babel-17*, by Samuel Delany, won a Nebula Award in 1967.
- B) Samuel Delany published a science fiction novel in 1966.
- C) Samuel Delany is an award-winning US writer known for his science fiction.
- D) One of Samuel Delany's novels was among the best works of science fiction published in the US.

33

While researching a topic, a student has taken the following notes:

- Chiura Obata was a Japanese American artist who lived in California.
- *Yosemite Falls* is a notable painting by Obata.
- It uses a Japanese method of black ink painting called sumi-e.
- This painting was completed in 1930.

The student wants to indicate the year *Yosemite Falls* was completed. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) While living in California, Obata created black ink paintings.
- B) Obata, a Japanese American artist, created a notable painting.
- C) *Yosemite Falls* was completed in 1930.
- D) Obata used a Japanese painting method called sumi-e.

STOP

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

Math

27 QUESTIONS

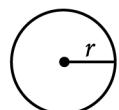
DIRECTIONS

The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

Unless otherwise indicated:

- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

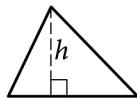
REFERENCE


$$A = \pi r^2$$

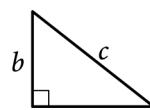
$$C = 2\pi r$$



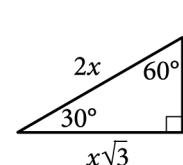
$$A = lw$$



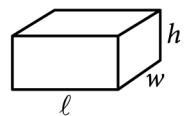
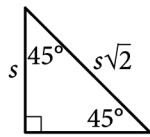
$$A = \frac{1}{2}bh$$



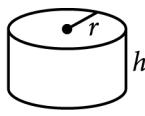
$$c^2 = a^2 + b^2$$



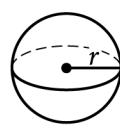
Special Right Triangles



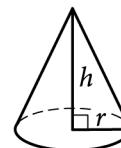
$$V = lwh$$



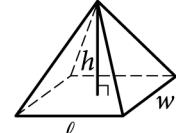
$$V = \pi r^2 h$$



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



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



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

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.

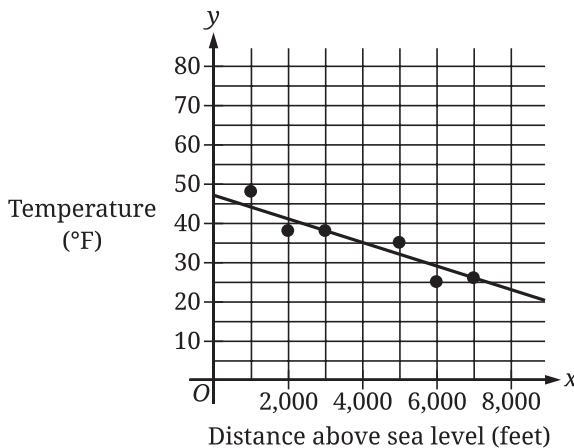
For multiple-choice questions, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled, or for questions with no answers circled.

For student-produced response questions, solve each problem and write your answer next to or under the question in the test book as described below.

- Once you've written your answer, circle it clearly. You will not receive credit for anything written outside the circle, or for any questions with more than one circled answer.
- If you find **more than one correct answer**, write and circle only one answer.
- Your answer can be up to 5 characters for a **positive** answer and up to 6 characters (including the negative sign) for a **negative** answer, but no more.
- If your answer is a **fraction** that is too long (over 5 characters for positive, 6 characters for negative), write the decimal equivalent.
- If your answer is a **decimal** that is too long (over 5 characters for positive, 6 characters for negative), truncate it or round at the fourth digit.
- If your answer is a **mixed number** (such as $3\frac{1}{2}$), write it as an improper fraction ($\frac{7}{2}$) or its decimal equivalent (3.5).
- Don't include **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

1

The scatterplot shows the temperature, in degrees Fahrenheit ($^{\circ}\text{F}$), and the distance above sea level, in feet, measured at 6 locations on Mount Jefferson. A line of best fit is also shown.



At a distance of 4,000 feet above sea level, what is the temperature, in $^{\circ}\text{F}$, predicted by the line of best fit?

- A) 47
- B) 35
- C) 25
- D) 0

2

Rectangle P has an area of 72 square inches. If a rectangle with an area of 20 square inches is removed from rectangle P, what is the area, in square inches, of the resulting figure?

- A) 92
- B) 84
- C) 80
- D) 52

3

$$|p| + 61 = 65$$

Which value is a solution to the given equation?

- A) $\frac{65}{61}$
- B) 4
- C) 126
- D) 130

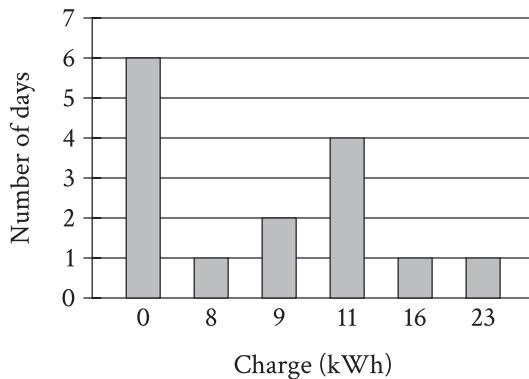
4

Lorenzo purchased a box of cereal and some strawberries at the grocery store. Lorenzo paid \$2 for the box of cereal and \$1.90 per pound for the strawberries. If Lorenzo paid a total of \$9.60 for the box of cereal and the strawberries, which of the following equations can be used to find p , the number of pounds of strawberries Lorenzo purchased? (Assume there is no sales tax.)

- A) $1.90p + 2 = 9.60$
- B) $1.90p - 2 = 9.60$
- C) $1.90 + 2p = 9.60$
- D) $1.90 - 2p = 9.60$

5

The bar graph summarizes the charge, in kilowatt-hours (kWh), a battery received each day for 15 days.



For how many of these 15 days did the battery receive a charge of 0 kWh?

- A) 0
- B) 1
- C) 4
- D) 6

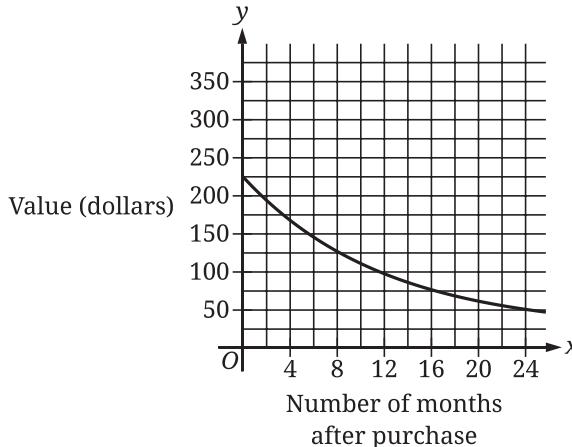
6

A line in the xy -plane has a slope of 9 and passes through the point $(0, -5)$. The equation $y = px + r$ defines the line, where p and r are constants. What is the value of p ?

7

What is an x -coordinate of an x -intercept of the graph of $y = 3(x - 14)(x + 5)(x + 4)$ in the xy -plane?

8



The graph shown gives the estimated value, in dollars, of a tablet as a function of the number of months since it was purchased. What is the best interpretation of the y -intercept of the graph in this context?

- A) The estimated value of the tablet was \$225 when it was purchased.
- B) The estimated value of the tablet 24 months after it was purchased was \$225.
- C) The estimated value of the tablet had decreased by \$225 in the 24 months after it was purchased.
- D) The estimated value of the tablet decreased by approximately 2.25% each year after it was purchased.

9

Triangles EFG and JKL are congruent, where E , F , and G correspond to J , K , and L , respectively. The measure of angle E is 45° and the measure of angle F is 20° . What is the measure of angle J ?

- A) 20°
- B) 45°
- C) 135°
- D) 160°

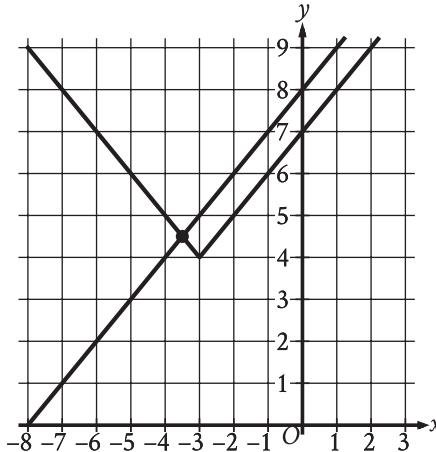
10

The function f is defined by $f(x) = \frac{1}{2}(x + 6)$. What

is the value of $f(4)$?

- A) 20
- B) 12
- C) 10
- D) 5

11



The graph of a system of an absolute value function and a linear function is shown. What is the solution (x, y) to this system of two equations?

- A) $(0, 8)$
- B) $\left(\frac{7}{2}, \frac{9}{2}\right)$
- C) $\left(-\frac{7}{2}, \frac{9}{2}\right)$
- D) $(-3, 4)$

12

$$y = 6x + 3$$

One of the two equations in a system of linear equations is given. The system has infinitely many solutions. Which equation could be the second equation in this system?

- A) $y = 2(6x) + 3$
- B) $y = 2(6x + 3)$
- C) $2(y) = 2(6x) + 3$
- D) $2(y) = 2(6x + 3)$

13

If $\frac{6}{7}p + 18 = 54$, what is the value of $7p$?

14

$$\begin{aligned}y &= 9x + 12 \\x + 7y &= 20\end{aligned}$$

The solution to the given system of equations is (x, y) . What is the value of y ?

15

A circle in the xy -plane has the equation $(x - 13)^2 + (y - k)^2 = 64$. Which of the following gives the center of the circle and its radius?

- A) The center is at $(13, k)$ and the radius is 8.
- B) The center is at $(k, 13)$ and the radius is 8.
- C) The center is at $(k, 13)$ and the radius is 64.
- D) The center is at $(13, k)$ and the radius is 64.

16

The function f is defined by $f(x) = |x - 4x|$. What value of a satisfies $f(5) - f(a) = -15$?

- A) -20
- B) 5
- C) 10
- D) 45

17

For the exponential function f , the value of $f(0)$ is c , where c is a constant. Of the following equations that define the function f , which equation shows the value of c as the coefficient or the base?

- A) $f(x) = 22(1.5)^{x+1}$
- B) $f(x) = 33(1.5)^x$
- C) $f(x) = 49.5(1.5)^{x-1}$
- D) $f(x) = 74.25(1.5)^{x-2}$

18

The function $f(t) = 40,000(2)^{\frac{t}{790}}$ gives the number of bacteria in a population t minutes after an initial observation. How much time, in minutes, does it take for the number of bacteria in the population to double?

- A) 2
- B) 790
- C) 1,580
- D) 40,000

19

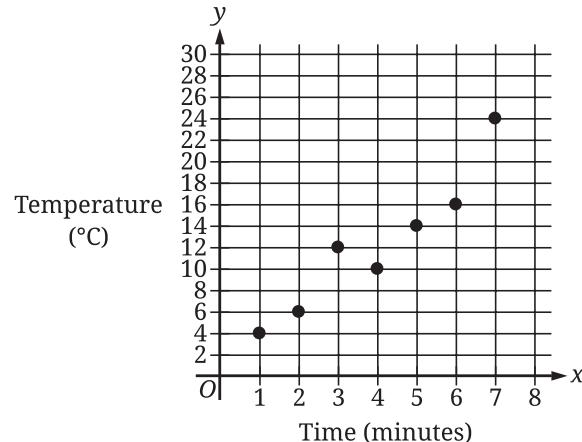
$$\frac{12}{n} - \frac{2}{t} = -\frac{2}{w}$$

The given equation relates the variables n , t , and w , where $n > 0$, $t > 0$, and $w > t$. Which expression is equivalent to n ?

- A) $12tw$
- B) $6(t-w)$
- C) $\frac{w-t}{6tw}$
- D) $\frac{6tw}{w-t}$

20

During a study, the temperature, in degrees Celsius ($^{\circ}\text{C}$), of the air in a chamber was recorded to the nearest integer at certain times. The scatterplot shows the recorded temperature y , in $^{\circ}\text{C}$, of the air in the chamber x minutes after the start of the study.



What was the average rate of change, in $^{\circ}\text{C}$ per minute, of the recorded temperature of the air in the chamber from $x = 5$ to $x = 7$?

21

In August, a car dealer completed 15 more than 3 times the number of sales the car dealer completed in September. In August and September, the car dealer completed 363 sales. How many sales did the car dealer complete in September?

22

Points Q and R lie on a circle with center P . The radius of this circle is 9 inches. Triangle PQR has a perimeter of 31 inches. What is the length, in inches, of \overline{QR} ?

- A) $13\sqrt{2}$
- B) 13
- C) $9\sqrt{2}$
- D) 9

23

In a set of four consecutive odd integers, where the integers are ordered from least to greatest, the first integer is represented by x . The product of 12 and the fourth odd integer is at most 26 less than the sum of the first and third odd integers. Which inequality represents this situation?

- A) $12(x + 6) \leq x + (x + 4) - 26$
- B) $12(x + 6) \geq 26 - (x + (x + 4))$
- C) $12(x + 4) \leq x + (x + 3) - 26$
- D) $12(x + 4) \geq 26 - (x + (x + 3))$

24

x	y
$-2s$	24
$-s$	21
s	15

The table shows three values of x and their corresponding values of y , where s is a constant. There is a linear relationship between x and y . Which of the following equations represents this relationship?

- A) $sx + 3y = 18s$
- B) $3x + sy = 18s$
- C) $3x + sy = 18$
- D) $sx + 3y = 18$

25

Which of the following expressions is equivalent to $(\sin 24^\circ)(\cos 66^\circ) + (\cos 24^\circ)(\sin 66^\circ)$?

- A) $2(\cos 66^\circ)(\sin 24^\circ)$
- B) $2(\cos 66^\circ) + 2(\cos 24^\circ)$
- C) $(\cos 66^\circ)^2 + (\cos 24^\circ)^2$
- D) $(\cos 66^\circ)^2 + (\sin 24^\circ)^2$

26

The cost of renting a carpet cleaner is \$52 for the first day and \$26 for each additional day. Which of the following functions gives the cost $C(d)$, in dollars, of renting the carpet cleaner for d days, where d is a positive integer?

- A) $C(d) = 26d + 26$
- B) $C(d) = 26d + 52$
- C) $C(d) = 52d - 26$
- D) $C(d) = 52d + 78$

27

$$f(x) = (x - 2)(x + 15)$$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

STOP

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

Do not turn to any other module in the test.

Math

27 QUESTIONS

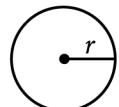
DIRECTIONS

The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

Unless otherwise indicated:

- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

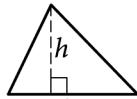
REFERENCE


$$A = \pi r^2$$

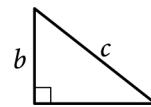
$$C = 2\pi r$$



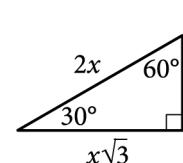
$$A = lw$$



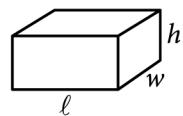
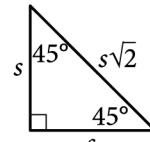
$$A = \frac{1}{2}bh$$



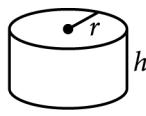
$$c^2 = a^2 + b^2$$



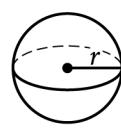
Special Right Triangles



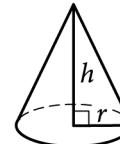
$$V = lwh$$



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



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



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



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

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.

For multiple-choice questions, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled, or for questions with no answers circled.

For student-produced response questions, solve each problem and write your answer next to or under the question in the test book as described below.

- Once you've written your answer, circle it clearly. You will not receive credit for anything written outside the circle, or for any questions with more than one circled answer.
- If you find **more than one correct answer**, write and circle only one answer.
- Your answer can be up to 5 characters for a **positive** answer and up to 6 characters (including the negative sign) for a **negative** answer, but no more.
- If your answer is a **fraction** that is too long (over 5 characters for positive, 6 characters for negative), write the decimal equivalent.
- If your answer is a **decimal** that is too long (over 5 characters for positive, 6 characters for negative), truncate it or round at the fourth digit.
- If your answer is a **mixed number** (such as $3\frac{1}{2}$), write it as an improper fraction (7/2) or its decimal equivalent (3.5).
- Don't include **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

1

A total of 165 people contributed to a charity event as either a donor or a volunteer. 130 people contributed as a donor. How many people contributed as a volunteer?

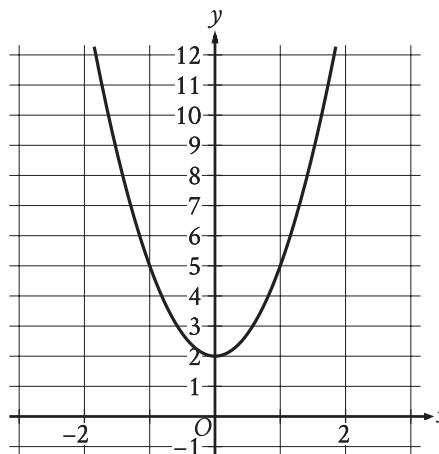
- A) 35
- B) 130
- C) 165
- D) 330

2

There are 250 trees in a park. Of these trees, 6% are birch trees. How many birch trees are in the park?

- A) 6
- B) 15
- C) 75
- D) 244

3



The graph of the quadratic function $y = f(x)$ is shown. What is the vertex of the graph?

- A) $(0, -2)$
- B) $(0, -3)$
- C) $(0, 2)$
- D) $(0, 3)$

4

The number of raccoons in a 131-square-mile area is estimated to be 2,358. What is the estimated population density, in raccoons per square mile, of this area?

- A) 18
- B) 131
- C) 149
- D) 2,376

5

$$-11, -9, 26$$

A data set of three numbers is shown. If a number from this data set is selected at random, what is the probability of selecting a positive number?

A) 0

B) $\frac{1}{3}$

C) $\frac{2}{3}$

D) 1

6

$$f(x) = 45x + 600$$

The function f gives the monthly fee $f(x)$, in dollars, a facility charges to keep x crates in storage. What is the monthly fee, in dollars, the facility charges to keep 50 crates in storage?

7

$$\text{The function } f \text{ is defined by } f(x) = 5\left(\frac{1}{4} - x\right)^2 + \frac{11}{4}.$$

What is the value of $f\left(\frac{1}{4}\right)$?

8

If $8x = 6$, what is the value of $72x$?

A) 3

B) 15

C) 54

D) 57

9

Which expression is equivalent to $23x^3 + 2x^2 + 9x$?

A) $23x(x^2 + 2x + 9)$

B) $9x(23x^3 + 2x^2 + 1)$

C) $x(23x^2 + 2x + 9)$

D) $34(x^3 + x^2 + x)$

10

Which expression is equivalent to $(9x^3 + 5x + 7) + (6x^3 + 5x^2 - 5)$?

A) $15x^6 + 5x^2 - 5x - 35$

B) $15x^3 + 10x^2 + 2$

C) $15x^6 + 5x^2 + 5x + 2$

D) $15x^3 + 5x^2 + 5x + 2$

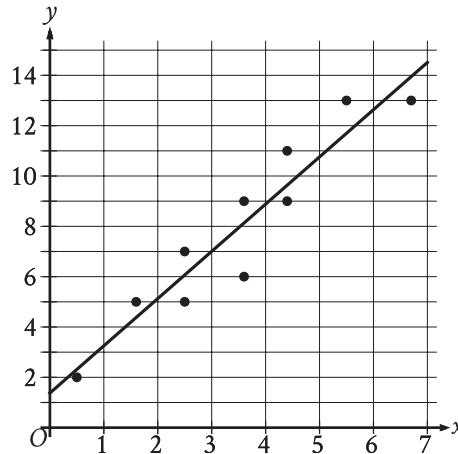
11

At a state fair, attendees can win tokens that are worth a different number of points depending on the shape. One attendee won S square tokens and C circle tokens worth a total of 1,120 points. The equation $80S + 90C = 1,120$ represents this situation. How many more points is a circle token worth than a square token?

- A) 950
- B) 90
- C) 80
- D) 10

12

In the given scatterplot, a line of best fit for the data is shown.



Which of the following is closest to the slope of the line of best fit shown?

- A) 0
- B) $\frac{1}{2}$
- C) 1
- D) 2

13

A circle has a radius of 2.1 inches. The area of the circle is $b\pi$ square inches, where b is a constant. What is the value of b ?

14

In triangle XYZ , angle Y is a right angle, point P lies on \overline{XZ} , and point Q lies on \overline{YZ} such that \overline{PQ} is parallel to \overline{XY} . If the measure of angle XZY is 63° , what is the measure, in degrees, of angle XPQ ?

15

An investment account was opened with an initial value of \$890. The value of the account doubled every 10 years. Which equation represents the value of the account $M(t)$, in dollars, t years after the account was opened?

A) $M(t) = 890\left(\frac{1}{2}\right)^{\frac{t}{10}}$

B) $M(t) = 890\left(\frac{1}{10}\right)^{\frac{t}{2}}$

C) $M(t) = 890(2)^{\frac{t}{10}}$

D) $M(t) = 890(10)^{\frac{t}{2}}$

16

$$y < x$$

$$x < 22$$

For which of the following tables are all the values of x and their corresponding values of y solutions to the given system of inequalities?

A)

x	y
19	18
20	19
21	20

B)

x	y
19	20
20	21
21	22

C)

x	y
23	22
24	23
25	24

D)

x	y
23	24
24	25
25	26

17

Which expression is equivalent to $\frac{h^{15}q^7}{h^5q^{21}}$,

where $h > 0$ and $q > 0$?

A) $\frac{h^{10}}{q^{14}}$

B) $\frac{h^3}{q^3}$

C) $h^{10}q^{14}$

D) h^3q^3

19

$$h(t) = -16t^2 + b$$

The function h estimates an object's height, in feet, above the ground t seconds after the object is dropped, where b is a constant. The function estimates that the object is 3,364 feet above the ground when it is dropped at $t = 0$. Approximately how many seconds after being dropped does the function estimate the object will hit the ground?

A) 7.25

B) 14.50

C) 105.13

D) 210.25

18

$$3y = 4x + 17$$

$$-3y = 9x - 23$$

The solution to the given system of equations is (x, y) . What is the value of $39x$?

A) -18

B) -6

C) 6

D) 18

20

$$2x^2 - 8x - 7 = 0$$

One solution to the given equation can be written as

$\frac{8 - \sqrt{k}}{4}$, where k is a constant. What is the value

of k ?

22

x	$f(x)$
-4	0
$-\frac{19}{5}$	1
$-\frac{18}{5}$	2

For the linear function f , the table shows three values of x and their corresponding values of $f(x)$. If $h(x) = f(x) - 13$, which equation defines h ?

- A) $h(x) = 5x - 4$
- B) $h(x) = 5x + 7$
- C) $h(x) = 5x + 9$
- D) $h(x) = 5x + 20$

23

The linear function g is defined by $g(x) = b - 15x$, where b is a constant. If $g(c + 7) = \frac{c}{4}$, where c is a constant, which of the following expressions represents the value of b ?

- A) $\frac{15c}{4}$
- B) $\frac{19c}{4} + 7$
- C) $\frac{61c}{4} + 105$
- D) $15c + 105$

24

In triangle XYZ , angle Z is a right angle and the length of \overline{YZ} is 24 units. If $\tan X = \frac{12}{35}$, what is the perimeter, in units, of triangle XYZ ?

- A) 188
- B) 168
- C) 84
- D) 71

25

$$x^2 + 14x + y^2 = 6y + 109$$

In the xy -plane, the graph of the given equation is a circle. What is the length of the circle's radius?

- A) $\sqrt{109}$
- B) $\sqrt{149}$
- C) $\sqrt{167}$
- D) $\sqrt{341}$

26

The speed of a vehicle is increasing at a rate of 7.3 meters per second squared. What is this rate, in **miles per minute squared**, rounded to the nearest tenth? (Use 1 mile = 1,609 meters.)

- A) 0.3
- B) 16.3
- C) 195.8
- D) 220.4

27

$$\begin{aligned}y &= -2.5 \\y &= x^2 + 8x + k\end{aligned}$$

In the given system of equations, k is a positive integer constant. The system has no real solutions. What is the least possible value of k ?

STOP

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

The SAT®

Practice

Test #7



ANSWER EXPLANATIONS

These answer explanations are for students taking the digital SAT in nondigital format.



Reading and Writing

Module 1

(33 questions)

QUESTION 1

Choice A is the best answer because it most logically completes the text's discussion of a prediction about a kilonova. In this context, a "theory" is an explanation that is considered scientifically acceptable. The text states that astronomers predicted in the 1990s that a collision between a black hole and a neutron star or between two neutron stars could release a massive gamma ray burst called a kilonova, explaining that they determined this possibility based on their extensive work with existing data and simulations ("calculations and models"). In other words, the prediction was a theory—a well-supported explanation—that, as the text indicates, was later confirmed with observations in 2017.

Choice B is incorrect because the text indicates that it is the prediction made by astronomers in the 1990s that was confirmed in 2017, and a prediction of an event isn't "evidence," or proof, of that event's existence, even when the prediction is based on extensive study. Further, there would be no need for later confirmation of something that was already recognized as evidence. *Choice C* is incorrect because in this context, a "constant" is a situation or factor that doesn't change. The text indicates that it is the prediction made by astronomers in the 1990s that was confirmed in 2017, and there is no reason to describe the prediction as a constant because the text doesn't suggest that the prediction was completely unchanged over time—it addresses only the making of the prediction and its later confirmation. *Choice D* is incorrect because the text indicates that it is the prediction made by astronomers in the 1990s that was confirmed in 2017; although a prediction might be informed by an "experiment," or a controlled test, a prediction is an idea rather than a test.

QUESTION 2

Choice D is the best answer because as used in the text, “clear” most nearly means transparent, or see-through. Muir states that the water beneath the boat “was so clear that it was almost invisible,” suggesting that those on the boat were able to see through the water and easily observe plants and fish below the surface.

Choice A is incorrect. In some contexts “clear” can mean “simple,” or uncomplicated, but Muir is describing the water, and water isn’t typically described as either simple or complicated. Muir emphasizes the water’s transparency, not its simplicity. *Choice B* is incorrect. In some contexts “clear” can mean “understandable,” or reasonable or easily comprehended, but Muir is describing the water, and it doesn’t make much sense to describe water as understandable. Muir emphasizes the water’s transparency, not how easily the water can be understood. *Choice C* is incorrect. Although “clear” can mean “obvious,” or easily seen or understood, in some contexts, Muir’s description emphasizes that the water “was almost invisible” and that the boat seemed to be “sustained in the air,” suggesting that the water was almost impossible to see, not that it was obvious.

QUESTION 3

Choice B is the best answer because it most logically completes the text’s discussion of how Maggie Lena Walker addressed the lack of financial services available to Black residents in Richmond, Virginia, at the turn of the twentieth century. In this context, “rectify” means to correct or remedy something undesirable. The text indicates that by chartering the St. Luke Penny Savings Bank in 1903, Walker took action to provide local Black residents with greater access to financial services like home loans and savings opportunities. This context supports the idea that she aimed to rectify the undesirable situation affecting these residents.

Choice A is incorrect because in this context, “prolong” would mean to lengthen something in time. The text indicates that at the turn of the twentieth century, Black residents in Richmond, Virginia, were faced with a lack of formal banking options. The text then states that Walker founded a new bank that provided these residents with financial services. Therefore, instead of prolonging the situation, she took steps to rectify, or correct, it. *Choice C* is incorrect because in this context, “retain” would mean to continue to have or to keep something. According to the text, at the turn of the twentieth century, Black residents in Richmond, Virginia, had few formal banking options, and Walker chartered a new institution to provide these residents with expanded financial services; therefore, she took steps to rectify, not retain, the situation. *Choice D* is incorrect because in this context, “highlight” would mean to emphasize or call attention to something, but the text indicates that Walker took concrete steps beyond merely drawing attention to the situation Black residents were facing in Richmond, Virginia, at the turn of the twentieth century. According to the text, Walker worked to rectify, or correct, the lack of formal banking options that were available to these residents by establishing a bank that provided them with home loans and savings opportunities.

QUESTION 4

Choice B is the best answer because it most logically completes the text's discussion of a relationship between the results of randomized clinical tests of how effective common medical interventions are and the conclusions practitioners reach about such interventions in real-world settings. In this context, "corroborate" means confirm or support with evidence. The text indicates that one possible explanation for the relationship being discussed is that practitioners may overlook confounding variables—that is, additional factors other than the medical interventions being investigated that affect the observed outcomes. This means that practitioners may assume that an outcome is the direct result of a medical intervention when it is actually the result of a combination of factors. Clinical trials take steps to rule out factors other than the one being studied, so if those extra factors are actually having an effect on real-world outcomes, the trials are likely to produce conclusions different from those practitioners reach in their real-world observations. In other words, clinical trials may fail to corroborate practitioners' conclusions.

Choice A is incorrect because it wouldn't make sense to say that the results of clinical trials could "circumvent," or find a way around or bypass, conclusions practitioners reach in real-world scenarios with patients; it's possible that researchers conducting the trials might avoid engaging with practitioners' conclusions, but findings from a study can't choose to get around something. **Choice C** is incorrect because it wouldn't make sense to say that the results of clinical trials could "disseminate," or spread widely, conclusions practitioners reach in real-world scenarios with patients; the researchers conducting the trials might choose to draw attention to practitioners' conclusions, but findings from a study can't spread anything. **Choice D** is incorrect because it wouldn't make sense to say that the results of clinical trials could "implement," or put into effect, conclusions practitioners reach in real-world scenarios with patients; the researchers conducting the trials might consider practitioners' conclusions, but findings from a study can't put anything into effect.

QUESTION 5

Choice A is the best answer because it most logically completes the text's discussion of diadromous fish. In this context, "demarcated from" means separate or set apart from. The text indicates that diadromous fish differ from euryhaline fish in that diadromous fish "migrate between freshwater and marine biomes during their life," whereas euryhaline fish do not relocate to a different biome because they can tolerate higher salinity environments. Therefore, this context suggests that because of differences between their migration patterns, diadromous fish are distinct and can be demarcated from euryhaline fish.

Choice B is incorrect. Although the text states that diadromous fish migrate and relocate, the text does not suggest that diadromous fish would be "reconstituted as," or formed again as, anything new. Only their environments change and not the fish themselves. **Choice C** is incorrect because the text does not suggest that diadromous fish can be "conflated with," or combined with, euryhaline fish. Instead, the text distinguishes the two types of fish by pointing out their

differences with regard to migration and tolerance for salinity. *Choice D* is incorrect because the text indicates that based on migration habits and tolerance for salinity, diadromous fish are different from euryhaline fish; so it would not make logical sense to say that diadromous fish would be “derived from,” or be an extension of or result from, euryhaline fish.

QUESTION 6

Choice A is the best answer because it most accurately describes how the underlined portion functions in the text as a whole. The first two sentences of the text establish that in California, houses were heated by building fires year-round. The underlined portion then indicates that the fires didn’t merely provide physical warmth: they also represented being “home” and feeling protected. The underlined portion thus illustrates that a fire provides comfort beyond physical warmth.

Choice B is incorrect because the underlined portion doesn’t summarize information that came before it. Whereas the previous two sentences describe fires’ ability to provide physical warmth to homes, the underlined portion focuses on the psychological comfort the fires offered. *Choice C* is incorrect. Although the text’s second sentence mentions that fires were built in the summer because fog came in, which may have cooled the house, this detail isn’t the focus of the underlined portion. Instead, the underlined portion indicates that fires were built for reasons beyond physical warmth: to create a sense of being home and safe. *Choice D* is incorrect because the underlined portion focuses on the emotional significance the author places on having a fire going inside the home. There is no indication that the author feels equally comfortable without a fire present.

QUESTION 7

Choice A is the best answer because it most accurately describes how the underlined phrase functions in the text as a whole. The text states that the wax produced by Liu and colleagues’ reactor can be turned into a surfactant. The underlined phrase, which is set off with parentheses, then provides a definition for the term “surfactant,” explaining that it’s a chemical compound that can be used as a detergent. Thus, the underlined portion of the text functions to clarify the meaning of a scientific term.

Choice B is incorrect. Though the text as a whole focuses broadly on an environmental concern, the underlined phrase does not; it simply indicates what a surfactant is. *Choice C* is incorrect. Though the text as a whole focuses on a scientific discovery (Liu and colleagues’ solution to the problem of plastic recycling), the underlined phrase does not explain its significance; it simply defines a scientific term used in the discussion. *Choice D* is incorrect. Though the text as a whole includes discussion of the result found by Liu and colleagues, the underlined phrase does not discuss it; it simply defines a scientific term used in the discussion. Additionally, at no point in the text is it mentioned that the team was confused.

QUESTION 8

Choice C is the best answer because it best describes the function of the underlined portion in the text as a whole. In the text, the speaker mentions the occurrence in nature of seedpods being shaken by a slight wind. The speaker then goes on to compare the black seeds to thoughts, using language that indicates that the speaker's state of mind is unsettled (e.g., "my thoughts are spent"; "My thoughts tear me, I dread their fever"). The text concludes with a comparison between the speaker's "scattered" state of mind and the "hot shrivelled seeds." Thus, the underlined portion of the text presents an observation of an occurrence in the natural world that the speaker then expands on to convey a sense of a turbulent interior state.

Choice A is incorrect because the text does not indicate that the seedpods are the cause of the speaker's state of mind; thus, they could not be responsible for any misgivings the speaker has. *Choice B* is incorrect because the text does not contrast the natural landscape with the speaker's state of mind or describe the wind shaking the seedpods as consistent; rather, the text suggests that the state of the natural world and the speaker's state of mind are similar in that both are unsettled. *Choice D* is incorrect because there is no indication in the text that the speaker regularly engages in critical self-evaluation, only that in this particular instance the speaker's state of mind is turbulent.

QUESTION 9

Choice A is the best answer because it most accurately describes how the underlined portion functions in the text as a whole. The first sentence of the text introduces literary scholar Jeremy Douglass's warning to technology investors and enthusiasts against predicting the displacement of conventional books by newer media forms. The next sentence, which is underlined in part, presents Douglass's observation that interactive texts are hardly new; they have been available for longer than technologists assume, beginning with the first time readers wrote notes in texts' margins. Thus, the function of the underlined portion is to challenge the stance of the technology investors and enthusiasts mentioned earlier in the text. As the remainder of the text points out, newer media doesn't necessarily replace older media, but rather, as Douglass believes, leads to new forms of expression.

Choice B is incorrect because the underlined portion challenges the position taken by investors and enthusiasts; it doesn't provide context for their claims. *Choice C* is incorrect because the underlined portion doesn't mention academics or compare them to investors regarding their ability to see potential in using contemporary interactive texts; instead, the underlined portion challenges the position of investors and enthusiasts who predict that conventional books will be replaced by newer forms of media. *Choice D* is incorrect because the underlined portion doesn't address technological challenges; instead, it disputes the stance taken by investors and enthusiasts, suggesting that conventional books haven't been displaced by traditional interactions with texts, such as writing in the margins, and won't be supplanted by newer forms of media either.

QUESTION 10

Choice A is the best answer because it most logically completes the text's discussion of the *M. robustus* population at the Octopus Garden. The text states that the scientists concluded that the site is likely used only for reproduction because over three years they saw many adults, freshly hatched octopuses, and eggs but didn't see any juveniles. This suggests that the *M. robustus* octopuses that hatch at the Octopus Garden leave the site when they reach an intermediary state of development, returning only as adults for reproductive purposes.

Choice B is incorrect because the text never discusses the stability of the *M. robustus* population at the site, only that the scientists observed 6,000 adults, hatchlings, and eggs there. Further, the text presents the site's temperatures as likely beneficial. **Choice C** is incorrect because the text doesn't provide any details about the eggs at the site and makes no mention of nests; it indicates only that eggs are present along with hatchlings and adults. **Choice D** is incorrect because the text makes no mention of the hatchlings feeding at the Octopus Garden, indicating only that the temperatures at the site are probably beneficial and that the site is likely used for reproduction.

QUESTION 11

Choice D is the best answer because it presents a statement about Hans Castorp's story that is suggested by the text. The narrator of the text indicates that the story about Hans Castorp will be told not because there is something particularly notable about him, since he is pleasant but "perfectly ordinary," but because the story itself is remarkable ("very much worth telling"). The narrator then notes that there is a benefit in being at the heart of the story—that it is "in Hans Castorp's favor" that the story is his, and maybe uniquely so ("not every story happens to everybody"). Thus, the text suggests both that the story that will be told is a remarkable one that happened to an unremarkable person and that it is reasonable to argue that the person at the center of a valuable story takes on some of the story's value.

Choice A is incorrect. Although the narrator of the text makes the point that "not every story happens to everybody," the narrator doesn't state that stories are interesting simply because the people they are about are unique. Rather, the narrator suggests that one particular story is "very much worth telling" on its own and that Hans Castorp benefits from the fact that the story is remarkable and may be unique to him. Further, the narrator never suggests that the story will be hard to understand even though it is old. **Choice B** is incorrect. Although the narrator of the text suggests that Hans Castorp is of no particular importance, since he is a "perfectly ordinary" person, the narrator never reveals what makes the story of Castorp important, just that "the story itself" is "very much worth telling." The narrator states that the story "took place long ago," is "covered with the patina of history," and can be told only "with verbs whose tense is that of the deepest past," but the story's age and the way it must be told aren't presented as reasons the story is important; the narrator is simply providing details about how the story will be told. **Choice C** is incorrect because the narrator of the text doesn't suggest that all stories about people who are "perfectly ordinary" (like Hans Castorp) must

be told in particular ways to make it clear why those stories are consequential. Further, the narrator suggests that Hans Castorp's story must be told "with verbs whose tense is that of the deepest past" because it took place so long ago, not because telling it that way will convey the story's importance.

QUESTION 12

Choice D is the best answer because it states the percentage of participants who mentioned costs in the interviews conducted by Judith Hilton and her team. The text states that Hilton and her team interviewed participants about factors that would encourage them to switch from single-use plastic containers to reusable containers. The graph presents three factors mentioned in the interviews (convenience, costs, and established behaviors) and the percentage of participants who mentioned each one. The graph shows that about 50% of participants mentioned costs as a factor.

Choice A is incorrect because the graph shows that about 50% of participants, not 10%, mentioned costs as a factor. *Choice B* is incorrect because the graph shows that about 50% of participants, not 95%, mentioned costs as a factor.

Choice C is incorrect because the graph shows that about 50% of participants, not 25%, mentioned costs as a factor.

QUESTION 13

Choice A is the best answer because it presents the quotation that best supports the student's claim that in *The Politics*, Aristotle gives advice on preserving constitutions—preventing governments from falling and maintaining order—and specifically asserts that in a healthy state, laws must be followed as strictly as possible and infractions should not be overlooked even if they are minor. The philosopher states that when Aristotle builds his argument about the characteristics of a well-functioning government, Aristotle asserts that transgression, or violation of law, will ruin the state if it "creeps in unperceived," or goes unnoticed. The philosopher then adds that Aristotle illustrates this point by comparing the situation to one in which small but frequent expenses diminish a fortune almost unnoticeably until, eventually, the fortune is entirely gone. In other words, the philosopher indicates that Aristotle makes the point that total obedience to law preserves a healthy state while even small violations, if ignored, will undermine the health of the state.

Choice B is incorrect because the philosopher addresses Aristotle's observation about corruption within the government (in particular, preventing the possibility that members of the government can take bribes), and although corruption can involve infractions, the observation is about a subset of people within the state and isn't directly connected to the importance of upholding total obedience to the law throughout the state. *Choice C* is incorrect because the philosopher discusses Aristotle's point about those who would intentionally destroy a constitution altogether and the need for rulers to remind the populace that it would be dangerous for a constitution to collapse, but neither idea is directly connected to the importance of upholding total obedience to the law. *Choice D* is incorrect because the philosopher explains that Aristotle makes the point that

oligarchic leaders may retain power by having members of disenfranchised classes participate in government alongside governing classes, and this point doesn't address the importance of ensuring obedience to the law and addressing even minor violations.

QUESTION 14

Choice B is the best answer because it presents a finding that, if true, would most directly support the researchers' conclusion that an observable pattern in time references in novels reflects a shift in human behavior prompted by the spread of electric lighting in the late nineteenth century. If novels published after 1880 contain significantly more references to activities occurring after 10 p.m. than novels from earlier periods do, this would suggest a change in human behavior and daily routines enabled by the availability of electric lighting. Before electric lighting—which provided illumination more easily than other available forms of light—many activities ceased after nightfall, so references to late-night activities would be less common in earlier novels. An increase in such references after 1880 would align with the researchers' conclusion, reflecting an increase in late-night activities made possible by electric lighting.

Choice A is incorrect because a decrease in references to 10 a.m. after the year 1800 would not support the researchers' conclusion involving a shift in human behavior prompted by the spread of electric lighting toward the end of the 1800s. The time of 10 a.m. is in the morning and, in most places, characterized by daylight, so a change in references to that time would not be clearly linked to the impact of electric lighting. *Choice C* is incorrect because while an increase in implied time references relative to clock phrases in nineteenth-century novels could suggest a change in writing style or conventions, it does not directly support the conclusion involving a shift in human behavior prompted by the spread of electric lighting. The text indicates that the researchers' conclusion is based on the content of the time references themselves, not the phrasing used. *Choice D* is incorrect. If references to noon and midnight are used with roughly the same frequency in all the novels analyzed by the researchers, this would reflect a lack of change in human behavior with regard to time and therefore would not support the researchers' conclusion involving a shift in human behavior that occurred in response to the spread of electric lighting.

QUESTION 15

Choice A is the best answer because it most effectively uses data from the graph to complete the statement about Mahtta et al.'s proposal regarding factors that affect urban land expansion (ULE). According to the text, ULE is influenced by urban population growth and by gross domestic product (GDP) growth per capita. Reasoning that efficient national governments provide urban services and infrastructure needed to attract economic investment, Mahtta et al. suggest that, as governments become more efficient at providing urban services and infrastructure, GDP growth per capita will account for more ULE and urban population growth will account for less. But according to the graph, Region 1 saw an increase in the percentage attributed to urban population growth from 1970–2000 (between 60 and 65%) to 2000–2014 (between 70 and 75%) and a decrease

in the percentage attributed to GDP growth per capita from 1970–2000 (between 35 and 40%) to 2000–2014 (about 25%). Because the percentage attributed to GDP growth per capita decreased (the opposite of what Mahtta et al. claimed would happen if the governments had become more efficient), the data suggest that the governments of Region 1 became less efficient at providing urban services and infrastructure over that period.

Choice B is incorrect. Neither the graph nor the text gives the regions' relative levels of economic growth or what effect Mahtta et al. would expect such growth to have. Furthermore, Mahtta et al.'s proposal suggests that Region 1's decline in the percentage of ULE attributed to GDP growth per capita from 1970–2000 (between 35 and 40%) to 2000–2014 (about 25%) would suggest decreasing, not increasing, government efficiency over this time. *Choice C* is incorrect. Neither the text nor the graph provides information about the relative efficiencies of different governments in Region 2. *Choice D* is incorrect. Mahtta et al.'s proposal suggests that more efficient governments will have a higher percentage of their ULE driven by GDP growth per capita and a lower percentage driven by urban population growth. For Region 2, the percentage of ULE attributed to GDP growth per capita increased from 1970–2000 (between 10 and 15%) to 2000–2014 (between 45 and 50%), but the opposite is true for Region 1, which saw the percentage of ULE attributed to GDP growth per capita decline over the same period. Thus, whereas the data suggest governments in Region 2 became more efficient, the data for Region 1 suggest that those governments became less efficient, not more.

QUESTION 16

Choice B is the best answer because it describes data from the graph that best support the student's assertion that initial efforts at trade liberalization in China were shaped by firms having limited capital (assets available for use) and that this situation resolved during the 2000s. The text explains that an approach to trade liberalization involves engaging in processing imports, one type of which doesn't require payment to a trade partner (processing with assembly) and one type of which requires upfront payment to a trade partner for raw materials (processing with inputs). The graph, which presents China's imports for ordinary imports and both types of processing imports in the years 2000, 2003, and 2006, shows that while processing imports with assembly rose from about 250 hundred million dollars in 2000 to about 750 hundred million dollars in 2006, processing imports with inputs rose much more sharply, increasing from approximately 650 hundred million dollars in 2000 to about 2,300 hundred million dollars in 2006. Because processing with inputs requires firms to pay for materials (expending capital) and processing with assembly doesn't, the sharper rise in processing imports with inputs suggests that Chinese firms' assets—and thus their ability to engage in that type of processing imports—were relatively limited in (and before) 2000 and then substantially increased from 2000 to 2006. In other words, the data suggest that the situation of having limited capital resolved during the 2000s.

Choice A is incorrect because the graph indicates that ordinary imports were greater than both types of processing imports in 2006, not that processing imports with inputs were greater than ordinary imports and processing imports

with assembly that year. *Choice C* is incorrect because the observation that ordinary imports were greater than both types of processing imports in 2000, 2003, and 2006 doesn't address a change within any type of imports from 2000 to 2006, and an indication of a change in that period that might be related to the availability of assets is needed to support the assertion that the situation of having limited capital resolved during the 2000s. *Choice D* is incorrect because the fact that processing imports with assembly were greater at the end of the period from 2000 to 2006 than processing imports with inputs were at the start of the same period doesn't address a change within either type of imports during the period, and an indication of such a change that might be related to the availability of assets is needed to support the assertion that the situation of having limited capital resolved during the 2000s.

QUESTION 17

Choice C is the best answer because it most logically completes the text's discussion of Kristin Laidre's reasoning about the purpose of the tusk that many, but not all, narwhals have. The text explains that one group of scientists thinks the tusk may help narwhals detect the threat of freezing water and that Laidre disagrees with that idea, given the importance of avoiding a dangerous situation. It's logical to suggest that if the tusk serves such an important purpose for narwhals, the trait would be more common among them—specifically, that more narwhals would have a tusk.

Choice A is incorrect because there's no reason to think Laidre would say that if the tusk has the important function of helping narwhals detect when the water around them is about to freeze (meaning that it isn't always freezing), some narwhals would choose a different habitat altogether. Indeed, if it's true that the tusk helps narwhals avoid areas with dangerous conditions when they occur in their Arctic Ocean habitat, the tusk would likely enable the narwhals to continue living in that habitat rather than drive them elsewhere entirely. *Choice B* is incorrect because the text focuses only on narwhals and makes no mention of other marine animals or how having a tusk might affect them. And if anything, it would be more logical to expect a very important trait to be more widespread, not less common, among other similar types of animals. *Choice D* is incorrect.

Although the text describes narwhals as shy, it doesn't indicate that the scientists' conclusion has anything to do with shyness. And because shyness and detection of the threat of freezing water aren't logically connected, there's no reason to think that Laidre would expect narwhals to become less shy over time if the tusk serves that important purpose.

QUESTION 18

Choice D is the best answer because it most logically completes the text's discussion of silicon carbide (SiC) fibers and creep, or deformation related to ongoing mechanical stress and elevated temperatures. The text states that Bhatt et al. found that a nitrogen-treated SiC fiber had a lower minimum creep rate than two polymer-derived SiC fibers did. Because having a lower creep rate means that the material is slower to deform with exposure to stress, as the text explains, this finding suggests that aerospace composites made with the nitrogen-treated SiC

fiber may be able to withstand mechanical stress for a longer period than those made with the other two polymer-derived SiC fibers can.

Choice A is incorrect because it overstates the implications of the study's findings, which have to do with the rate of a material's deformation under stress, not the absolute degree of deformation. The text states that Bhatt et al. observed that a nitrogen-treated SiC fiber had a lower minimum creep rate than two polymer-derived SiC fibers did, meaning only that it deformed more slowly over time under constant stress, not that it underwent less deformation overall.

Choice B is incorrect because the text doesn't establish any similarity between the two polymer-derived SiC fibers other than that both had a higher creep rate than the nitrogen-treated SiC fiber did in Bhatt et al.'s study. Moreover, reducing a material's resistance to creep would mean that the material becomes more susceptible to deformation with exposure to stress and elevated temperatures, which would be expected to shorten rather than prolong the lifespan of machinery made with that material. *Choice C* is incorrect because the text suggests that the stability of aerospace equipment may be better improved by composites containing nitrogen-treated SiC fiber than by composites containing the two polymer-derived SiC fibers, not the other way around. The text indicates that Bhatt et al. observed that the nitrogen-treated SiC fiber had a lower minimum creep rate than the other two fibers did, meaning that it was slower to degrade under exposure to mechanical stress and elevated temperatures—suggesting that it may remain stable for longer periods.

QUESTION 19

Choice A is the best answer. The convention being tested is the use of verb forms within a sentence. The singular verb "describes" agrees in number with the singular subject "map."

Choice B is incorrect because the plural verb "describe" doesn't agree in number with the singular subject "map." *Choice C* is incorrect because the plural verb "have described" doesn't agree in number with the singular subject "map."

Choice D is incorrect because the plural verb "are describing" doesn't agree in number with the singular subject "map."

QUESTION 20

Choice D is the best answer. The convention being tested is the use of determiners in a sentence. The plural determiner "these" agrees in number with the plural noun "letters" that it modifies. This choice clearly indicates that the letters demonstrate Alcott's business sense.

Choice A is incorrect because the singular determiner "one" doesn't agree in number with the plural noun "letters." *Choice B* is incorrect because the singular determiner "that" doesn't agree in number with the plural noun "letters." *Choice C* is incorrect because the singular determiner "this" doesn't agree in number with the plural noun "letters."

QUESTION 21

Choice D is the best answer. The convention being tested is the use of verbs to express tense in a sentence. In this choice, the past tense verb “affected,” used in conjunction with the phrase “during this time,” correctly indicates that the dust storms occurred in the 1930s.

Choice A is incorrect because the present progressive tense verb “are affecting” doesn’t indicate that the dust storms occurred in the 1930s. *Choice B* is incorrect because the future perfect tense verb “will have affected” doesn’t indicate that the dust storms occurred in the 1930s. *Choice C* is incorrect because the future tense verb “will affect” doesn’t indicate that the dust storms occurred in the 1930s.

QUESTION 22

Choice C is the best answer. The convention being tested is the coordination of main clauses within a sentence. This choice correctly uses a comma and a coordinating conjunction (“but”) to join the first main clause (“Leibniz...century”) and the second main clause (“these ingenious...calculators”).

Choice A is incorrect because it results in a run-on sentence. The two main clauses are fused without punctuation and/or a conjunction. *Choice B* is incorrect because it results in a comma splice. Without a conjunction following it, a comma can’t be used in this way to join two main clauses. *Choice D* is incorrect because joining the two main clauses in this way with the subordinating conjunction “that” results in an ungrammatical and illogical sentence.

QUESTION 23

Choice C is the best answer. The convention being tested is the use of verb forms within a sentence. The nonfinite past participle “characterized” is correctly used within a supplementary element that modifies the main clause “Zhang...shanshui,” defining *qinglü shanshui* and explaining some of its identifying traits.

Choice A is incorrect because it results in a comma splice. Using the finite present perfect tense verb “has been characterized” creates a second main clause in the sentence, and the two main clauses can’t be joined in this way by only the comma before “a type.” *Choice B* is incorrect because it results in a comma splice. Using the finite future tense verb “will be characterized” creates a second main clause in the sentence, and the two main clauses can’t be joined in this way by only the comma before “a type.” *Choice D* is incorrect because it results in a comma splice. Using the finite present tense verb “is characterized” creates a second main clause in the sentence, and the two main clauses can’t be joined in this way by only the comma before “a type.”

QUESTION 24

Choice A is the best answer. The convention being tested is punctuation use between sentences. In this choice, the period is used correctly to mark the boundary between one sentence (“What...vapor”) and another (“With...point”).

Choice B is incorrect because it results in a run-on sentence. The sentences ("What...vapor" and "with...point") are fused without punctuation and/or a conjunction. *Choice C* is incorrect because it results in a comma splice. A comma can't be used in this way to mark the boundary between sentences. *Choice D* is incorrect. Without a comma preceding it, the conjunction "and" can't be used in this way to join sentences.

QUESTION 25

Choice D is the best answer. The convention being tested is subject-modifier placement. This choice makes the noun phrase "the Alaska Centennial Commission" the subject of the sentence and places it immediately after the modifying phrase "wanting...Purchase." In doing so, this choice clearly establishes that the Alaska Centennial Commission—and not another noun in the sentence—wanted to celebrate the 100th anniversary of the Alaska Purchase.

Choice A is incorrect because it results in a dangling modifier. The placement of the noun phrase "a contest" immediately after the modifying phrase illogically suggests that the contest wanted to celebrate the 100th anniversary of the Alaska Purchase. *Choice B* is incorrect because it results in a dangling modifier. The placement of the noun phrase "an award of \$300" immediately after the modifying phrase illogically suggests that the award of \$300 wanted to celebrate the 100th anniversary of the Alaska Purchase. *Choice C* is incorrect because it results in a dangling modifier. The placement of the noun phrase "\$300" immediately after the modifying phrase illogically suggests that the \$300 wanted to celebrate the 100th anniversary of the Alaska Purchase.

QUESTION 26

Choice D is the best answer. The convention being tested is the use of punctuation within a sentence. This choice correctly uses a comma to mark the boundary between the main clause ("Recently...supposed") and the supplementary element ("a finding...Paleolithic") that provides additional information about the implications of the Neronian tool discovery.

Choice A is incorrect because a semicolon can't be used in this way to join the main clause ("Recently...supposed") and the supplementary element ("a finding...Paleolithic"). *Choice B* is incorrect because it results in a rhetorically unacceptable sentence fragment beginning with "a finding." *Choice C* is incorrect because it results in a run-on sentence. The main clause ("Recently...supposed") and the supplementary element ("a finding...Paleolithic") are fused without punctuation and/or a conjunction.

QUESTION 27

Choice A is the best answer. "Additionally" logically signals that guard cells' role in regulating water loss is an additional function of these specialized plant cells that is separate from the function of regulating carbon dioxide intake.

Choice B is incorrect because "previously" illogically signals that the activity described in this sentence occurs earlier in a chronological sequence of events

than the regulation of carbon dioxide intake described in the previous sentence. Instead, regulating water loss is an additional function of guard cells that is separate from the function of regulating carbon dioxide intake. *Choice C* is incorrect because “in conclusion” illogically signals that the description of guard cells’ role in regulating water loss concludes or summarizes the information about guard cells provided in the previous sentences. Instead, regulating water loss is one of the two distinct functions of guard cells described in the text. *Choice D* is incorrect because “instead” illogically signals that the activity described in this sentence happens in place of the activity of regulating carbon dioxide intake described in the previous sentence. Rather, regulating water loss is an additional function of guard cells.

QUESTION 28

Choice D is the best answer. The sentence identifies the type of scientist Chaudhuri is, noting that she is a sedimentologist.

Choice A is incorrect. The sentence provides an example of a type of sedimentary rock; it doesn’t identify what type of scientist Chaudhuri is. *Choice B* is incorrect. The sentence indicates types of rock that some scientists study; it doesn’t identify what type of scientist Chaudhuri is. *Choice C* is incorrect. While the sentence states that some scientists study sedimentary rocks, it doesn’t identify Chaudhuri as this type of scientist.

QUESTION 29

Choice A is the best answer. The sentence indicates where “Raymond’s Run” takes place, stating that it takes place in Harlem.

Choice B is incorrect. The sentence identifies the book in which the story “Raymond’s Run” was published; it doesn’t indicate where the story takes place. *Choice C* is incorrect. The sentence indicates the point of view used in “Raymond’s Run”; it doesn’t indicate where the story takes place. *Choice D* is incorrect. The sentence identifies the author of “Raymond’s Run”; it doesn’t indicate where the story takes place.

QUESTION 30

Choice C is the best answer. The sentence contrasts the two styles of tiles, noting that tiles in the arista style have designs stamped into them, whereas tiles in the majolica style have designs painted directly on them.

Choice A is incorrect because the sentence indicates that the two styles of tile can be found in the same location; it doesn’t contrast the two styles of tile. *Choice B* is incorrect because the sentence indicates that the Royal Alcázar of Seville features tiles in both the majolica and arista styles; it doesn’t contrast the two styles of tile. *Choice D* is incorrect because the sentence indicates that the tilework of the Royal Alcázar of Seville includes tiles in the majolica style; it doesn’t contrast tiles in the majolica style with tiles in the arista style.

QUESTION 31

Choice B is the best answer. The sentence contrasts the two songs, noting that “Poor Miner’s Farewell” is about coal miners in Kentucky, whereas “Bring Him Back Home” is about Nelson Mandela.

Choice A is incorrect. The sentence emphasizes a similarity between “Poor Miner’s Farewell” and “Bring Him Back Home”; it doesn’t contrast the two songs.

Choice C is incorrect. While the sentence provides a description of the song “Bring Him Back Home,” it doesn’t mention “Poor Miner’s Farewell” or contrast the two songs. *Choice D* is incorrect. While the sentence provides a description of the song “Poor Miner’s Farewell,” it doesn’t mention “Bring Him Back Home” or contrast the two songs.

QUESTION 32

Choice C is the best answer. Using a quotation from Stewart, the sentence challenges Thucydides’s explanation that the rise of Athens caused the conflict, suggesting that it was instead caused by a “clash of cultures.”

Choice A is incorrect. While the sentence uses a quotation, the quotation doesn’t challenge Thucydides’s explanation of the conflict. *Choice B* is incorrect. While the sentence mentions that Stewart challenged Thucydides’s explanation of the conflict, it doesn’t use a quotation to challenge Thucydides’s explanation: the quoted word “inevitable” is from Thucydides. *Choice D* is incorrect. While the sentence appears to refute Thucydides’s explanation, it does so in a way that misrepresents the information in the notes; Allison’s Thucydides trap theory is based on Thucydides’s explanation of the conflict. Thus, Allison’s theory affirms, rather than challenges, Thucydides’s explanation.

QUESTION 33

Choice D is the best answer. The sentence presents an overview of the study’s findings, noting that, for some of the languages (the examples of Spanish and Vietnamese are given in the notes), the number of syllables spoken per second varied, while the amount of information conveyed per second remained roughly constant across all 17 languages.

Choice A is incorrect. While the sentence describes one of the metrics the study assessed, it doesn’t present any of the study’s findings. *Choice B* is incorrect.

While the sentence compares specific findings about two of the languages studied, it doesn’t provide an overview of the study’s findings across all 17 languages. *Choice C* is incorrect. The sentence compares specific findings about two of the languages studied; it doesn’t provide an overview of the study’s findings across all 17 languages. It also misrepresents the information from the notes about Spanish’s information rate.

Reading and Writing

Module 2

(33 questions)

QUESTION 1

Choice C is the best answer because it most logically completes the text's discussion of *carte de visite* photos. To "popularize" a technology is to allow it to be used and appreciated widely. The text explains that unlike the photos produced by earlier forms of photographic technology, *carte de visite* photos were inexpensive and could easily be obtained by "everyday people," who enjoyed exchanging the images. Therefore, *carte de visite* photos helped popularize photography.

Choice A is incorrect because the text indicates that instead of weakening the emerging technology of photography, *carte de visite* photos allowed it to be more widely accessed and enjoyed by people. *Choice B* is incorrect. The text establishes that large numbers of people enjoyed using *carte de visite* photos, so it can be inferred that these photos caused photography to be praised, or celebrated. However, it wouldn't make sense to say that inanimate objects—in this case, photos—had praised photography; instead, *carte de visite* consumers themselves would have praised it. *Choice D* is incorrect because the text explains that rather than isolating photography, or limiting its availability, *carte de visite* technology made photography more widely accessible to people.

QUESTION 2

Choice D is the best answer because it most logically completes the text's discussion of painter Alma W. Thomas's work. In this context, "influenced" means to have had an effect on something's development. The text indicates that there is a connection between Thomas's work and the flowers and trees in her home's garden, giving the example of Thomas's brushstrokes being inspired by light shining through the leaves of a tree in front of her house. This context conveys that Thomas's work was influenced by the flowers and trees in the garden.

Choice A is incorrect because the text conveys that Thomas drew inspiration for her work from the plants in her garden, which suggests that the flowers and trees contributed positively to her work, not that they "restricted," or limited, her work.

Choice B is incorrect because it wouldn't make sense to suggest that flowers and trees in a garden could have "announced," or made known, a painter's work.

Choice C is incorrect because the text conveys that Thomas drew inspiration for her work from the plants in her garden, which suggests that the flowers and trees contributed positively to her work, not that they were a distraction. Further, it's not clear how an artist's work could itself be "distracted."

QUESTION 3

Choice C is the best answer because it most logically completes the text's discussion of the conservationists' efforts to increase Azores bullfinch's numbers. In this context, "successful" means accomplishing a goal or purpose. According to the text, conservationists planted more than 500,000 native trees in an Azores bullfinch habitat in order to boost the bird's population size. The text then indicates that the population size did indeed grow as a result of the planted trees. Thus, in this context, the conservationists' approach of planting native trees was successful because it achieved the goal of increasing the bird's population size.

Choice A is incorrect because the text gives no indication that the conservationists' approach of planting native trees to increase Azores bullfinch's numbers was "amusing," or comical or entertaining. Instead, the approach was seriously undertaken and ultimately accomplished. *Choice B* is incorrect because the text doesn't address how much it cost to achieve the goal of planting native trees to increase Azores bullfinch's numbers. The text indicates that the approach was beneficial and successful rather than "costly," or expensive or harmful.

Choice D is incorrect. According to the text, the conservationists' approach of planting native trees to increase Azores bullfinch's numbers was beneficial and successful rather than "disastrous," or damaging or unsuccessful.

QUESTION 4

Choice D is the best answer because it most logically completes the text's discussion of the duration of gamma ray burst GRB 230307A. In this context, "an oddity" is something that is odd or unusual. The text explains that the burst lasted for 200 seconds and that other bursts generated by neutron mergers have usually lasted fewer than 2 seconds. In other words, the duration of gamma ray burst GRB 230307A was unusual.

Choice A is incorrect because the text focuses on a difference between the duration of gamma ray burst GRB 230307A and the typical duration of bursts caused by neutron mergers, not "a coincidence," or a point of correspondence, between them; the text indicates that GRB 230307A lasted much longer than what is typical of other bursts. *Choice B* is incorrect. In this context, "a reprieve" would be either a temporary relief from something or a delay of a punishment, neither of which would make sense as something that the duration of a gamma ray burst could provide to the burst itself. *Choice C* is incorrect. Although it would make sense to refer to gamma ray burst GRB 230307A itself as "an incident," or a thing that occurred, the missing word describes the duration of the burst, and it doesn't make much sense to describe a length of time as an incident. Further, the sentence emphasizes that the burst's duration was very unusual, not simply that the burst occurred.

QUESTION 5

Choice B is the best answer because it most logically completes the text's discussion of Benjamin Franklin's popularity in France. In this context, "esteem" means high regard. The text indicates that Franklin was very popular, or highly regarded, in France, where he sought the country's support for the United States in its fight for independence, and indicates that his status helped him achieve his goal. The context therefore suggests that being held in high regard by the people likely helped Franklin convince France to help the United States.

Choice A is incorrect because the text directly indicates that it was Franklin's popularity that likely helped him convince France to help the United States, not his "thoughtfulness" (which in this context would mean either his careful reasoning and attention or his kind consideration of others' needs). *Choice C* is incorrect because the text doesn't suggest that there was any "controversy," or dispute, about Franklin's presence in France; instead, the text states that Franklin was very popular in France and directly indicates that this status likely helped him convince France to help the United States. *Choice D* is incorrect because the text directly indicates that it was Franklin's popularity that likely helped him convince France to help the United States, not his "sincerity," or his honesty.

QUESTION 6

Choice A is the best answer because it most accurately describes how the underlined sentence functions in the text as a whole. The first sentence of the text establishes that scientists didn't know much about the ocean floor in the 1950s. The second sentence, which is underlined, describes what many scientists thought at the time—that the ocean floor was mostly flat. The remainder of the text establishes that the ocean floor is far from flat, citing research conducted by Marie Tharp and Bruce Heezen. Thus, the purpose of the underlined sentence is to identify a scientific belief that Tharp and Heezen showed to be wrong.

Choice B is incorrect. Although Tharp and Heezen's work with sonar data in the Atlantic Ocean is mentioned later in the text, the underlined sentence doesn't describe the design of their experiment. Instead, it identifies a belief held by scientists that Tharp and Heezen demonstrated to be wrong. *Choice C* is incorrect because the underlined sentence presents a belief held by many scientists in the 1950s; nowhere does the text mention a disagreement between Tharp and Heezen, whom the text describes as research partners working together to map the ocean floor. *Choice D* is incorrect because the underlined sentence doesn't present data in support of a claim; instead, it presents a scientific belief that Tharp and Heezen's work showed to be wrong.

QUESTION 7

Choice B is the best answer because it accurately describes the function of the underlined phrase in the text as a whole. According to the text, advertisers were reluctant to support television in its early days. The underlined phrase then indicates that this reluctance was partly due to the US's involvement in World War II, which hindered television production. Thus, the underlined phrase identifies a specific reason behind some advertisers' hesitance to support television.

Choice A is incorrect. The text merely mentions that television was expected to be financed through advertising, as radio was at the time. Nothing in the text compares the origins of radio and television. *Choice C* is incorrect. The underlined phrase focuses on a reason advertisers were reluctant to support television, not measures taken to convince advertisers to support television. *Choice D* is incorrect. The underlined phrase focuses on a reason advertisers were reluctant to support television, not what types of television programming were popular.

QUESTION 8

Choice B is the best answer because it most accurately describes the function of the underlined sentence in the text as a whole. The text discusses the Bayeux Tapestry, making the point that the workers who produced the huge tapestry in the eleventh century might not have ever produced a tapestry so large before. The text goes on to suggest that because of this lack of previous experience, the workers developed and refined the process of joining the tapestry's panels over time as they worked. The last sentence of the text then provides an example of an observation that suggests the workers' process changed: clear misalignment of the borders of the two panels the workers joined first and virtually invisible joins completed later. Thus, the underlined sentence serves to support an argument about the workers who produced the tapestry.

Choice A is incorrect because the example given in the last sentence of the text has to do with how the panels of the Bayeux Tapestry were joined by the workers, not with what is depicted in those panels; the text never identifies any people or places depicted in the tapestry. *Choice C* is incorrect because the last sentence compares how early panels in the Bayeux Tapestry were joined with how later panels in the same tapestry were joined; it doesn't make any comparison between the Bayeux Tapestry and other tapestries from the same time in France. *Choice D* is incorrect because the last sentence doesn't address the location where the Bayeux Tapestry was created; the first sentence of the text presents it as a given that the tapestry was created in France, but nothing in the text indicates how that origin was determined.

QUESTION 9

Choice D is the best answer because it reflects how the author of Text 2 would most likely respond to what the researchers mentioned in Text 1 contend. Text 1 discusses the lack of knowledge of how plate tectonics on Earth began. Text 1 also mentions researchers who contend that movements of tectonic plates began around 3 billion years ago. As support for this assertion, these researchers cite computer models (which are simulations, not empirical evidence) of the temperature in Earth's mantle that show that at that time, the mantle would have been sufficiently molten for plates to move. However, the author of Text 2 asserts that empirical evidence from the geological record is necessary to make plausible claims about when tectonic movement began. Text 2 mentions an analysis performed by Wriju Chowdhury and his team of the geochemistry of zircon crystals (which would constitute empirical evidence). Chowdhury and his team argue, based on this analysis, that tectonic plates may have begun to move as early as 4.2 billion years ago. Therefore, since the author of Text 2 would consider

Chowdhury et al.'s empirical evidence to be more conclusive than the computer models cited in Text 1, the author of Text 2 would most likely assert that a more definitive form of evidence than the computer models suggests a different timeline for the onset of plate tectonics on Earth.

Choice A is incorrect because the author of Text 2 makes no claims about the temperature of Earth's mantle and therefore wouldn't argue that the temperature of Earth's mantle 3 billion years ago was insufficient to allow tectonic movement. *Choice B* is incorrect because the author of Text 2 claims that empirical evidence is needed to fix the earliest date of tectonic movement. Computer models are simulations, not empirical evidence, so the author of Text 2 wouldn't distinguish between different kinds of computer models but would instead argue that no computer models can reliably predict the onset of plate tectonics. *Choice C* is incorrect because the author of Text 2 wouldn't consider any computer model to be able to provide evidence to support a plausible claim about tectonic movement, no matter how much such models were improved. The author of Text 2 would only accept empirical evidence.

QUESTION 10

Choice B is the best answer because it most accurately states what feature of *Hevea brasiliensis* is helpful for the process of making rubber. According to the text, this tree species produces latex, which is used to make rubber, and its inner bark contains a "network of tubes" that, when cut, enables the latex to flow out. The text explicitly states that this feature of *Hevea brasiliensis* is "helpful for the process of making rubber."

Choice A is incorrect because the text doesn't mention the quality of the rubber produced from the latex of *Hevea brasiliensis* or compare its quality to that of rubber produced from other sources. *Choice C* is incorrect because the text never discusses the climates in which *Hevea brasiliensis* grows. Moreover, the text mentions only one region where this tree is found: the Amazon rainforest. *Choice D* is incorrect. Because the text states that *Hevea brasiliensis* is the world's "main source of natural rubber," it can be inferred that there is at least one other source. However, the text doesn't specify whether that other source is also a tree species and, if so, whether that species grows in the Amazon rainforest.

QUESTION 11

Choice B is the best answer because it best states the main idea of the text: that nature-based approaches can be effective for achieving conservation goals. The text indicates that in many cases where conservationists are trying to protect ecosystems, their methods depend on natural processes or features. The text then gives an example of this phenomenon, a project with the Quinault Indian Nation that allowed logjams to form naturally in a river, creating spawning habitats for blueback salmon.

Choice A is incorrect. Although the text does suggest that the partnership with the Quinault Indian Nation was beneficial, this is not the central aim of the text; the text primarily argues that nature-based approaches to conservation can be effective. *Choice C* is incorrect. Although the text indicates that logjams are

helpful to blueback salmon, the example of the blueback salmon project is included to illustrate the larger point made earlier in the text: that nature-based approaches to conservation are often effective. *Choice D* is incorrect. There is no evidence in the text to support a direct comparison of the efficacy of nature-based conservation approaches to other types of approaches. The text merely indicates that nature-based approaches can often be effective.

QUESTION 12

Choice D is the best answer because it effectively uses data from the table to complete the student's claim about the highest percentage of bus stops with shaded shelter in the areas represented. The table shows the highest average surface temperature of five areas and the percentage of bus stops with shaded shelter in each area, and 29% is the highest percentage listed.

Choice A is incorrect because the list of percentages of bus stops with shaded shelter does not include 50%; the highest percentage in the table is 29%.

Choice B is incorrect because 15% is the lowest value in the listed percentages of bus stops with shaded shelter, not the highest value. *Choice C* is incorrect because the list of percentages of bus stops with shaded shelter does not include 90%; the highest percentage in the table is 29%.

QUESTION 13

Choice C is the best answer because it states the total area of Bahrain that is indicated in the table. The table presents the total area (in square miles) and population for Bahrain, Qatar, and Kuwait, and it indicates that the total area of Bahrain is 304 square miles.

Choice A is incorrect because the table indicates that 4,268,873 is the population of Kuwait, not the total area of Bahrain. *Choice B* is incorrect because the table indicates that 4,471 square miles is the total area of Qatar, not of Bahrain.

Choice D is incorrect because the table indicates that 6,880 square miles is the total area of Kuwait, not of Bahrain.

QUESTION 14

Choice C is the best answer because it presents the quotation that most effectively illustrates the claim that Echelman's sculptures appear delicate but are in fact quite durable. The text explains that Echelman's sculptures include flowing shapes that mimic the wind. If it is true that the materials she uses are both flexible and strong, that would help explain why the works are durable even though they appear delicate.

Choice A is incorrect because the claim in the text is not about how Echelman models her work before sculpting. *Choice B* is incorrect because the claim in the text is not about the planning and design phases of Echelman's work. *Choice D* is incorrect because the claim in the text is not about how the sculptures relate to their locations.

QUESTION 15

Choice D is the best answer because it presents a finding that, if true, would most directly support the researchers' conclusion that the transition from a stagnant lid regime to a tectonic plate regime occurred around 3.2 billion years ago. The text explains that early in Earth's history, Earth exhibited a stagnant lid regime in which there's no interaction between the lithosphere and the underlying mantle. The text further explains that, by contrast, once Earth began to exhibit a tectonic plate regime, its lithospheric and mantle material began to mix. If mantle-derived rocks younger than 3.2 billion years contain material not found in older mantle-derived rocks, that material must have originated somewhere other than the mantle. And if this material is found in both older and contemporaneous lithospheric rocks, that would imply that the lithosphere was able to mix with mantle material beginning around 3.2 billion years ago, as the researchers concluded.

Choice A is incorrect. The text gives no basis for comparing the quantities of lithospheric and mantle-derived rocks. *Choice B* is incorrect. The text gives no basis for comparing the material makeup of lithospheric rocks to that of mantle-derived rocks. *Choice C* is incorrect. A positive correlation between the age of lithospheric rocks and these rocks' chemical similarity to mantle-derived rocks would mean that the oldest rocks would be the most similar, which contradicts the text's claim that lithospheric and mantle-derived rocks were completely separate until 3.2 billion years ago. If the researchers' conclusion about the onset of tectonics on Earth is correct, then younger lithospheric rocks would show greater chemical similarity to mantle-derived rocks than older lithospheric rocks do.

QUESTION 16

Choice D is the best answer because it most logically completes the discussion of Uto-Aztec language. The text explains that the northern and southern branches of the Uto-Aztec language family descended from a single language (believed to have originated in what is now the US Southwest), resulting in similarities across the family's languages; however, the branches don't have similar vocabulary for maize, even though maize has been cultivated by all Uto-Aztec tribes. The text also indicates that maize originated in Mexico and spread northward into what is now the US Southwest—the area where the Uto-Aztec language family originated. It follows, then, that the language family had already divided into northern and southern branches before maize reached that area; if maize had been present before the division occurred, the family's origin language would have had terminology for it that likely would have been reflected in the branches, meaning they would have had similar vocabulary for maize. If maize arrived after the division occurred, however, the tribes in the two regions likely would have developed vocabulary pertaining to maize separately, at the times when they acquired the crop.

Choice A is incorrect because the text focuses on vocabulary pertaining to maize in the branches of the Uto-Aztec language family, and referring only to how some Uto-Aztec tribes obtained maize wouldn't directly address the role of language. Moreover, if northern Uto-Aztec tribes had acquired maize from a southern Uto-Aztec tribe, it's reasonable to assume that the northern tribes

might have also picked up southern Uto-Aztecan terminology for maize in that exchange. *Choice B* is incorrect because the text discusses the fact that the northern and southern branches of the Uto-Aztecan language family don't have shared vocabulary pertaining to maize, not the idea that there are variations in such vocabulary within each branch—that is, the text focuses on differences between the two branches, not on differences between languages within a branch. *Choice C* is incorrect because the text focuses on vocabulary pertaining to maize in the branches of the Uto-Aztecan language family, and referring only to the timing and source of maize acquisition wouldn't directly address the role of language. Furthermore, the text implies that southern Uto-Aztecan tribes probably acquired maize before the northern tribes did, given the evidence that maize originated in Mexico—the location of the best-known representative of the southern branch of the Uto-Aztecan language family—before spreading to the north.

QUESTION 17

Choice B is the best answer because it most logically completes the text's discussion of the sediments found at the Gale Crater's Murray Formation on Mars. The text states that data gathered by the *Curiosity* rover suggest that bodies of water deposited sediment on Mars's surface long ago. The text goes on to say that studying the sediment, Rivera-Hernández et al. found some coarse grains they believe are sandstone, which tends to be left by flowing water, and many more fine grains they believe are mudstone, which tends to slowly sink in low-flow water. The text further indicates that the researchers noted cracks in the fine grains that suggest there were cycles of desiccation, or drying, at the site. Taken together, this information suggests that a lake (a body of low-flow water) existed at the site for a prolonged period but occasionally experienced drying and that there were periods in which one or more streams (flowing water) were present, since the extended existence of a lake would account for the abundance of fine grains, periods of drying would account for the cracks in the fine grains, and periods with streams would account for the sections of coarse grains.

Choice A is incorrect because the text indicates that an abundance of fine grains of sediment was found at the Murray Formation site, which suggests that a low-flow water source (such as a lake) was present. Further, the text makes no mention of where the water at the site may have originated from. *Choice C* is incorrect because the evidence described in the text doesn't support the idea that there were streams at the Murray Formation for an extended period and a lake for just a short time. The abundance of fine grains suggests that a lake (a body of low-flow water) was present for an extended time, not just a short time, and the sections of coarse grains suggest that one or more streams (bodies of flowing water) were intermittently present while the lake existed, not at a separate time. *Choice D* is incorrect. Although the text suggests that both a low-flow body of water (such as a lake) and flowing water (such as streams) existed at the Murray Formation site, meaning that there could have been a stream-fed lake, the text explains that the fine grains that signify the presence of a lake exhibit cracking that indicates periods of desiccation, or drying, which suggests that a lake was present but did occasionally dry out.

QUESTION 18

Choice B is the best answer because it most logically completes the text's discussion of Sidonian coins. As the text explains, researchers determined that Sidonian coins were made of silver and copper and that from 450 BCE to 367 BCE, the percentage of silver in each coin decreased from 98% to 74.2% while the percentage of copper increased from 1% to 24.7%. The text indicates that because the coins containing less than 80% silver weren't considered suitable for trade (suggesting that copper was less valuable than silver) and looked different from coins containing more silver, the researchers suspect there was a serious loss in confidence in the currency in Sidon in 367 BCE when the copper content was high. It's reasonable to assume that it wasn't possible to boost confidence simply by devoting a greater amount of valuable silver to the currency, since Sidon was under significant and ongoing financial pressure; however, keeping the total amount of silver the same and reducing the amount of copper in the coins would have resulted in smaller coins with a higher percentage of silver. Therefore, it makes sense to suggest that Abd'aštar I (the ruler after 367 BCE) likely restored confidence in the currency by deciding to keep the amount of silver in Sidonian coins consistent with that in coins minted in 367 BCE but to decrease the coins' weight.

Choice A is incorrect because the text conveys that a crisis in confidence in the currency of Sidon likely occurred around 367 BCE because the percentage of silver in coins had fallen below 80% (presumably because Sidon's financial pressures meant that less silver was available for currency), making the coins unsuitable for trade. Thus, announcing that the threshold for the percentage of silver in coins would be raised—that is, that coins would need to contain even more than 80% silver to be suitable for trade—likely would have worsened the crisis rather than relieved it. *Choice C* is incorrect because the text strongly suggests that a crisis in confidence in the currency of Sidon was caused by the proportion of silver to copper in the coins in 367 BCE, with 74.2% being too little silver for the coins to be considered suitable for trade; therefore, it's unlikely that minting coins with a similar proportion of silver to copper (that is, still around 74.2% silver) would have restored confidence, even if the coins were heavier. *Choice D* is incorrect because the text gives no indication that funding the mining of more copper would have relieved a crisis in confidence in the currency of Sidon. The text establishes that Sidonian coins that visibly contained copper weren't considered suitable for trade, so Abd'aštar I wouldn't have wanted to add even more copper to them, and it's unclear how else copper mining would affect views of the currency.

QUESTION 19

Choice D is the best answer. The convention being tested is the use of verb forms within a sentence. The nonfinite to-infinitive verb "to include" is correctly used to form a subordinate clause that indicates what the Olympic committee decided (to include tug-of-war as an Olympic event).

Choice A is incorrect because it results in an ungrammatical sentence. The finite verb "included" can't be used in this way to form a subordinate clause that

indicates what the Olympic committee decided. *Choice B* is incorrect because it results in an ungrammatical sentence. The nonfinite participle “including” can’t be used in this way to form a subordinate clause that indicates what the Olympic committee decided. *Choice C* is incorrect because it results in an ungrammatical sentence. The finite verb “include” can’t be used in this way to form a subordinate clause that indicates what the Olympic committee decided.

QUESTION 20

Choice D is the best answer. The convention being tested is the use of verbs to express tense. In this choice, the past tense verb “malfunctioned” is consistent with the other past tense verbs (“ignited” and “was”) used to describe the destruction of the original Globe Theatre.

Choice A is incorrect because the present tense verb “malfunctions” isn’t consistent with the other past tense verbs used to describe the destruction of the original Globe Theatre. *Choice B* is incorrect because the future tense verb “will malfunction” isn’t consistent with the other past tense verbs used to describe the destruction of the original Globe Theatre. *Choice C* is incorrect because the present perfect tense verb “has malfunctioned” isn’t consistent with the other past tense verbs used to describe the destruction of the original Globe Theatre.

QUESTION 21

Choice C is the best answer. The convention being tested is punctuation use between a subject and a verb. No punctuation is needed when, as in this case, a subject (“Her portrait of novelist Zadie Smith”) is immediately followed by a main verb (“is displayed”).

Choice A is incorrect because no punctuation is needed between the subject and the verb. *Choice B* is incorrect because no punctuation is needed between the subject and the verb. *Choice D* is incorrect because no punctuation is needed between the subject and the verb.

QUESTION 22

Choice C is the best answer. The convention being tested is pronoun-antecedent agreement. The singular pronoun “it” agrees in number with the singular antecedent “industry” and clearly indicates that the industry consists of just one or two suppliers per municipality.

Choice A is incorrect. The plural pronoun “these” neither agrees in number with the singular antecedent “industry” nor clearly indicates that the industry—not another plural noun in the sentence, such as “start-up costs” or “barriers”—consists of just one or two suppliers per municipality. *Choice B* is incorrect because the plural pronoun “they” doesn’t agree in number with the singular antecedent “industry.” *Choice D* is incorrect because the singular pronoun “this” is ambiguous in this context; the resulting sentence leaves unclear what consists of just one or two suppliers per municipality.

QUESTION 23

Choice C is the best answer. The convention being tested is the punctuation of elements in a complex series. It's conventional to use a semicolon to separate items in a complex series with internal punctuation, and in this choice, the semicolon after "items" is conventionally used to separate the first item ("overseeing...items") and the second item ("managing...law") in a list of Hayden's responsibilities.

Choice A is incorrect because it fails to use appropriate punctuation to separate the first item and the second item in the complex series. *Choice B* is incorrect because a comma after "items" doesn't match the semicolon used later to separate the second and third items in the series ("managing...law" and "and appointing the US poet laureate"). *Choice D* is incorrect because it results in a rhetorically unacceptable sentence fragment beginning with "Managing."

QUESTION 24

Choice A is the best answer. The convention being tested is the use of punctuation within a sentence. The comma after "work" pairs with the comma after "though" to separate the supplementary element "though" from the rest of the sentence. This supplementary element signals that what follows is an exception to Chen using software tools to create illustrations, and the pair of commas indicates that this element could be removed without affecting the grammatical coherence of the sentence.

Choice B is incorrect because the comma after "work" must be paired with a comma after "though" to separate the supplementary element from the rest of the sentence. *Choice C* is incorrect because a semicolon can't be paired with a comma in this way to separate the supplementary element from the rest of the sentence. *Choice D* is incorrect because a semicolon can't be paired with a comma in this way to separate the supplementary element from the rest of the sentence.

QUESTION 25

Choice B is the best answer. The convention being tested is the use of punctuation within a sentence. This choice correctly uses a comma to separate the supplementary adverb "though" from the preceding main clause ("They are hardly pristine") and uses a semicolon to join the two main clauses ("They... though" and "many...objects"). Further, placing the semicolon after "though" indicates that the information in the preceding main clause (chondrites are far from pristine) is contrary to what might be assumed from the information in the previous sentence (chondrites have been generally unaltered by their environment).

Choice A is incorrect because placing the comma after "pristine" and using "though" as a subordinating conjunction illogically indicates that the information in the next main clause (many chondrites have experienced damage) is contrary to the information in the previous clause (chondrites are far from pristine).

Choice C is incorrect because placing the semicolon after "pristine" illogically

indicates that the information in the next main clause (many chondrites have experienced damage) is contrary to the information in the previous clause (chondrites are far from pristine). *Choice D* is incorrect because it results in a comma splice. Without a conjunction following it, the comma after “though” can’t be used in this way to join two main clauses.

QUESTION 26

Choice D is the best answer. The convention being tested is the use of punctuation within a sentence. This choice uses a semicolon in a conventional way to join the first main clause (“That the...involved”) and the second main clause (“establishing...divisive”). Further, the semicolon is the most appropriate choice when joining two separate, parallel statements, such as here, where the information following the semicolon contrasts with the information before.

Choice A is incorrect because placing a colon after “involved” illogically indicates that the information in the second main clause (the precise location was the subject of disagreement) explains or amplifies the information in the previous main clause (the general location was agreed upon by all). Instead, the information in the second clause contrasts with the previous information. *Choice B* is incorrect because it results in a comma splice. Without a conjunction following it, a comma can’t be used in this way to join two main clauses. *Choice C* is incorrect because it results in a run-on sentence. The two main clauses are fused without punctuation and/or a conjunction.

QUESTION 27

Choice B is the best answer. “As a result” logically signals that the action described in this sentence—closing the area around Garisenda Tower to explore stabilization solutions—occurred as a consequence or result of measurements revealing the tower’s concerning rotation.

Choice A is incorrect because “similarly” illogically signals that the action of closing the tower area is similar to the discovery of concerning rotation described in the previous sentence. Instead, closing the area around the tower to explore solutions occurred as a result of the measurements revealing the rotation.

Choice C is incorrect because “for example” illogically signals that the action of closing the tower area serves as an example of the tower’s concerning rotation described in the previous sentence. Instead, closing the area around the tower to explore solutions occurred as a result of the measurements revealing the rotation.

Choice D is incorrect because “in comparison” illogically signals that the action of closing the tower area is being compared to the discovery of concerning rotation described in the previous sentence. Instead, closing the area around the tower to explore solutions occurred as a result of the measurements revealing the rotation.

QUESTION 28

Choice D is the best answer. “Specifically” logically signals that the information in this sentence—that the Local Bubble’s expansion trapped clouds of gas and dust that formed new stars—provides specific, precise details elaborating on the more general information in the previous sentence about the relationship between the Local Bubble’s expansion and the formation of new stars.

Choice A is incorrect because “hence” illogically signals that the information in this sentence is a result of the information in the previous sentence about the relationship between the Local Bubble’s expansion and the formation of new stars. Instead, this sentence provides specific, precise details elaborating on that information. *Choice B* is incorrect because “however” illogically signals that the information in this sentence contrasts with the information in the previous sentence about the relationship between the Local Bubble’s expansion and the formation of new stars. Instead, this sentence provides specific, precise details elaborating on that information. *Choice C* is incorrect because “admittedly” illogically signals that the information in this sentence provides an exception or caveat to the previous information about the relationship between the Local Bubble’s expansion and the formation of new stars. Instead, this sentence provides specific, precise details elaborating on that information.

QUESTION 29

Choice A is the best answer. “In particular” logically signals that the information in this sentence—that maize and wheat supply chains transformed North American foodways into a global food system—provides specific, precise details elaborating on the more general information in the previous sentence about the transformation of North American foodways (with maize and wheat the “certain grains” at the center of it).

Choice B is incorrect because “alternatively” illogically signals that the information in this sentence is an alternative option to the previous information about the transformation of North American foodways. Instead, the roles of maize and wheat in creating a global food system are specific, precise details elaborating on that information. *Choice C* is incorrect because “by comparison” illogically signals that the information in this sentence is being compared to the previous information about the transformation of North American foodways. Instead, the roles of maize and wheat in creating a global food system are specific, precise details elaborating on that information. *Choice D* is incorrect because “second of all” illogically signals that the information in this sentence is a second, separate claim from the previous claim that North American foodways were transformed. Instead, the roles of maize and wheat in creating a global food system are specific, precise details elaborating on that information, rather than a separate claim.

QUESTION 30

Choice D is the best answer. “To that end” logically signals that the information in this sentence—the students’ creation of a show with six starring female roles—is the product of a goal or desire in the previous sentence (the students’ wish to develop a musical with roles for female actors).

Choice A is incorrect because “in other words” illogically signals that the information in this sentence is a paraphrase or restatement of the previous information about the students’ wish to develop a musical with roles for female actors. Instead, the students’ show is the product of that desire. *Choice B* is incorrect because “in summary” illogically signals that the information in this sentence summarizes the previous information about the students’ wish to

develop a musical with roles for female actors. Instead, the students' show is the product of that desire. *Choice C* is incorrect because "for example" illogically signals that the information in this sentence is merely an example of the previous information about the students' wish to develop a musical with roles for female actors. Instead, the students' show is the direct product of that desire.

QUESTION 31

Choice C is the best answer. "More often" logically signals that the claim in this sentence—that new via ferratas favor recreation over utility—explains a difference between the new "sporting activity" routes and the older "mode of travel" routes. In so doing, it emphasizes and reinforces the previous claim ("modern via ferratas are rarely designed to simply reach a summit").

Choice A is incorrect because "additionally" illogically signals that this sentence's claim about new via ferratas adds a new, separate point to the previous claim ("modern via ferratas are rarely designed to simply reach a summit"). Instead, the second claim—that new routes favor recreation over utility—emphasizes and reinforces the previous one. *Choice B* is incorrect because "on the other hand" illogically signals that this sentence's claim about new via ferratas contrasts with or opposes the previous claim ("modern via ferratas are rarely designed to simply reach a summit"). Instead, the second claim—that new routes favor recreation over utility—emphasizes and reinforces the previous one. *Choice D* is incorrect because "nonetheless" illogically signals that this sentence's claim about new via ferratas is true despite the previous claim ("modern via ferratas are rarely designed to simply reach a summit"). Instead, the second claim—that new routes favor recreation over utility—emphasizes and reinforces the previous one.

QUESTION 32

Choice A is the best answer. The sentence indicates the title of a novel that won a Nebula Award, noting that *Babel-17* by Samuel Delany won the award in 1967.

Choice B is incorrect because the sentence identifies the year that Samuel Delany published a science fiction novel; it doesn't indicate the novel's title or that it won a Nebula Award. *Choice C* is incorrect because the sentence provides an introduction of Samuel Delany; it doesn't indicate the title of a novel that has won a Nebula Award. *Choice D* is incorrect because the sentence indicates that one of Samuel Delany's novels met the qualification for a Nebula Award; it doesn't indicate the novel's title or that it won an award.

QUESTION 33

Choice C is the best answer. The sentence indicates the year *Yosemite Falls* was completed, stating that it was completed in 1930.

Choice A is incorrect. The sentence indicates where Obata created black ink paintings; it doesn't indicate when the painting was completed. *Choice B* is incorrect. While the sentence identifies Obata as an artist who created a notable painting, it doesn't indicate when that painting was completed. *Choice D* is incorrect. The sentence identifies the method Obata used; it doesn't indicate when the painting was completed.

Math

Module 1 (27 questions)

QUESTION 1

Choice B is correct. In the given scatterplot, the x -values represent the distance above sea level, in feet, and the y -values represent the temperature, in °F. The point on the line of best fit with an x -value of 4,000 has a corresponding y -value of 35. Therefore, at a distance of 4,000 feet above sea level, the temperature predicted by the line of best fit is 35°F.

Choice A is incorrect. This is the temperature, in °F, predicted by the line of best fit at a distance of 0 feet above sea level. *Choice C* is incorrect. This is the measured temperature, in °F, at a distance of 6,000 feet above sea level. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 2

Choice D is correct. It's given that rectangle P has an area of 72 square inches. If a rectangle with an area of 20 square inches is removed from rectangle P, the area, in square inches, of the resulting figure is $72 - 20$, or 52.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

QUESTION 3

Choice B is correct. Subtracting 61 from each side of the given equation yields $|p|=4$. By the definition of absolute value, if $|p|=4$, then $p=4$ or $p=-4$. Of the given choices, 4 is a solution to the given equation.

Choice A is incorrect. This is the quotient, not the difference, of 65 and 61.

Choice C is incorrect. This is the sum, not the difference, of 65 and 61. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 4

Choice A is correct. It's given that p represents the number of pounds of strawberries Lorenzo purchased and Lorenzo paid \$1.90 per pound for the strawberries. It follows that the total amount, in dollars, Lorenzo paid for strawberries can be represented by $1.90p$. It's given that Lorenzo paid \$2 for the box of cereal. If Lorenzo paid a total of \$9.60 for the box of cereal and strawberries, it follows that the equation $1.90p + 2 = 9.60$ can be used to find p .

Choice B is incorrect and may result from conceptual errors. **Choice C** is incorrect and may result from conceptual errors. **Choice D** is incorrect and may result from conceptual errors.

QUESTION 5

Choice D is correct. It's given that the bar graph summarizes the charge, in kilowatt-hours (kWh), a battery received each day for 15 days. The height of each bar in the bar graph shown represents the number of days the battery received the charge, in kWh, specified at the bottom of the bar. The bar for a charge of 0 kWh reaches a height of 6. Therefore, the battery received a charge of 0 kWh for 6 of these days.

Choice A is incorrect. This is the charge, in kWh, that the battery received, not the number of days the battery received this charge. **Choice B** is incorrect. This is the number of days the battery received a charge of either 8, 16, or 23 kWh. **Choice C** is incorrect. This is the number of days the battery received a charge of 11 kWh.

QUESTION 6

The correct answer is 9. It's given that the equation $y = px + r$ defines the line. In this equation, p represents the slope of the line and r represents the y -coordinate of the y -intercept of the line. It's given that the line has a slope of 9. Therefore, the value of p is 9.

QUESTION 7

The correct answer is either 14, -5, or -4. The x -intercepts of a graph in the xy -plane are the points at which the graph intersects the x -axis, or when the value of y is 0. Substituting 0 for y in the given equation yields $0 = 3(x - 14)(x + 5)(x + 4)$. Dividing both sides of this equation by 3 yields $0 = (x - 14)(x + 5)(x + 4)$. Applying the zero product property to this equation yields three equations: $x - 14 = 0$, $x + 5 = 0$, and $x + 4 = 0$. Adding 14 to both sides of the equation $x - 14 = 0$ yields $x = 14$, subtracting 5 from both sides of the equation $x + 5 = 0$ yields $x = -5$, and subtracting 4 from both sides of the equation $x + 4 = 0$ yields $x = -4$. Therefore, the x -coordinates of the x -intercepts of the graph of the given equation are 14, -5, and -4. Note that 14, -5, and -4 are examples of ways to enter a correct answer.

QUESTION 8

Choice A is correct. It's given that the graph shown gives the estimated value y , in dollars, of a tablet as a function of the number of months since it was purchased, x . The y -intercept of a graph is the point at which the graph intersects the y -axis, or when x is 0. The graph shown intersects the y -axis at the point $(0, 225)$. It follows that 0 months after the tablet was purchased, or when the tablet was purchased, the estimated value of the tablet was 225 dollars. Therefore, the best interpretation of the y -intercept is that the estimated value of the tablet was \$225 when it was purchased.

Choice B is incorrect. The estimated value of the tablet 24 months after it was purchased was \$50, not \$225. **Choice C** is incorrect. The estimated value of the tablet had decreased by $\$225 - \50 , or \$175, not \$225, in the 24 months after it was purchased. **Choice D** is incorrect and may result from conceptual errors.

QUESTION 9

Choice B is correct. It's given that triangles EFG and JKL are congruent such that angle E corresponds to angle J . Corresponding angles of congruent triangles are congruent, so angle E and angle J must be congruent. Therefore, if the measure of angle E is 45° , then the measure of angle J is also 45° .

Choice A is incorrect. This is the measure of angle K , not angle J . **Choice C** is incorrect and may result from conceptual or calculation errors. **Choice D** is incorrect and may result from conceptual or calculation errors.

QUESTION 10

Choice D is correct. It's given that the function f is defined by $f(x) = \frac{1}{2}(x + 6)$. Substituting 4 for x in the given function yields $f(4) = \frac{1}{2}(4 + 6)$, or $f(4) = 5$. Therefore, the value of $f(4)$ is 5.

Choice A is incorrect. This is the value of $2(4 + 6)$, not $\frac{1}{2}(4 + 6)$. **Choice B** is incorrect. This is the value of $2 + (4 + 6)$, not $\frac{1}{2}(4 + 6)$. **Choice C** is incorrect. This is the value of $4 + 6$, not $\frac{1}{2}(4 + 6)$.

QUESTION 11

Choice C is correct. The solution to a system of two equations corresponds to the point where the graphs of the equations intersect. The graphs of the linear function and the absolute value function shown intersect at a point with an x -coordinate between -4 and -3 and a y -coordinate between 4 and 5. Of the given choices, only $(-\frac{7}{2}, \frac{9}{2})$ has an x -coordinate between -4 and -3 and a y -coordinate between 4 and 5.

Choice A is incorrect. This is the y -intercept of the graph of the linear function.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the vertex of the graph of the absolute value function.

QUESTION 12

Choice D is correct. It's given that the system has infinitely many solutions. A system of two linear equations has infinitely many solutions when the two linear equations are equivalent. When one equation is a multiple of another equation, the two equations are equivalent. Multiplying each side of the given equation by 2 yields $2(y) = 2(6x + 3)$. Thus, $2(y) = 2(6x + 3)$ is equivalent to the given equation and could be the second equation in the system.

Choice A is incorrect. The system consisting of this equation and the given equation has one solution rather than infinitely many solutions. *Choice B* is incorrect. The system consisting of this equation and the given equation has one solution rather than infinitely many solutions. *Choice C* is incorrect. The system consisting of this equation and the given equation has no solutions rather than infinitely many solutions.

QUESTION 13

The correct answer is 294. Subtracting 18 from each side of the given equation yields $\frac{6}{7}p = 36$. Multiplying each side of this equation by $\frac{7}{6}$ yields $p = 42$. Multiplying each side of this equation by 7 yields $7p = 294$. Therefore, the value of $7p$ is 294.

QUESTION 14

The correct answer is 3. It's given that $y = 9x + 12$. Substituting $9x + 12$ for y in the second equation in the system, $x + 7y = 20$, yields $x + 7(9x + 12) = 20$, which gives $x + 63x + 84 = 20$, or $64x + 84 = 20$. Subtracting 84 from each side of this equation yields $64x = -64$. Dividing each side of this equation by 64 yields $x = -1$. Substituting -1 for x in the first equation in the system, $y = 9x + 12$, yields $y = 9(-1) + 12$, or $y = 3$. Therefore, the value of y is 3.

QUESTION 15

Choice A is correct. For a circle in the xy -plane that has the equation $(x - h)^2 + (y - k)^2 = r^2$, where h , k , and r are constants, (h, k) is the center of the circle and the positive value of r is the radius of the circle. In the given equation, $h = 13$ and $r^2 = 64$. Taking the square root of each side of $r^2 = 64$ yields $r = \pm 8$. Therefore, the center of the circle is at $(13, k)$ and the radius is 8.

Choice B is incorrect. This gives the center and radius of a circle with equation $(x - k)^2 + (y - 13)^2 = 64$, not $(x - 13)^2 + (y - k)^2 = 64$. *Choice C* is incorrect. This gives the center and radius of a circle with equation $(x - k)^2 + (y - 13)^2 = 4,096$, not $(x - 13)^2 + (y - k)^2 = 64$. *Choice D* is incorrect. This gives the center and radius of a circle with equation $(x - 13)^2 + (y - k)^2 = 4,096$, not $(x - 13)^2 + (y - k)^2 = 64$.

QUESTION 16

Choice C is correct. It's given that the function f is defined by $f(x)=|x-4x|$. It's also given that $f(5)-f(a)=-15$. Substituting 5 for x in the function $f(x)=|x-4x|$ yields $f(5)=|5-4(5)|$ and substituting a for x in the function $f(x)=|x-4x|$ yields $f(a)=|a-4a|$. Therefore, $f(5)=15$ and $f(a)=|-3a|$. Substituting 15 for $f(5)$ and $|-3a|$ for $f(a)$ in the equation $f(5)-f(a)=-15$ yields $15-|-3a|=-15$. Subtracting 15 from both sides of this equation yields $-|-3a|=-30$. Dividing both sides of this equation by -1 yields $|-3a|=30$. By the definition of absolute value, if $|-3a|=30$, then $-3a=30$ or $-3a=-30$. Dividing both sides of each of these equations by -3 yields $a=-10$ or $a=10$, respectively. Thus, of the given choices, a value of a that satisfies $f(5)-f(a)=-15$ is 10.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 17

Choice B is correct. Each of the given choices is an equation of the form $f(x)=a(b)^{x-k}$, where a , b , and k are constants. For an equation of this form, the coefficient, a , is equal to the value of the function when the exponent is equal to 0, or when $x=k$. It follows that in the equation $f(x)=33(1.5)^x$, the coefficient, 33, is equal to the value of $f(0)$. Substituting 0 for x in this equation yields $f(0)=33(1.5)^0$, which is equivalent to $f(0)=33(1)$, or $f(0)=33$. Thus, the value of c is 33 and the equation $f(x)=33(1.5)^x$ shows the value of c as the coefficient.

Choice A is incorrect. This equation shows the value of $f(-1)$, not $f(0)$, as the coefficient. *Choice C* is incorrect. This equation shows the value of $f(1)$, not $f(0)$, as the coefficient. *Choice D* is incorrect. This equation shows the value of $f(2)$, not $f(0)$, as the coefficient.

QUESTION 18

Choice B is correct. It's given that t minutes after an initial observation, the number of bacteria in a population is $40,000(2)^{\frac{t}{790}}$. This expression consists of the initial number of bacteria, 40,000, multiplied by the expression $2^{\frac{t}{790}}$. The time, in minutes, it takes for the number of bacteria to double is the increase in the value of t that causes the expression $2^{\frac{t}{790}}$ to double. Since the base is 2, the expression $2^{\frac{t}{790}}$ will double when the exponent increases by 1. Since the exponent of this expression is $\frac{t}{790}$, the exponent will increase by 1 when t increases by 790.

Therefore, the time, in minutes, it takes for the number of bacteria in the population to double is 790.

Alternate approach: The initial number of bacteria in the population can be found by substituting 0 for t in the given function. This yields $f(0)=40,000(2)^{\frac{0}{790}}$, or $f(0)=40,000$. Therefore, the initial number of bacteria present in the population is 40,000, so the bacteria population will have doubled when $f(t)=80,000$.

Substituting 80,000 for $f(t)$ in the given function yields $80,000 = 40,000(2)^{\frac{t}{790}}$. Dividing both sides of this equation by 40,000 yields $2 = 2^{\frac{t}{790}}$, or $2^1 = 2^{\frac{t}{790}}$. It follows that $1 = \frac{t}{790}$. Multiplying both sides of this equation by 790 yields $790 = t$. Therefore, the time, in minutes, it takes for the number of bacteria in the population to double is 790.

Choice A is incorrect. This is the base of the exponent, not the time it takes for the number of bacteria in the population to double. *Choice C* is incorrect. This is the number of minutes it takes for the population to double twice. *Choice D* is incorrect. This is the number of bacteria that are initially observed, not the time it takes for the number of bacteria in the population to double.

QUESTION 19

Choice D is correct. Adding $\frac{2}{t}$ to each side of the given equation yields $\frac{12}{n} = -\frac{2}{w} + \frac{2}{t}$. The fractions on the right side of this equation have a common denominator of tw ; therefore, the equation can be written as $\frac{12}{n} = \frac{2w}{tw} - \frac{2t}{tw}$, or $\frac{12}{n} = \frac{2w-2t}{tw}$, which is equivalent to $\frac{12}{n} = \frac{2(w-t)}{tw}$. Dividing each side of this equation by 2 yields $\frac{6}{n} = \frac{w-t}{tw}$. Since n , t , w , and $w-t$ are all positive quantities, taking the reciprocal of each side of the equation $\frac{6}{n} = \frac{w-t}{tw}$ yields an equivalent equation: $\frac{n}{6} = \frac{tw}{w-t}$. Multiplying each side of this equation by 6 yields $n = \frac{6tw}{w-t}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is equivalent to $\frac{1}{n}$ rather than n .

QUESTION 20

The correct answer is 5. For the graph shown, x represents time, in minutes, and y represents temperature, in degrees Celsius (°C). Therefore, the average rate of change, in °C per minute, of the recorded temperature of the air in the chamber between two x -values is the difference in the corresponding y -values divided by the difference in the x -values. The graph shows that at $x=5$, the corresponding y -value is 14. The graph also shows that at $x=7$, the corresponding y -value is 24. It follows that the average rate of change, in °C per minute, from $x=5$ to $x=7$ is $\frac{24-14}{7-5}$, which is equivalent to $\frac{10}{2}$, or 5.

QUESTION 21

The correct answer is 87. It's given that in August, the car dealer completed 15 more than 3 times the number of sales the car dealer completed in September. Let x represent the number of sales the car dealer completed in September. It follows that $3x+15$ represents the number of sales the car dealer completed in August. It's also given that in August and September, the car dealer completed 363 sales. It follows that $x+(3x+15)=363$, or $4x+15=363$. Subtracting 15 from each side of this equation yields $4x=348$. Dividing each side of this equation by 4 yields $x=87$. Therefore, the car dealer completed 87 sales in September.

QUESTION 22

Choice B is correct. Since it's given that P is the center of a circle with a radius of 9 inches, and that points Q and R lie on that circle, it follows that \overline{PQ} and \overline{RP} of triangle PQR each have a length of 9 inches. Let the length of \overline{QR} be x inches. It follows that the perimeter of triangle PQR is $9 + 9 + x$ inches. Since it's given that the perimeter of triangle PQR is 31 inches, it follows that $9 + 9 + x = 31$, or $18 + x = 31$. Subtracting 18 from both sides of this equation gives $x = 13$. Therefore, the length, in inches, of \overline{QR} is 13.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 23

Choice A is correct. It's given that the four odd integers are consecutive, ordered from least to greatest, and that the first odd integer is represented by x . It follows that the second odd integer is represented by $x + 2$, the third odd integer is represented by $x + 4$, and the fourth odd integer is represented by $x + 6$. Therefore, the product of 12 and the fourth odd integer is represented by $12(x + 6)$, and 26 less than the sum of the first and third odd integers is represented by $x + (x + 4) - 26$. Since the product of 12 and the fourth odd integer is at most 26 less than the sum of the first and third odd integers, it follows that $12(x + 6) \leq x + (x + 4) - 26$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 24

Choice B is correct. The linear relationship between x and y can be represented by an equation of the form $y - y_1 = m(x - x_1)$, where m is the slope of the graph of the equation in the xy -plane and (x_1, y_1) is a point on the graph. The slope of a line can be found using two points on the line and the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Each value of x and its corresponding value of y in the table can be represented by a point (x, y) . Substituting the points $(-s, 21)$ and $(s, 15)$ for (x_1, y_1) and (x_2, y_2) , respectively, in the slope formula yields $m = \frac{15 - 21}{s - (-s)}$, which gives $m = \frac{-6}{2s}$, or $m = -\frac{3}{s}$. Substituting $-\frac{3}{s}$ for m and the point $(s, 15)$ for (x_1, y_1) in the equation $y - y_1 = m(x - x_1)$ yields $y - 15 = -\frac{3}{s}(s - s)$. Distributing $-\frac{3}{s}$ on the right-hand side of this equation yields $y - 15 = -\frac{3x}{s} + 3$. Adding 15 to each side of this equation yields $y = -\frac{3x}{s} + 18$. Multiplying each side of this equation by s yields $sy = -3x + 18s$. Adding $3x$ to each side of this equation yields $3x + sy = 18s$. Therefore, the equation $3x + sy = 18s$ represents this relationship.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 25

Choice C is correct. The sine of an angle is equal to the cosine of its complementary angle. Since angles with measures 24° and 66° are complementary to each other, $\sin 24^\circ$ is equal to $\cos 66^\circ$ and $\sin 66^\circ$ is equal to $\cos 24^\circ$. Substituting $\cos 66^\circ$ for $\sin 24^\circ$ and $\cos 24^\circ$ for $\sin 66^\circ$ in the given expression yields $(\cos 66^\circ)(\cos 66^\circ) + (\cos 24^\circ)(\cos 24^\circ)$, or $(\cos 66^\circ)^2 + (\cos 24^\circ)^2$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice A is correct. It's given that the cost of renting a carpet cleaner is \$52 for the first day and \$26 for each additional day. Therefore, the cost $C(d)$, in dollars, of renting the carpet cleaner for d days is the sum of the cost for the first day, \$52, and the cost for the additional $d - 1$ days, \$26($d - 1$). It follows that $C(d) = 52 + 26(d - 1)$, which is equivalent to $C(d) = 52 + 26d - 26$, or $C(d) = 26d + 26$.

Choice B is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is \$78, not \$52, for the first day and \$26 for each additional day. *Choice C* is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is \$26, not \$52, for the first day and \$52, not \$26, for each additional day. *Choice D* is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is \$130, not \$52, for the first day and \$52, not \$26, for each additional day.

QUESTION 27

The correct answer is $-\frac{13}{2}$. The value of x for which $f(x)$ reaches its minimum can be found by rewriting the given equation in the form $f(x) = (x - h)^2 + k$, where $f(x)$ reaches its minimum, k , when the value of x is h . The given equation, $f(x) = (x - 2)(x + 15)$, can be rewritten as $f(x) = x^2 + 13x - 30$. By completing the square, this equation can be rewritten as $f(x) = \left(x^2 + 13x + \left(\frac{13}{2}\right)^2\right) - 30 - \left(\frac{13}{2}\right)^2$, which is equivalent to $f(x) = \left(x + \frac{13}{2}\right)^2 - \frac{289}{4}$, or $f(x) = \left(x - \left(-\frac{13}{2}\right)\right)^2 - \frac{289}{4}$. Therefore, $f(x)$ reaches its minimum when the value of x is $-\frac{13}{2}$. Note that $-13/2$ and -6.5 are examples of ways to enter a correct answer.

Alternate approach: The graph of $y = f(x)$ in the xy -plane is a parabola. The value of x for the vertex of a parabola is the x -value of the midpoint between the two x -intercepts of the parabola. Since it's given that $f(x) = (x - 2)(x + 15)$, it follows that the two x -intercepts of the graph of $y = f(x)$ in the xy -plane occur when $x = 2$ and $x = -15$, or at the points $(2, 0)$ and $(-15, 0)$. The midpoint between two points, (x_1, y_1) and (x_2, y_2) , is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$. Therefore, the midpoint between $(2, 0)$ and $(-15, 0)$ is $\left(\frac{2-15}{2}, \frac{0+0}{2}\right)$, or $\left(-\frac{13}{2}, 0\right)$. It follows that $f(x)$ reaches its minimum when the value of x is $-\frac{13}{2}$. Note that $-13/2$ and -6.5 are examples of ways to enter a correct answer.

Math

Module 2

(27 questions)

QUESTION 1

Choice A is correct. It's given that a total of 165 people contributed to a charity event as either a donor or a volunteer. It's also given that 130 people contributed as a donor. It follows that $165 - 130$, or 35, people contributed as a volunteer.

Choice B is incorrect. This is the number of people who contributed as a donor, not a volunteer. *Choice C* is incorrect. This is the total number of people who contributed as either a donor or a volunteer, not the number of people who contributed as a volunteer. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 2

Choice B is correct. It's given that there are 250 trees in a park and of these trees, 6% are birch trees. The number of birch trees in the park can be calculated by multiplying the number of trees in the park by $\frac{6}{100}$. Therefore, the number of birch trees in the park is $250\left(\frac{6}{100}\right)$, or 15.

Choice A is incorrect. This is the percentage of trees in the park that are birch trees, not the number of birch trees in the park. *Choice C* is incorrect. This is 30%, not 6%, of 250. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 3

Choice C is correct. The vertex of the graph of a quadratic function in the xy -plane is the point at which the graph is either at its minimum or maximum y -value. In the graph shown, the minimum y -value occurs at the point $(0, 2)$.

Choice A is incorrect. The graph shown doesn't pass through the point $(0, -2)$.

Choice B is incorrect. The graph shown doesn't pass through the point $(0, -3)$.

Choice D is incorrect. The graph shown doesn't pass through the point $(0, 3)$.

QUESTION 4

Choice A is correct. It's given that there are 2,358 raccoons in a 131-square-mile area. The estimated population density, in raccoons per square mile, is the estimated number of raccoons divided by the number of square miles. Therefore, the estimated population density of this area is $\frac{2,358 \text{ raccoons}}{131 \text{ square miles}}$, or 18 raccoons per square mile.

Choice B is incorrect. This is the number of square miles in the area, not the estimated number of raccoons per square mile in this area. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 5

Choice B is correct. The probability of selecting a positive number is the number of positive numbers in the data set divided by the total number of numbers in the data set. There is 1 positive number in this data set. There are 3 total numbers in this data set. Thus, if a number from this data set is selected at random, the probability of selecting a positive number is $\frac{1}{3}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the probability of selecting a negative number from this data set. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 6

The correct answer is 2,850. It's given that the function $f(x) = 45x + 600$ gives the monthly fee, in dollars, a facility charges to keep x crates in storage. Substituting 50 for x in this function yields $f(50) = 45(50) + 600$, or $f(50) = 2,850$. Therefore, the monthly fee, in dollars, the facility charges to keep 50 crates in storage is 2,850.

QUESTION 7

The correct answer is $\frac{11}{4}$. It's given that the function f is defined by

$$f(x) = 5\left(\frac{1}{4} - x\right)^2 + \frac{11}{4}. \text{ Substituting } \frac{1}{4} \text{ for } x \text{ in this equation yields}$$

$$f\left(\frac{1}{4}\right) = 5\left(\frac{1}{4} - \frac{1}{4}\right)^2 + \frac{11}{4}, \text{ which is equivalent } f\left(\frac{1}{4}\right) = 5(0)^2 + \frac{11}{4}, \text{ or } f\left(\frac{1}{4}\right) = \frac{11}{4}. \text{ Therefore,}$$

the value of $f\left(\frac{1}{4}\right)$ is $\frac{11}{4}$. Note that 11/4 or 2.75 are examples of ways to enter a correct answer.

QUESTION 8

Choice C is correct. It's given that $8x = 6$. Multiplying each side of this equation by 9 yields $72x = 54$. Therefore, the value of $72x$ is 54.

Choice A is incorrect. This is the value of $4x$, not $72x$. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 9

Choice C is correct. Since x is a common factor of each term in the given expression, the given expression can be rewritten as $x(23x^2 + 2x + 9)$.

Choice A is incorrect. This expression is equivalent to $23x^3 + 46x^2 + 207x$.

Choice B is incorrect. This expression is equivalent to $207x^4 + 18x^3 + 9x$.

Choice D is incorrect. This expression is equivalent to $34x^3 + 34x^2 + 34x$.

QUESTION 10

Choice D is correct. The given expression can be rewritten as $(9x^3 + 6x^3) + 5x^2 + 5x + (7 - 5)$. Combining like terms in this expression yields $15x^3 + 5x^2 + 5x + 2$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

QUESTION 11

Choice D is correct. It's given that the equation $80S + 90C = 1,120$ represents this situation, where S is the number of square tokens won, C is the number of circle tokens won, and 1,120 is the total number of points the tokens are worth. It follows that $80S$ represents the total number of points the square tokens are worth. Therefore, each square token is worth 80 points. It also follows that $90C$ represents the total number of points the circle tokens are worth. Therefore, each circle token is worth 90 points. Since a circle token is worth 90 points and a square token is worth 80 points, then a circle token is worth $90 - 80$, or 10, more points than a square token.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the number of points a circle token is worth.

Choice C is incorrect. This is the number of points a square token is worth.

QUESTION 12

Choice D is correct. A line in the xy -plane that passes through the points (x_1, y_1) and (x_2, y_2) has a slope of $\frac{y_2 - y_1}{x_2 - x_1}$. The line of best fit shown passes approximately through the points $(1, 3.3)$ and $(7, 14.5)$. It follows that the slope of this best fit line is approximately $\frac{14.5 - 3.3}{7 - 1}$, which is equivalent to $\frac{11.2}{6}$, or approximately 1.87. Therefore, of the given choices, 2 is closest to the slope of the line of best fit shown.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

QUESTION 13

The correct answer is 4.41. The area, A , of a circle is given by the formula $A = \pi r^2$, where r is the radius of the circle. It's given that the area of the circle is $b\pi$ square inches, where b is a constant, and the radius of the circle is 2.1 inches.

Substituting $b\pi$ for A and 2.1 for r in the formula $A = \pi r^2$ yields $b\pi = \pi(2.1^2)$.

Dividing both sides of this equation by π yields $b = 4.41$. Therefore, the value of b is 4.41.

QUESTION 14

The correct answer is 153. Since it's given that \overline{PQ} is parallel to \overline{XY} and angle Y is a right angle, angle ZQP is also a right angle. Angle ZPQ is complementary to angle XZY , which means its measure, in degrees, is $90 - 63$, or 27. Since angle XPQ is supplementary to angle ZPQ , its measure, in degrees, is $180 - 27$, or 153.

QUESTION 15

Choice C is correct. It's given that t represents the number of years since the account was opened. Therefore, $\frac{t}{10}$ represents the number of 10-year periods since the account was opened. Since the value of the account doubles during each of these 10-year periods, the value of the account can be found by multiplying the initial value by $\frac{t}{10}$ factors of 2. This is equivalent to $2^{\frac{t}{10}}$. It's given that the initial value of the account is \$890. Therefore, the value of the account $M(t)$, in dollars, t years after the account was opened can be represented by $M(t) = 890(2)^{\frac{t}{10}}$.

Choice A is incorrect. This equation represents the value of an account if the value of the account halves, not doubles, every 10 years. *Choice B* is incorrect. This equation represents the value of an account if the value of the account decreases by 90%, not doubles, every 2, not 10, years. *Choice D* is incorrect. This equation represents the value of an account if the value of the account increases by a factor of 10, not doubles, every 2, not 10, years.

QUESTION 16

Choice A is correct. The inequality $y < x$ indicates that for any solution to the given system of inequalities, the value of x must be greater than the corresponding value of y . The inequality $x < 22$ indicates that for any solution to the given system of inequalities, the value of x must be less than 22. Of the given choices, only choice A contains values of x that are each greater than the corresponding value of y and less than 22. Therefore, for choice A, all the values of x and their corresponding values of y are solutions to the given system of inequalities.

Choice B is incorrect. The values in this table aren't solutions to the inequality $y < x$. *Choice C* is incorrect. The values in this table aren't solutions to the inequality $x < 22$. *Choice D* is incorrect. The values in this table aren't solutions to the inequality $y < x$ or the inequality $x < 22$.

QUESTION 17

Choice A is correct. For positive values of a , $\frac{a^m}{a^n} = a^{(m-n)}$, where m and n are integers. Since it's given that $h > 0$ and $q > 0$, this property can be applied to rewrite the given expression as $(h^{(15-5)})(q^{(7-21)})$, which is equivalent to $h^{10}q^{-14}$. For positive values of a , $a^{-n} = \frac{1}{a^n}$. This property can be applied to rewrite the expression $h^{10}q^{-14}$ as $(h^{10})\left(\frac{1}{q^{14}}\right)$, which is equivalent to $\frac{h^{10}}{q^{14}}$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 18

Choice D is correct. Adding the second equation to the first equation in the given system of equations yields $3y - 3y = 4x + 9x + 17 - 23$, or $0 = 13x - 6$. Adding 6 to each side of this equation yields $6 = 13x$. Multiplying each side of this equation by 3 yields $18 = 39x$. Therefore, the value of $39x$ is 18.

Choice A is incorrect. This is the value of $-39x$, not $39x$. *Choice B* is incorrect. This is the value of $-13x$, not $39x$. *Choice C* is incorrect. This is the value of $13x$, not $39x$.

QUESTION 19

Choice B is correct. It's given that the function h estimates that the object is 3,364 feet above the ground when it's dropped at $t = 0$. Substituting 3,364 for $h(t)$ and 0 for t in the function h yields $3,364 = -16(0)^2 + b$, or $3,364 = b$. Substituting 3,364 for b in the function h yields $h(t) = -16t^2 + 3,364$. When the object hits the ground, its height will be 0 feet above the ground. Substituting 0 for $h(t)$ in $h(t) = -16t^2 + 3,364$ yields $0 = -16t^2 + 3,364$. Adding $16t^2$ to each side of this equation yields $16t^2 = 3,364$. Dividing each side of this equation by 16 yields $t^2 = 210.25$. Since the object will hit the ground at a positive number of seconds after it's dropped, the value of t can be found by taking the positive square root of each side of this equation, which yields $t = 14.50$. It follows that the function estimates the object will hit the ground approximately 14.50 seconds after being dropped.

Choice A is incorrect. The function estimates that 7.25 seconds after being dropped, the object's height will be $-16(7.25)^2 + 3,364$ feet, or 2,523 feet, above the ground. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 20

The correct answer is 120. The solutions to a quadratic equation of the form $ax^2 + bx + c = 0$ can be calculated using the quadratic formula and are given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. The given equation is in the form $ax^2 + bx + c = 0$, where $a = 2$, $b = -8$, and $c = -7$. It follows that the solutions to the given equation are $x = \frac{8 \pm \sqrt{(-8)^2 - 4(2)(-7)}}{2(2)}$, which is equivalent to $x = \frac{8 \pm \sqrt{64 + 56}}{4}$, or $x = \frac{8 \pm \sqrt{120}}{4}$. It's given that one solution to the equation $2x^2 - 8x - 7 = 0$ can be written as $\frac{8 - \sqrt{k}}{4}$. The solution $\frac{8 - \sqrt{120}}{4}$ is in this form. Therefore, the value of k is 120.

QUESTION 21

The correct answer is 1,660. It's given that a line intersects two parallel lines, forming four acute angles and four obtuse angles. When two parallel lines are intersected by a transversal line, the angles formed have the following properties: two adjacent angles are supplementary, and alternate interior angles are congruent. Therefore, each of the four acute angles have the same measure, and each of the four obtuse angles have the same measure. It's also given that the measure of one of the acute angles is $(9x - 560)^\circ$. If two angles are supplementary, then the sum of their measures is 180° . Therefore, the measure of the obtuse angle adjacent to any of the acute angles is $(180 - (9x - 560))^\circ$, or $(180 - 9x + 560)^\circ$, which is equivalent to $(-9x + 740)^\circ$. It's given that the sum of the measures of one of the acute angles and three of the obtuse angles is $(-18x + w)^\circ$. It follows that $(9x - 560) + 3(-9x + 740) = (-18x + w)$, which is equivalent to $9x - 560 - 27x + 2,220 = -18x + w$, or $-18x + 1,660 = -18x + w$. Adding $18x$ to both sides of this equation yields $1,660 = w$.

QUESTION 22

Choice B is correct. An equation that defines a linear function f can be written in the form $f(x) = mx + b$, where m and b are constants. It's given in the table that when $x = -4$, $f(x) = 0$. Substituting -4 for x and 0 for $f(x)$ in the equation $f(x) = mx + b$ yields $0 = m(-4) + b$, or $0 = -4m + b$. Adding $4m$ to both sides of this equation yields $4m = b$. Substituting $4m$ for b in the equation $f(x) = mx + b$ yields $f(x) = mx + 4m$. It's also given in the table that when $x = -\frac{19}{5}$, $f(x) = 1$. Substituting $-\frac{19}{5}$ for x and 1 for $f(x)$ in the equation $f(x) = mx + 4m$ yields $1 = m\left(-\frac{19}{5}\right) + 4m$, or $1 = \frac{1}{5}m$. Multiplying both sides of this equation by 5 yields $m = 5$. Substituting 5 for m in the equation $f(x) = mx + 4m$ yields $f(x) = 5x + 4(5)$, or $f(x) = 5x + 20$. If $h(x) = f(x) - 13$, substituting $5x + 20$ for $f(x)$ in this equation yields $h(x) = (5x + 20) - 13$, or $h(x) = 5x + 7$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is an equation that defines the linear function f , not h .

QUESTION 23

Choice C is correct. It's given that $g(c+7)=\frac{c}{4}$. Therefore, for the given linear function g , when $x=c+7$, $g(x)=\frac{c}{4}$. Substituting $c+7$ for x and $\frac{c}{4}$ for $g(x)$ in $g(x)=b-15x$ yields $\frac{c}{4}=b-15(c+7)$. Applying the distributive property to the right-hand side of this equation yields $\frac{c}{4}=b-15c-105$. Adding $15c$ to both sides of this equation yields $\frac{c}{4}+15c=b-105$. Adding 105 to both sides of this equation yields $\frac{c}{4}+15c+105=b$, or $\frac{61c}{4}+105=b$. Therefore, the expression that represents the value of b is $\frac{61c}{4}+105$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 24

Choice B is correct. It's given that angle Z in triangle XYZ is a right angle. Thus, side YZ is the leg opposite angle X and side XZ is the leg adjacent to angle X . The tangent of an acute angle in a right triangle is the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle. It follows that $\tan X = \frac{YZ}{XZ}$. It's given that $\tan X = \frac{12}{35}$ and the length of side YZ is 24 units.

Substituting $\frac{12}{35}$ for $\tan X$ and 24 for YZ in the equation $\tan X = \frac{YZ}{XZ}$ yields $\frac{12}{35} = \frac{24}{XZ}$. Multiplying both sides of this equation by $35(XZ)$ yields $12(XZ) = 24(35)$, or $12(XZ) = 840$. Dividing both sides of this equation by 12 yields $XZ = 70$. The length XY can be calculated using the Pythagorean theorem, which states that if a right triangle has legs with lengths of a and b and a hypotenuse with length c , then $a^2 + b^2 = c^2$. Substituting 70 for a and 24 for b in this equation yields $70^2 + 24^2 = c^2$, or $5,476 = c^2$. Taking the square root of both sides of this equation yields $\pm 74 = c$. Since the length of the hypotenuse must be positive, $74 = c$. Therefore, the length of XY is 74 units. The perimeter of a triangle is the sum of the lengths of all sides. Thus, $(74 + 70 + 24)$ units, or 168 units, is the perimeter of triangle XYZ .

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This would be the perimeter, in units, for a right triangle where the length of side YZ is 12 units, not 24 units. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 25

Choice C is correct. It's given that in the xy -plane, the graph of the given equation is a circle. The equation of a circle in the xy -plane can be written in the form $(x-h)^2 + (y-k)^2 = r^2$, where (h, k) is the center of the circle and r is the length of the circle's radius. Subtracting $6y$ from both sides of the equation $x^2 + 14x + y^2 = 6y + 109$ yields $x^2 + 14x + y^2 - 6y = 109$.

By completing the square, this equation can be rewritten as

$$\left(x^2 + 14x + \left(\frac{14}{2}\right)^2\right) + \left(y^2 - 6y + \left(\frac{-6}{2}\right)^2\right) = 109 + \left(\frac{14}{2}\right)^2 + \left(\frac{-6}{2}\right)^2. \text{ This equation}$$

can be rewritten as $(x^2 + 14x + 49) + (y^2 - 6y + 9) = 109 + 49 + 9$, or $(x+7)^2 + (y-3)^2 = 167$. Therefore, $r^2 = 167$. Taking the square root of both sides of this equation yields $r = \sqrt{167}$ and $r = -\sqrt{167}$. Since r is the length of the circle's radius, r must be positive. Therefore, the length of the circle's radius is $\sqrt{167}$.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice B is incorrect and may result from conceptual or calculation errors.
Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice B is correct. It's given that the speed of a vehicle is increasing at a rate of 7.3 meters per second squared. It's given to use 1 mile = 1,609 meters. There are 60 seconds in 1 minute; therefore, 60^2 or 3,600 seconds squared is equal to 1 minute squared. It follows that the rate of 7.3 meters per second squared is equivalent to $\left(\frac{7.3 \text{ meters}}{1 \text{ second squared}}\right)\left(\frac{1 \text{ mile}}{1,609 \text{ meters}}\right)\left(\frac{3,600 \text{ seconds squared}}{1 \text{ minute squared}}\right)$, or approximately 16.33 miles per minute squared. The rate, in miles per minute squared, rounded to the nearest tenth is 16.3.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect and may result from conceptual or calculation errors.
Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 27

The correct answer is 14. It's given by the first equation of the system of equations that $y = -2.5$. Substituting -2.5 for y in the second given equation, $y = x^2 + 8x + k$, yields $-2.5 = x^2 + 8x + k$. Adding 2.5 to both sides of this equation yields $0 = x^2 + 8x + k + 2.5$. A quadratic equation of the form $0 = ax^2 + bx + c$, where a , b , and c are constants, has no real solutions if and only if its discriminant, $b^2 - 4ac$, is negative. In the equation $0 = x^2 + 8x + k + 2.5$, where k is a positive integer constant, $a = 1$, $b = 8$, and $c = k + 2.5$. Substituting 1 for a , 8 for b , and $k + 2.5$ for c in $b^2 - 4ac$ yields $8^2 - 4(1)(k + 2.5)$, or $64 - 4(k + 2.5)$. Since this value must be negative, $64 - 4(k + 2.5) < 0$. Adding $4(k + 2.5)$ to both sides of this inequality yields $64 < 4(k + 2.5)$. Dividing both sides of this inequality by 4 yields $16 < k + 2.5$. Subtracting 2.5 from both sides of this inequality yields $13.5 < k$. Since k is a positive integer constant, the least possible value of k is 14.