

# PSAT/NMSQT Practice Test #2

Exam Materials

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Answer Key Materials

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# PSAT/NMSQT®

Preliminary SAT/National Merit Scholarship Qualifying Test

# Practice Test #2

**Make time to take the practice test.**

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

# PSAT/NMSQT®

Preliminary SAT/National Merit Scholarship Qualifying Test

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## 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

Novelist Leon Forrest admired William Faulkner's writing style. Forrest's novel *Divine Days* contains a long passage in tribute to Faulkner that is a perfect \_\_\_\_\_ of Faulkner's style: anyone familiar with Faulkner's writing would see the resemblance.

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

- A) forgetting
- B) rejection
- C) imitation
- D) opinion

2

Shoppers can help keep money cycling within a community by making purchases at small local businesses instead of large retailers. Some cities are \_\_\_\_\_ programs to encourage this behavior, establishing reward points and other incentives for shopping at small businesses.

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

- A) instituting
- B) occupying
- C) underestimating
- D) encountering

3

Economists often assert that countries looking to increase their reliance on solar energy should expand their capacity for storage; having an ample reserve of stored energy can mitigate the effects of \_\_\_\_\_ solar energy collection caused by unpredictable shifts in cloud cover and haze.

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

- A) developments of
- B) fluctuations in
- C) calibrations with
- D) incentives for

4

As discussed by scholar Anna Mladentseva, many artworks produced in the mid-1990s to the early 2000s exclusively for exhibition on the internet, such as Sinae Kim’s *Genesis* (2001), have become inaccessible because viewing them requires the use of \_\_\_\_\_ software (most notably Adobe Flash, discontinued in 2021).

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

- A) defunct
- B) arcane
- C) ubiquitous
- D) extraneous

5

The following text is from the 1989 novel *The Ancient Child* by Kiowa writer N. Scott Momaday. The main character has achieved tremendous commercial success as a painter.

More and more often he was asked to compromise his art or himself in one way or another, and more often than not he did so, for he was inclined to be passive and naïve; it was difficult for him to say no. Those who exhibited his work, who praised and purchased it, and who demanded its proliferation began to determine it.

©1989 by N. Scott Momaday

As used in the text, what does the word “determine” most nearly mean?

- A) Conclude
- B) Dictate
- C) Evaluate
- D) Select

6

Ordinary soap bubbles usually exist for a minute or less before popping due to either a rupture forced by gravity-induced drainage or the evaporation of the liquid from which the bubble is composed. But physicist Aymeric Roux and colleagues discovered ways to mitigate these factors, resulting in bubbles that can last for a year or more. For example, glycerol tends to adhere to water molecules, so a bubble with a shell that contains both water and glycerol is able to draw additional water molecules from the surrounding air and thereby compensate for evaporation.

Which choice best states the purpose of the underlined portion in the text as a whole?

- A) It describes the effects of a process devised by researchers that increases the longevity of an object discussed in the text.
- B) It details the circumstances that prompted the research discussed in the text.
- C) It presents a reason why the phenomenon discussed in the text that the researchers wanted to avoid will inevitably occur.
- D) It mentions a method discussed in the text that researchers intend to test in future experiments.

7

Generally it takes Tule geese about four days to migrate south for the winter. From their summer breeding grounds in Cook Inlet, Alaska, the birds begin by flying over the Gulf of Alaska, keeping about 100 miles from the Canadian shore. They pause to rest on the Pacific Ocean, then fly toward Summer Lake, Oregon, before finally arriving at their winter destination of Sacramento Valley, California. In 2020, however, it took the geese over twice as long to make their way from Cook Inlet to Sacramento Valley. According to researchers, the reason was airborne pollutants.

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

- A) It illustrates a change in Tule geese's usual flight behavior.
- B) It suggests an explanation for why Tule geese breed in Alaska.
- C) It describes part of the Tule geese's typical winter migration journey.
- D) It compares Tule geese to other birds that migrate south for the winter.

8

In 1154, Muhammad al-Idrisi completed a collection of maps of the lands known to medieval Arabic and European scholars. This collection was titled *Al-Kitāb al-Rujārī (The Book of Roger)*, after the Norman king Roger II who hired him to create it. To create the collection, al-Idrisi consulted Arabic and Greek maps and interviewed travelers about the lands they visited. He included these travelers' stories alongside the map illustrations.

Which choice best states the main purpose of the text?

- A) To discuss the benefits of studying mapmaking
- B) To explain how travelers created maps
- C) To describe a collection of medieval maps and how it was created
- D) To compare medieval Arabic and Greek mapmaking techniques

9

A study by Dr. Paul Hanel and colleagues concluded that people are more likely to behave politely when listening to ideas they disagree with if they think about values before they engage in a discussion. Study participants were assigned to one of two groups. The experimental group spent a few minutes writing about one of their personal values before they had a group discussion on a controversial topic. And the control group spent a few minutes writing about a drink (tea, milk, etc.) before their group discussion on that topic. Hanel and colleagues found that the experimental group's discussion was more civil than the control group's discussion was.

Which choice best describes the main purpose of the text?

- A) To describe a widely held belief and how a study's results support that belief
- B) To argue that researchers were surprised by the results of a certain study
- C) To suggest ways to improve a certain study's experimental design
- D) To explain a study's conclusion and how a research team arrived at that conclusion

10

In the 1960s, Chavela Vargas became an unlikely star in ranchera, a style of traditional Mexican music. Most ranchera singers had clear, polished voices and performed with a full band. But Vargas accompanied her raspy voice with just her guitar. Dressed in men's trousers and a poncho, she would perform classic songs that had been written from a male point of view and were usually sung by men. She also altered those songs by performing them much more slowly than other ranchera singers did. The slower tempo allowed her to express the emotional quality of the lyrics more fully.

According to the text, what is one way that Vargas differed from other ranchera singers?

- A) She possessed a voice that was clear and polished.
- B) She avoided singing songs written from a male point of view.
- C) She disliked performing classic songs.
- D) She altered classic songs by slowing them down.

11

Archaeologists have discovered a runestone in Norway that may contain the earliest example of written words in Scandinavia. Carbon dating at the discovery site revealed that the stone was likely carved between 1 and 250 CE. Runologist Kristel Zilmer believes the stone will be helpful in learning more about the use of runic alphabets in early Iron Age Scandinavia.

Which choice best states the main topic of the text?

- A) Battles of the Iron Age
- B) A runestone found in Norway
- C) A new method for dating rock samples
- D) The research interests of Kristel Zilmer

12

In her 1998 book *Blues Legacies and Black Feminism*, Angela Y. Davis bases her analysis in part on recordings of songs sung in the 1920s by Gertrude "Ma" Rainey and Bessie Smith. Davis focuses on how Rainey and Smith improvised the lyrics—replacing the original lines with mischievous jokes and wordplay. Davis's work was particularly labor intensive because in order to transcribe, or write down, the lyrics as Rainey and Smith sang them, Davis had to listen repeatedly to the vinyl recordings, which weren't very clear.

What does the text most strongly suggest about the songs sung by Rainey and Smith?

- A) The songs have grown in popularity since Rainey and Smith first sang them.
- B) There were more recordings made of Rainey's songs than there were of Smith's.
- C) There were few, if any, reliable transcriptions of Smith's and Rainey's improvised lyrics when Davis began her research.
- D) According to Davis, the songs sung by Rainey were more musically innovative than those sung by Smith typically were.

13

*Happy House* is a 1920 novel by Jane Abbott. The narrator presents a young woman as being unimpressed with the house she is visiting: \_\_\_\_\_

Which quotation from *Happy House* most effectively illustrates the claim?

- A) "Her first feeling was of disappointment; in the square lines of the house there was little claim to beauty."
- B) "Someone had opened one of the blinds so here there was more light."
- C) "The door, built squarely in the middle of the house, opened almost directly upon a stone-flagged path that led in a straight line to the road."
- D) "She tip-toed through the hall and opened the door on the right."

14

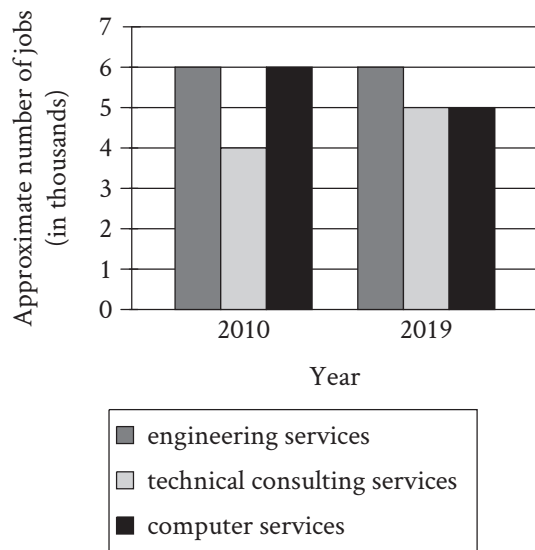
Ochre sea stars live in tidal pools along the shoreline of the Pacific Ocean. At night, they move to higher shore levels in search of prey. But scientists Corey Garza and Carlos Robles noticed that ochre sea stars stayed at lower levels at night after heavy rains. Garza and Robles hypothesized that a layer of fresh water formed by rainfall was a barrier to the sea stars. To test their hypothesis, the scientists did an experiment. They placed some sea stars in a climbable tank of seawater and other sea stars in a similar tank of seawater with a layer of fresh water on top. Then, the scientists watched the sea stars' behavior at night.

Which finding from the experiment, if true, would most directly support Garza and Robles's hypothesis?

- A) None of the sea stars climbed to the tops of the tanks, but sea stars in the tank with only seawater moved around the bottom of the tank more than sea stars in the other tank did.
- B) Sea stars in the tank with only seawater climbed to the top of the tank, but sea stars in the other tank stopped climbing just below the layer of fresh water.
- C) Both groups of sea stars climbed to the tops of the tanks, but sea stars in the tank with only seawater climbed more slowly than sea stars in the other tank did.
- D) Sea stars in the tank with only seawater mostly stayed near the bottom of the tank, but sea stars in the other tank climbed into the layer of fresh water.

15

Employment in Technology in  
Hawaii in 2010 and 2019



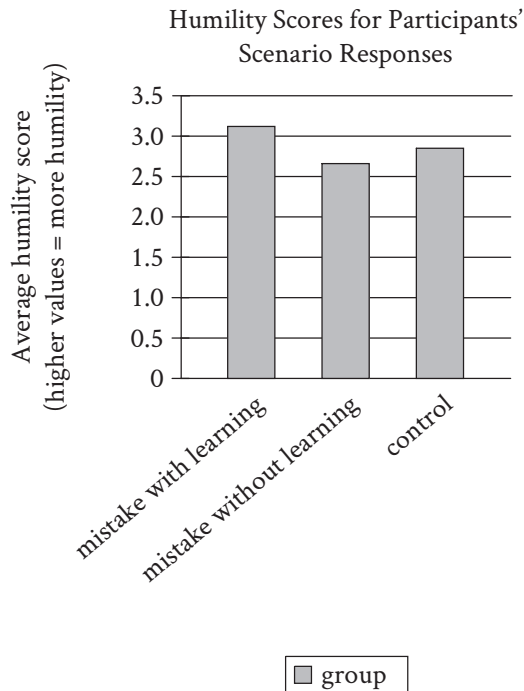
A student in Hawaii is interested in pursuing a career in technology and decides to do some research on local trends. The student notices that the number of jobs in computer services in 2010 was \_\_\_\_\_

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

- A) higher than the number of jobs in technical consulting services, and in 2019 was about the same as the number of jobs in engineering services.
- B) about the same as the number of jobs in engineering services, and in 2019 was about the same as the number of jobs in technical consulting services.
- C) lower than the number of jobs in engineering services, but in 2019 was higher than the number of jobs in engineering services.
- D) about the same as the number of jobs in technical consulting services, but in 2019 was lower than the number of jobs in technical consulting services.



16



Jia Hu and colleagues hypothesized that workplace leaders who reflect on lessons learned from past mistakes are likely to exhibit more humility than leaders who don't engage in such reflection. To test this, the team placed 301 managers in one of three groups. Participants in two experimental groups were asked to reflect on a mistake, one group focusing on a mistake that resulted in learning and the other group focusing on a mistake that didn't result in learning. Participants in a control group were asked to reflect on their daily routine. All the participants then described how they would respond to a workplace scenario. After evaluating the responses for evidence of humility, the researchers concluded that their hypothesis was correct.

Which choice best describes data in the graph that support the researchers' conclusion?

- A) None of the three groups' average humility scores exceeded 3.5.
- B) The managers in the control group exhibited only slightly less humility on average than the managers in the two experimental groups did.
- C) The managers who reflected on a past mistake that resulted in learning exhibited more humility on average than the managers in the other two groups did.
- D) All three groups exhibited less humility on average than the researchers expected.

17

If an animal has been extinct for a long time, how can scientists learn what color it was? One group of scientists came up with a possible answer. When the scientists examined the fossilized feather of an extinct bird, they found melanosomes in it. Melanosomes produce pigment, or grains of color, inside cells. Because melanosomes are shaped differently depending on which colors they produce, the scientists hypothesized that they could \_\_\_\_\_

Which choice most logically completes the text?

- A) show how melanosomes can be found in fossils belonging to animals from other extinct species.
- B) determine the colors of the bird based on the appearance of the melanosomes in the feather.
- C) explain why the melanosomes in the feather were so well preserved.
- D) identify the colors of extinct animals whose fossils lack melanosomes.

18

Silicon-based photovoltaic cells account for 95% of the cells used in solar panels worldwide despite converting an average of only 18–22% of the sunlight that reaches them. In a study addressing this relative inefficiency, a team led by Laura Miranda-Pérez demonstrated that the addition of a thin layer of the mineral perovskite—which captures the blue range of light in the solar spectrum, whereas silicon captures the red range—allows the cells to convert 29.5% or more of the Sun’s energy into usable electricity. Cells made with only perovskite, however, are no more efficient than silicon-based ones. It’s reasonable to conclude, then, that \_\_\_\_\_

Which choice most logically completes the text?

- A) photovoltaic cells with both silicon and perovskite are more efficient because they make use of more of the solar spectrum.
- B) photovoltaic cells with only perovskite and no silicon would likely convert more than 29.5% of the Sun’s energy.
- C) solar power will remain elusive until photovoltaic cells are replaced with a more practical technology.
- D) researchers need to evaluate whether other minerals like perovskite are as effective as perovskite seems to be.

19

In 1953, a fellow performer tripped on legendary jazz musician Dizzy Gillespie's trumpet, bending its bell upward. When Gillespie tested the damaged instrument, he realized that he \_\_\_\_\_ sound of a bent bell over that of a straight one.

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

- A) preferred; the
- B) preferred the
- C) preferred, the
- D) preferred. The

20

From 1912 to 1951, Charlotta Bass owned and operated the newspaper *The California Eagle*. While it was under Bass's leadership, *The Eagle* \_\_\_\_\_ one of the US's most influential Black-owned newspapers.

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

- A) will become
- B) became
- C) is becoming
- D) to become

21

To illustrate Albert Einstein's special theory of relativity, picture two jugglers: one juggling on a steadily moving parade float, the other juggling while standing still on a sidewalk. The laws of physics are identical for both \_\_\_\_\_ motion relative to each other. But what, Einstein wondered, about the speed of light?

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

- A) jugglers', regardless of they're
- B) jugglers, regardless of there
- C) juggler's, regardless of their
- D) jugglers, regardless of their

22

Horsepower is a unit of measurement used to determine how much power a vehicle produces. The measurement is based on how much and how quickly weight can be \_\_\_\_\_ one unit of mechanical horsepower is equivalent to the amount of power it takes to lift 550 pounds one foot off the ground in one second.

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

- A) moved, for example,
- B) moved,
- C) moved; for example,
- D) moved

23

Solarpunk is an art movement that imagines renewable energy-powered technology infused complementarily into nature. In Paolo Bacigalupi's solarpunk short story "Efficiency," an artificial intelligence that absorbs sustainable energies, redistributing them through intricate networks of weights and generators, \_\_\_\_\_ Chicago's energy grid.

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

- A) have been powering
- B) power
- C) powers
- D) are powering

24

*Butterfly* is a 1988 painting by the Japanese artist Ay-O. Like many of Ay-O's paintings, *Butterfly*, which portrays a swimmer performing the butterfly stroke, attempts to make use of the entire visual light \_\_\_\_\_ sporting rainbow-striped goggles, the rainbow-hued swimmer splashes through a wavy rainbow of water.

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

- A) spectrum
- B) spectrum:
- C) spectrum while
- D) spectrum, while

25

The relationship between genomes and epigenomes reveals how cells with identical DNA develop different \_\_\_\_\_ whereas the genome in each cell contains a complete DNA sequence, the epigenome consists of chemical compounds that determine which traits in the sequence will be expressed.

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

- A) functions
- B) functions,
- C) functions and,
- D) functions:

26

In order to create the Global Positioning System (GPS), scientists had to develop an accurate mathematical model of Earth's shape that accounted for various forces, such as tides. \_\_\_\_\_ it was mathematician Gladys West who wrote the computer program that could perform these necessary calculations.

Which choice completes the text with the most logical transition?

- A) Ultimately,
- B) In other words,
- C) Secondly,
- D) In addition,

27

In 1942, the 1,500-mile Alaska Highway was constructed in under nine months, largely due to the skilled work of nearly 4,000 African American soldiers from US Army engineering regiments. The soldiers' contribution was overlooked for decades. \_\_\_\_\_ in 2017, lawmakers declared October 25 a day of recognition—"Alaska Highway Day"—for the troops who helped build this critical roadway.

Which choice completes the text with the most logical transition?

- A) Lastly,
- B) Then,
- C) Similarly,
- D) For example,

28

The Coastal Futures Conservatory in Virginia is known for creating aural representations of ecological data. One such effort combines underwater audio recorded in seagrass beds with data that track rising carbon levels in the seagrass. As carbon levels increase, the audio is correspondingly distorted; \_\_\_\_\_ listeners can "hear" the changes in the carbon levels.

Which choice completes the text with the most logical transition?

- A) furthermore,
- B) by comparison,
- C) for instance,
- D) thus,

29

Observing that a fire in a closed container soon went out, leading eighteenth-century scientists did not conclude that fresh air (specifically, oxygen) is necessary for combustion; instead, many theorized that the container's air had become saturated with a substance called phlogiston. \_\_\_\_\_ when Joseph Priestley first isolated oxygen gas in 1774, he termed it "dephlogisticated air."

Which choice completes the text with the most logical transition?

- A) In other words,
- B) For this reason,
- C) Alternatively,
- D) Nevertheless,

30

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

- Komodo dragons are the largest lizards in the world.
- They live on four islands in Komodo National Park, Indonesia.
- The park has a total of twenty-nine islands.

The student wants to emphasize how many islands in Komodo National Park have Komodo dragons living on them. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) Komodo dragons, the world's largest lizards, live on islands in Komodo National Park, Indonesia.
- B) The largest lizards in the world are found in Komodo National Park.
- C) Only four of the twenty-nine islands in Komodo National Park have Komodo dragons living on them.
- D) There are twenty-nine islands in Indonesia's Komodo National Park.

31

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

- Pointillism is a painting technique in which small, distinct dots of color are applied in patterns to form an image.
- Betty Acquah is an artist from Ghana who uses pointillism in her work.
- "By extending dabs of color in the subject matter into the background and vice-versa, an illusion of movement is created," she says about pointillism.
- Her work often portrays Ghanaian women, whom she sees as the "unsung heroines of the Ghanaian Republic."
- Her pointillist painting "Exquisite" (2016) features five dancing women twirling their skirts.

The student wants to provide a quotation from Acquah that explains why she used pointillism in "Exquisite." Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) In painting "Exquisite," Acquah applied pointillism to create what she called an "illusion of movement" within the painting's five dancing women and their twirling skirts.
- B) Pointillism, the technique used in Acquah's "Exquisite," involves the application of small, distinct dots of color.
- C) In "Exquisite," Acquah uses a technique that she says involves "extending dabs of color in the subject matter into the background and vice-versa."
- D) "Exquisite" portrays Acquah's fellow Ghanaian women as she sees them: the "unsung heroes of the Ghanaian Republic."

32

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

- *The Ramayana* is a Sanskrit epic poem from ancient India.
- In *The Ramayana*, the character Kaikeyi is often portrayed as a villain.
- *Kaikeyi* is a 2022 novel by Vaishnavi Patel.
- The novel is a retelling of the epic poem from Kaikeyi's point of view.
- It often portrays Kaikeyi as heroic.

The student wants to emphasize whose point of view the novel is told from. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- From the point of view of *The Ramayana*, the character Kaikeyi is often a villain.
- Vaishnavi Patel often portrays the character as heroic.
- Kaikeyi* is a retelling of *The Ramayana* from the character Kaikeyi's point of view.
- The Ramayana* is an epic poem that features the character Kaikeyi.

33

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

- Marcela Guerrero is a curator at the Whitney Museum of American Art in New York.
- She curated the Whitney's 2018 exhibition *Pacha, Llaqta, Wasichay: Indigenous Space, Modern Architecture, New Art*.
- This exhibition featured works by seven emerging Latino artists.
- She curated the Whitney's 2020 exhibition *Vida Americana: Mexican Muralists Remake American Art, 1925–1945*.
- This exhibition included nearly 200 works by twentieth-century Latino and Mexican artists.

The student wants to describe the exhibition that Guerrero curated in 2018. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- Held at the Whitney Museum of American Art, the exhibition *Vida Americana: Mexican Muralists Remake American Art, 1925–1945* included nearly 200 works by twentieth-century Mexican and Latino artists.
- Pacha, Llaqta, Wasichay: Indigenous Space, Modern Architecture, New Art*, an exhibition at the Whitney Museum of American Art, featured works by seven emerging Latino artists.
- In both 2018 and 2020, Marcela Guerrero curated exhibitions at the Whitney Museum of American Art in New York.
- While one exhibition that Marcela Guerrero curated featured works by emerging artists, another included works by twentieth-century artists.

# 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

A unique dialect, or regional variety, of Spanish is spoken in Puerto Rico. It contains many words borrowed from the language of the Taínos, the Indigenous people of Puerto Rico. African languages also made important contributions to the Puerto Rican dialect. For example, the way certain vowel sounds are pronounced in it can be \_\_\_\_\_ to how they are pronounced in Yoruba, a West African language.

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

- A) traced
- B) surrendered
- C) announced
- D) offered

2

The Menominee and Anishinaabe peoples have been growing wild rice—known as *manoomin* in the Ojibwe language—in the Great Lakes region of North America for centuries, but climatic changes are causing lakes to get deeper, thereby threatening wild rice. These plants are extremely \_\_\_\_\_ to water depth during the “floating leaf” stage of development, and if the water is too deep, the buoyancy of the young wild-rice plants can literally uproot them from the lake bottom, destroying them.

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

- A) immune
- B) sensitive
- C) limited
- D) receptive



3

The invention in 1958 of the integrated circuit (or microchip) radically altered the semiconductor industry. In fact, some historians argue that it fundamentally \_\_\_\_\_ the industry by enabling it to take advantage of mass production methods for the first time.

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

- A) overwhelmed
- B) bypassed
- C) obstructed
- D) transformed

4

The early British postal system required the cost of mail delivery to be paid upon receipt, a system which encouraged inventive strategies by the intended recipient to avoid payment. To improve this system, \_\_\_\_\_ were proposed in 1837, including the use of a postage stamp, a small receipt pasted to the mail indicating that delivery costs had been paid by the sender.

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

- A) investigations
- B) expansions
- C) reforms
- D) possessions

5

Economist Jingting Fan argues that the effects of international trade may display spatial variation at sub-national levels. For instance, imported goods may reduce expenses for a country's average consumer, but for consumers living far from ports, high intranational transport costs could \_\_\_\_\_ the price advantages associated with imports.

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

- A) nullify
- B) denigrate
- C) underestimate
- D) misconstrue

6

The following text is from the 1895 poem "Marshlands" by Emily Pauline Johnson, a Kanienkahagen (Mohawk) writer also known as Tekahionwake.

Among the wild rice in the still lagoon,  
In monotone the lizard shrills his tune.  
The wild goose, homing, seeks a sheltering,  
Where rushes grow, and oozing lichens cling.  
Late cranes with heavy wing, and lazy flight,  
Sail up the silence with the nearing night.  
And like a spirit, swathed in some soft veil,  
Steals twilight and its shadows o'er the swale.  
Hushed lie the sedges, and the vapours creep,  
Thick, grey and humid, while the marshes sleep.

Which choice best describes the overall structure of the text?

- A) It names animal species found in a place, then names plant species there.
- B) It sketches a setting by presenting a series of images of nature.
- C) It makes an extended comparison of nature to human emotions.
- D) It identifies a location, then refers to a person living there.

7

The following text is from Annie Dillard’s 1987 autobiographical novel *An American Childhood*. The narrator is a young girl living in Pittsburgh.

I walked. My mother had given me the freedom of the streets as soon as I could say our telephone number. I walked and memorized the neighborhood. I made a mental map and located myself upon it. At night in bed I rehearsed the small world’s scheme and set challenges: Find the store using backyards only. Imagine a route from the school to my friend’s house.

©1987 by Annie Dillard

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

- A) It describes the narrator trying to memorize her telephone number.
- B) It provides examples of what the narrator thinks about at night.
- C) It gives directions to the narrator’s favorite local store.
- D) It portrays the narrator’s relationship with her mother.

8

Asteroid 6478 Gault has experienced intermittent mass loss since at least 2013, but in contrast to some other asteroids with repeated mass-loss episodes, 6478 Gault has not lost mass at its perihelion (the closest point of its orbit to the Sun), and thus the loss is not attributable to solar energy–driven ice vaporization. And as Jane X. Luu et al. point out, the singular nature of impact ejection makes it untenable as an account of multiple loss episodes of similar duration over several years. Instead, Luu et al. are likely correct that 6478 Gault is shedding mass due to rotational instability.

Which choice best describes the overall structure of the text?

- A) It presents a scientific observation, describes a contrast between that observation and other observations, and then explains why those other observations should not be considered credible.
- B) It describes an astronomical finding, discusses competing theories about that finding that the author regards as flawed, and then describes new evidence that supports an alternative theory.
- C) It introduces a natural phenomenon, refutes two potential explanations for that phenomenon, and then presents a third explanation for that phenomenon that the author regards as plausible.
- D) It discusses a physical process, evaluates possible causes of that process, and then states that a persuasive account of the process has yet to be put forward.

**Text 1**

Mycoprotein is a fungal biomass that can be eaten as an alternative to meat. Studies of the environmental impact of its manufacture generally agree it is lower than that of beef and closer to that of chicken or pork. But the expense of producing mycoprotein restricts its availability to a few countries with postindustrial economies. Knowing that cost reductions would expand access to mycoprotein, biochemists are exploring solutions, such as a cheaper substrate to feed the mycoprotein as it grows.

**Text 2**

Cattle farming is a principal cause of global deforestation, and a study by Florian Humpenöder and his colleagues found that replacing 20% of beef consumption worldwide with consumption of mycoprotein would cut deforestation by half if accomplished over the next thirty years. However, this would likely involve only a small change in agricultural water consumption, since water once dedicated to raising cattle would be diverted to raising crops instead.

Based on the texts, how would the author of Text 1 most likely respond to the study findings mentioned in Text 2?

- A) By emphasizing that since agricultural water consumption would remain static in the event of replacing beef consumption with mycoprotein consumption, an effort must be made to substitute mycoprotein for chicken and pork in diets as well
- B) By asserting that the development of a more inexpensive substrate for mycoprotein production would contribute to the goal of decreasing worldwide deforestation over time
- C) By noting that most people would be more likely to use mycoprotein as a substitute for chicken or pork in their diets than as a substitute for beef
- D) By pointing out that some countries are responsible for greater deforestation than others and thus, to have any significant effect on the environment, will have to replace more than 20% of their beef consumption with mycoprotein

10

When fashion designer Lloyd Henri Kiva New opened his store in Scottsdale, Arizona, in 1945, he quickly became known for creating delicately crafted leather goods, like belts and hats. He was perhaps most renowned for his colorful handbags, which he made by hand using a long and painstaking process. As he gained more customers, New began using sewing machines and other tools to help him produce bags more efficiently, though he continued to handcraft the crucial details that made each bag unique.

Based on the text, what would have been the most likely consequence if New had not begun using sewing machines?

- A) He would have been unable to ensure that each bag included unique, handcrafted details.
- B) He would have struggled to meet the increasing demand for his bags.
- C) He would have had to individually design each bag he produced.
- D) He would not have been able to generate as much interest in his bags.

11

The following text is from Anton Chekhov's 1898 short story "Ionitch" (translated by Marian Fell in 1915). The text is set in a Russian city referred to as the city of S.

If newcomers to the little provincial city of S. complained that life there was monotonous and dull, its inhabitants would answer that, on the contrary, S. was a very amusing place, indeed, that it had a library and a club, that balls were given there, and finally, that very pleasant families lived there with whom one might become acquainted. And they always pointed to the Turkins as the most accomplished and most enlightened family of all.

What does the text suggest about the Turkins?

- A) They are relative newcomers to the city of S.
- B) They have a unique status in the city of S.
- C) They have long disliked living in the city of S.
- D) They are amused by the other residents of the city of S.

12

The following text is from Milan Kundera's 1984 novel *The Unbearable Lightness of Being* (translated by Michael Henry Heim in 1984). Karenin is a dog that belongs to Tomas and Tereza.

Karenin was not overjoyed by the move to Switzerland [from Prague]. Karenin hated change. Dog time cannot be plotted along a straight line; it does not move on and on, from one thing to the next. It moves in a circle like the hands of a clock, which—they, too, unwilling to dash madly ahead—turn round and round the face, day in and day out following the same path. In Prague, when Tomas and Tereza bought a new chair or moved a flower pot, Karenin would look on in displeasure. It disturbed his sense of time. It was as though they were trying to dupe the hands of the clock by changing the numbers on its face.

©1984 by Milan Kundera. Translation  
©1984 by Harper & Row, Publishers, Inc.

Which choice best states the main idea of the text?

- A) As a dog, Karenin possesses a sense of time that involves a strong preference for predictability and an aversion to disruption.
- B) After he's moved to a new home, Karenin's negative response to changes has become more pronounced.
- C) Similar to Tomas and Tereza, Karenin comprehends time as circular rather than as a straightforward progression.
- D) As is the case for other dogs, Karenin's sense of time seems to accelerate depending on the objects and places that surround him.

Incorporated and Unincorporated Self-Employment Rates  
in Four Occupational Fields, 2015

Occupational field	Incorporated self-employment rate	Unincorporated self-employment rate
Construction and resource extraction	4.4%	14.8%
Installation, maintenance, and repair	2.7%	6.2%
Management, business, and financial services	8.9%	9.7%
Sales and related	5.8%	7.8%

Self-employed workers—individuals who are not employees of other individuals or businesses but instead earn their income as business owners, independent contractors, or freelance workers—make up an important part of the US labor force. In order to receive legal and tax benefits enjoyed by corporations, self-employed individuals may choose to incorporate their business. A 2015 survey of incorporated and unincorporated self-employment rates in four occupational fields showed that the highest incorporated self-employment rate occurred among people working in \_\_\_\_\_

Which choice most effectively uses data from the table to complete the text?

- A) sales and related occupations.
- B) installation, maintenance, and repair occupations.
- C) construction and resource extraction occupations.
- D) management, business, and financial services occupations.

14

*There Is Confusion* is a 1924 novel by Jessie Redmon Fauset. In the novel, the narrator portrays the character Joanna as someone who admires ambition in other people to the exclusion of all other qualities:

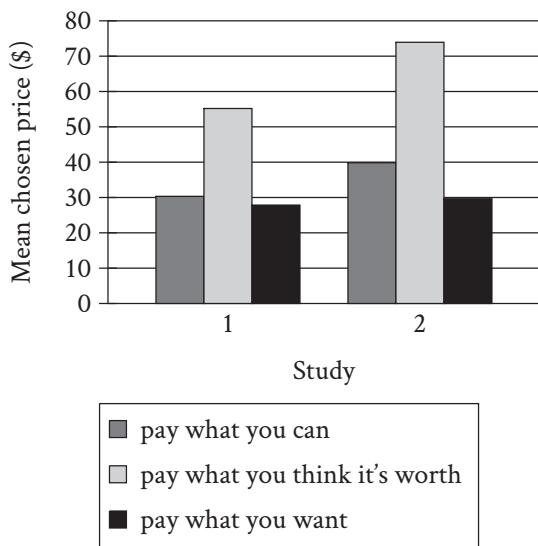
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Which quotation from *There Is Confusion* most effectively illustrates the claim?

- A) “Joanna was mightily interested in people who had a ‘purpose’ in life. Otherwise not at all.”
- B) “Indeed from the very beginning Joanna showed her preference for her father.”
- C) “Joanna was like her father not only so far as ambition was concerned but also in her willingness to work.”
- D) “She had a good sense of logic, a strong power of concentration, and a remarkably retentive and visualizing memory.”

15

Mean Ticket Prices Chosen in Two Studies  
of Participative Pricing Messaging



Participative pricing, in which purchasers choose the prices they pay for products, can enable sellers to capitalize on the heterogeneous values consumers assign to the same goods and services, but doing so requires careful messaging. Annie Peng Cui and Jennifer Wiggins recruited 171 participants (ages 18–60) online for an initial study and 83 students (ages 18–31) at a state university for a second study to test the effect of three different messages—“pay what you can,” “pay what you think it’s worth,” and “pay what you want”—on how much participants would pay for concert tickets. Their results illustrate both the heterogeneity of consumer valuations and how sellers can benefit by prompting consumers to consider their own valuations: \_\_\_\_\_

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

- A) the students tended to value the concert tickets more highly than did the more age-diverse group recruited online, but when considering what they could afford to pay, the students tended to choose a lower price than did the other group.
- B) in all three messaging conditions, the group of participants recruited online tended to choose lower prices than did the students, but both groups tended to choose prices closest to the actual cost of the tickets when prompted to consider the tickets’ value.
- C) the students tended to value the concert tickets more highly than did the more age-diverse group recruited online, but both groups tended to choose a higher price when considering the value of the tickets than when considering what they could afford or wanted to pay.
- D) within each group of participants, there was wide variation in the value that individuals assigned to the concert tickets, but the students tended to assign a higher value to the tickets than did the more age-diverse group recruited online.



16

Initially observed in 2017, the interstellar object ‘Oumuamua is the first object of its kind to be seen in our solar system. Researchers have been puzzled because its acceleration cannot be entirely explained by the gravitational pull of nearby bodies: there must be a nongravitational influence on its velocity and trajectory. Some previously suggested explanations for this nongravitational acceleration involve mechanisms that are unlikely or unrealistic, such as geometric effects from ‘Oumuamua being potentially composed of several spatially separated bodies. Now, Jennifer Bergner and colleagues propose that the nongravitational acceleration is due to the gaseous expulsion of entrapped hydrogen from ‘Oumuamua’s water-rich icy body.

Which statement, if true, would most strongly support the claim made by Bergner and colleagues about the cause of ‘Oumuamua’s acceleration?

- A) Existing proposed models of outgassing from ‘Oumuamua include the direct conversion of nitrogen or carbon monoxide from a solid to a gaseous state without becoming liquid, but these models have theoretical or observational inconsistencies.
- B) ‘Oumuamua’s trajectory is inconsistent with a nongravitational acceleration that would be caused by the release of hydrogen gas resulting from the processing of water ice ( $\text{H}_2\text{O}$ ), but the interstellar object’s observable properties can be explained if it has a significant component of molecular hydrogen ice ( $\text{H}_2$ ).
- C) Since nongravitational accelerations of interstellar objects are several orders of magnitude weaker than gravitational accelerations, deviation from behavior that could be fully attributed to gravitational pull has been detected on a limited number of objects similar to ‘Oumuamua.
- D) Exposure to interstellar cosmic radiation can result in the formation of embedded pockets of hydrogen gas in water ice; moreover, when traveling through the solar system, ‘Oumuamua experienced warming sufficient to alter its icy structure and allow for outgassing.

17

A main goal of the Association for the Advancement of Creative Musicians (AACM), an arts organization founded in 1965, is to advance new works by Black musicians. The AACM achieves this goal in part by focusing on young artists. By having established musicians and composers serve as mentors, the AACM gives young artists the benefits of expert technical training and creative guidance. Numerous organizations offer similar kinds of support to new generations of painters, writers, and other artists, suggesting that \_\_\_\_\_

Which choice most logically completes the text?

- A) artists of all ages benefit more from technical training than from creative guidance.
- B) many arts organizations recognize the importance of providing opportunities for young artists to learn from experienced mentors.
- C) most established artists could become even better artists by serving as mentors.
- D) finding a mentor is more important for musicians than it is for painters, writers, and other types of artists.

18

Overgrazing by purple sea urchins has caused many kelp forests along North America's west coast to be replaced by urchin barrens—areas stripped of vegetation and covered in purple sea urchins. Urchins in barrens persist in a state of starvation that lessens their nutritional value—and thus their appeal—to many predators. Sarah Gravem and colleagues placed sunflower sea stars, a once-abundant predator species suffering massive population declines in recent years, in aquariums that each contained a nutritionally poor and a nutritionally rich purple sea urchin. The researchers found that the sea stars selected the nutritionally rich urchin in 42.7% of trials and the nutritionally poor urchin in 37.5% of trials, suggesting that \_\_\_\_\_

Which choice most logically completes the text?

- A) sunflower sea stars are willing to hunt sea urchins, but if given a choice, they will prey on other more nutritious marine animals instead.
- B) sunflower sea stars are reluctant to feed on both nutritionally poor and nutritionally rich sea urchins and are therefore unlikely to thrive in kelp forests.
- C) sunflower sea stars are less likely to consume sea urchins in barrens than other species of sea stars are, putting sunflower sea stars at a high risk of extinction.
- D) sunflower sea stars do not always avoid foraging on nutritionally poor sea urchins, making sunflower sea star population recovery a potentially important tool for controlling urchin barrens.

19

What is the correct pronunciation of Kiribati? In the Gilbertese language spoken by residents of the island nation, the letter combination -ti makes the -s sound; as a result, the country's name \_\_\_\_\_ pronounced "Kiribas."

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

- A) are
- B) have been
- C) are being
- D) is

20

*Light of Truth* is a bronze and marble sculpture by artist Richard Hunt. It honors civil rights icon Ida B. Wells. The sculpture \_\_\_\_\_ in a tree-lined plaza in Chicago, just a few blocks from where Wells lived.

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

- A) are standing
- B) have been standing
- C) stands
- D) were standing

21

The short story "Rogue Enchantments" by Isabel Ibañez appears in *Reclaim the* \_\_\_\_\_ anthology of fantasy and science fiction written by authors of Latin American descent.

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

- A) *Stars*. An
- B) *Stars*, while an
- C) *Stars* an
- D) *Stars*, an

22

Novelist Jane Austen greatly admired the work of Fanny Burney, a popular English author. In fact, scholars believe that a passage from the last chapter of *Cecilia*, a 1782 novel by Burney, likely inspired the title of one of \_\_\_\_\_ *Pride and Prejudice*.

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

- A) Austen’s most famous novels,
- B) Austens’ most famous novels’,
- C) Austens most famous novels,
- D) Austen’s most famous novel’s,

23

Customers who are satisfied with how a company resolves a service issue may regard that company more positively than they would if no such issue had occurred. This idea is known as the service recovery \_\_\_\_\_ research suggests that it has important implications for customer loyalty and retention.

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

- A) paradox,
- B) paradox
- C) paradox, and
- D) paradox and,

24

It can take time for proposed amendments to the US Constitution to become law. For example, the Twenty-Second Amendment, which limits the number of \_\_\_\_\_ can serve, was first proposed in 1947 but wasn’t approved by the required three-fourths majority of state legislatures until 1951.

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

- A) terms presidents
- B) term’s presidents
- C) term’s president’s
- D) terms president’s

25

Tortoises can be found in many works of literature. For example, in Tom Stoppard’s 1993 play *Arcadia*, there is a tortoise that \_\_\_\_\_ by two names (Plautus and Lightning) and appears in both of the play’s parallel timelines. As a character, the tortoise symbolizes the connection between the past and present.

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

- A) goes
- B) will have gone
- C) went
- D) had gone

26

By analyzing the level of radioactive decay within a fossil specimen, scientists can establish the age of that fossil with a high degree of precision. When radioactive elements aren't present, scientists turn to \_\_\_\_\_ analysis of Earth's sediment layers (strata)—to estimate how old a fossil is based on the age of the strata in which the fossil is found.

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

- A) stratigraphy—the
- B) stratigraphy (the
- C) stratigraphy: the
- D) stratigraphy, the

27

In modern plays, actors typically won't acknowledge the \_\_\_\_\_ do so breaks the fourth wall, a metaphorical barrier between actors and audiences that allows viewers to suspend the knowledge that they're watching a staged performance.

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

- A) audience. As to
- B) audience to
- C) audience. To
- D) audience, to

28

Paleontologists once thought that early apes lived in tropical forests, but recent research suggests that they may have actually lived in savannas. Tropical forests are humid and have many trees spaced close together. \_\_\_\_\_ savannas are drier, and their trees are spaced further apart.

Which choice completes the text with the most logical transition?

- A) For instance,
- B) In comparison,
- C) Firstly,
- D) In conclusion,

29

When sculptor Frédéric Auguste Bartholdi was designing the Statue of Liberty, he sought the advice of engineer Gustave Eiffel. Eiffel suggested that he make the statue's arm thick and position it straight above the figure's head. \_\_\_\_\_ Bartholdi decided to slim the arm and tilt it out at an angle.

Which choice completes the text with the most logical transition?

- A) Additionally,
- B) Instead,
- C) Thus,
- D) For example,

30

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

- Some atoms contain an excess of neutrons.
- Often, these neutrons form a “skin” on the atom’s surface.
- An atom of lead-208 has a neutron skin.
- The thickness of its neutron skin is approximately 0.28 trillionths of a millimeter.

The student wants to emphasize the thickness of lead-208’s neutron skin. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) The neutron skin surrounding an atom of lead-208 measures about 0.28 trillionths of a millimeter.
- B) Atoms with excess neutrons will often acquire a neutron skin.
- C) An atom of lead-208, like some other atoms, is surrounded by a neutron skin.
- D) Neutrons surround the surface of an atom of lead-208.

31

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

- Some animals have evolved to physically resemble another animal, plant, or object.
- This is known as mimicry.
- Crab spiders mimic the appearance of flowers.
- This helps crab spiders ambush their prey.
- Katydid mimic the appearance of leaves.
- This helps katydids hide from their predators.

The student wants to emphasize a difference in how katydids and crab spiders use mimicry. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) Katydids mimic the appearance of flowers, and crab spiders mimic that of leaves.
- B) Katydids and crab spiders are two examples of animals that use mimicry.
- C) Unlike crab spiders, which use mimicry to ambush prey, katydids use mimicry to hide from predators.
- D) Animals that use mimicry have evolved to resemble another animal, plant, or object.

32

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

- *Here I Have Returned* is a sculpture by Egyptian American artist Sherin Guirguis.
- It is a large, curved strip of wood inspired by the shape of a sistrum.
- A sistrum is a curved musical instrument played by ancient Egyptian priestesses in ceremonies.
- Guirguis says that the sculpture symbolizes “women who have lifted and supported Egyptian society and culture.”
- Overall, Guirguis wants her works to “engage audiences in a dialogue about power, agency, and social transformation.”

The student wants to use a quotation from Guirguis to explain what the sculpture represents. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) Guirguis, whose works include a sculpture that is a large, curved strip of wood, has explained that she wants her work to create a dialogue with audiences.
- B) Inspired by the sistrum played by Egyptian priestesses, *Here I Have Returned* symbolizes “women who have lifted and supported Egyptian society and culture,” according to Guirguis.
- C) According to Guirguis, the curved strip of wood used in *Here I Have Returned* was inspired by the sistrum, a musical instrument played by ancient Egyptian priestesses in ceremonies.
- D) Guirguis, the sculptor of *Here I Have Returned*, wants her works to “engage audiences in a dialogue about power, agency, and social transformation.”

33

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

- A sestina is a thirty-nine-line poetic form.
- Each line of the poem ends with one of six end words, which alternate according to a set pattern.
- “Forage Sestina” is a sestina by Marilyn Hacker.
- Its end words are *words, structure, wire, beam, wall, and room*.
- “Towards Autumn” is a sestina by Marilyn Hacker.
- Its end words are *daughter, friend, bread, mother, lover, and myself*.

The student wants to use one of the poems to illustrate the sestina form. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) Hacker employs the sestina, a poetic form with thirty-nine lines and six end words, in both “Forage Sestina” and “Towards Autumn.”
- B) As a sestina, “Towards Autumn” contains thirty-nine lines and six end words—in this case, *daughter, friend, bread, mother, lover, and myself*—that alternate in a set pattern.
- C) The thirty-nine-line sestina form uses the words *daughter, friend, bread, mother, lover, and myself*, which are found in the poem “Forage Sestina.”
- D) Hacker has used the sestina form multiple times, as in “Towards Autumn,” which contains these six words: *words, structure, wire, beam, wall, and room*.

**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

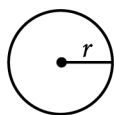
The questions in this section address a number of important math skills.  
Use of a calculator is permitted for all questions.

### NOTES

Unless otherwise indicated:

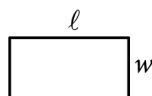
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function  $f$  is the set of all real numbers  $x$  for which  $f(x)$  is a real number.

### REFERENCE

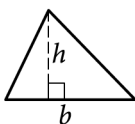


$$A = \pi r^2$$

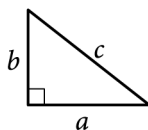
$$C = 2\pi r$$



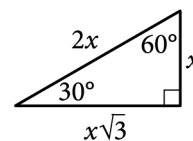
$$A = \ell w$$



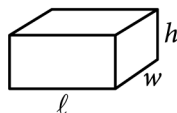
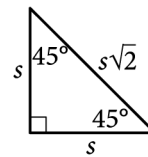
$$A = \frac{1}{2}bh$$



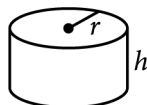
$$c^2 = a^2 + b^2$$



Special Right Triangles



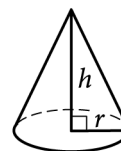
$$V = \ell wh$$



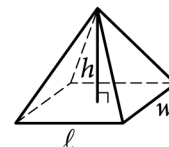
$$V = \pi r^2 h$$



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



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



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

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

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

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

**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

$$|x + 45| = 48$$

What is the positive solution to the given equation?

- A) 3
- B) 48
- C) 93
- D) 96

2

$$\begin{aligned}x &= 4 \\ y &= 5 - x\end{aligned}$$

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

- A) 1
- B) 4
- C) 5
- D) 9

3

A mixture consisting of only vitamin D and calcium has a total mass of 150 grams. The mass of vitamin D in the mixture is 50 grams. What is the mass, in grams, of calcium in the mixture?

- A) 200
- B) 150
- C) 100
- D) 50

4

A contract for a certain service requires a onetime activation cost of \$35 and a monthly cost of \$23. Which equation represents this situation, where  $c$  is the total cost, in dollars, of this service contract for  $t$  months?

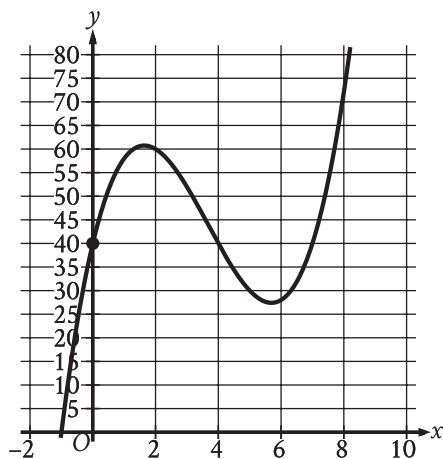
- A)  $c = \frac{t}{23} + 35$
- B)  $c = \frac{t}{35} + 23$
- C)  $c = 23t + 35$
- D)  $c = 35t + 23$

5

The function  $f$  is defined by  $f(x) = 3x - 8$ . What is the value of  $f(7)$ ?

- A) 29
- B) 13
- C) -5
- D) -29

6



The  $y$ -intercept of the graph shown is  $(x, y)$ . What is the value of  $y$ ?

7

$$8x - 7x + 130 = 260$$

What value of  $x$  is the solution to the given equation?

8

A geologist needs to collect at least 67 samples of lava from a volcano. If the geologist has already collected 63 samples from the volcano, what is the minimum number of additional samples the geologist needs to collect?

- A) 130
- B) 63
- C) 4
- D) 0

9

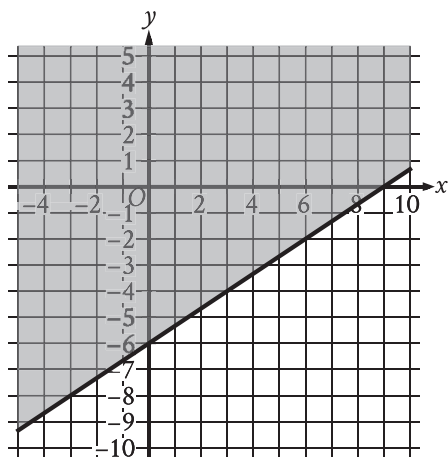
Each of 157 gemstones can be classified as one of three classifications, as shown in the frequency table.

Classification	Frequency
color X	119
color Y	3
color Z	35

If one of the gemstones is selected at random, what is the probability of selecting a gemstone of color Y?

- A)  $\frac{3}{157}$
- B)  $\frac{35}{157}$
- C)  $\frac{119}{157}$
- D)  $\frac{154}{157}$

10



The shaded region shown represents the solutions to which inequality?

- A)  $y \geq \frac{2}{3}x - 6$
- B)  $y \geq \frac{2}{3}x + 6$
- C)  $y \geq \frac{2}{3}x - 9$
- D)  $y \geq \frac{2}{3}x + 9$

11

In triangle  $ABC$ ,  $AB = 4,680$  millimeters (mm) and  $BC = 4,680$  mm. Which statement is sufficient to prove that triangle  $ABC$  is equilateral?

- A)  $AC = 4,680$  mm
- B)  $AC = 468$  mm
- C)  $AC = 46.8$  mm
- D)  $AC = 4.68$  mm

12

$$P(t) = 24.8(1.036)^t$$

The function  $P$  gives the predicted population, in millions, of a certain country for the period from 1984 to 2018, where  $t$  is the number of years after 1984. According to the model, what is the best interpretation of the statement “ $P(8)$  is approximately equal to 32.91”?

- A) In 1984, the predicted population of this country was approximately 8 million.
- B) In 1984, the predicted population of this country was approximately 32.91 million.
- C) 8 years after 1984, the predicted population of this country was approximately 32.91 million.
- D) 32.91 years after 1984, the predicted population of this country was approximately 8 million.

13

A right circular cylinder has a volume of 377 cubic centimeters. The area of the base of the cylinder is 13 square centimeters. What is the height, in centimeters, of the cylinder?

14

The list gives the mass, in grams, of 5 alpine marmots.

4,010; 4,010; 3,030; 4,050; 3,050

What is the mean mass, in grams, of these 5 alpine marmots?

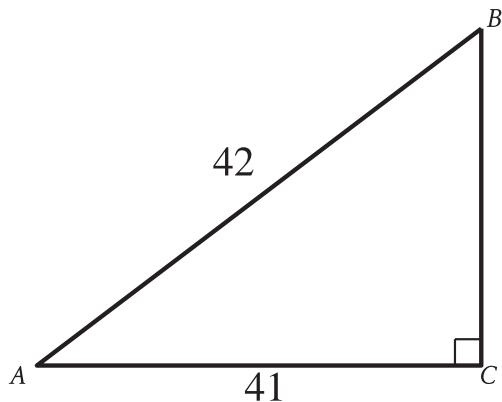
15

$$\begin{aligned}x &= 3 \\ y &= (15 - x)^2\end{aligned}$$

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

- A) 432
- B) 54
- C) 45
- D) 18

16



Note: Figure not drawn to scale.

What is the value of  $\cos A$  in the triangle shown?

- A)  $\frac{42}{41}$
- B)  $\frac{41}{42}$
- C)  $\frac{1}{42}$
- D)  $\frac{1}{41}$

17

A circle has a radius of 43 meters. What is the area, in square meters, of the circle?

- A)  $\frac{43\pi}{2}$
- B)  $43\pi$
- C)  $86\pi$
- D)  $1,849\pi$

18

An object has a mass of 168 grams and a volume of 24 cubic centimeters. What is the density, in grams per cubic centimeter, of the object?

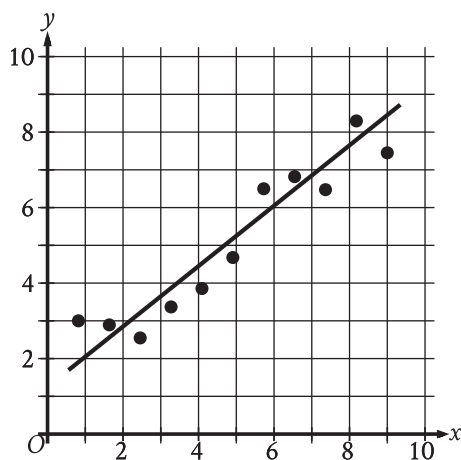
- A) 7
- B) 144
- C) 192
- D) 4,032

19

A company has a newsletter. In January 2018, there were 1,300 customers subscribed to the newsletter. For the next 24 months after January 2018, the total number of customers subscribed to the newsletter each month was 7% greater than the total number subscribed the previous month. Which equation gives the total number of customers,  $c$ , subscribed to the company's newsletter  $m$  months after January 2018, where  $m \leq 24$ ?

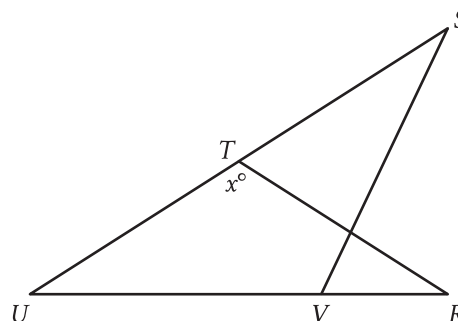
- A)  $c = 1,300(0.07)^m$
- B)  $c = 1,300(1.07)^m$
- C)  $c = 1,300(1.7)^m$
- D)  $c = 1,300(7)^m$

20



The scatterplot shows the relationship between two variables,  $x$  and  $y$ . A line of best fit is also shown. For how many of the 11 data points does the line of best fit predict a greater  $y$ -value than the actual  $y$ -value?

21



Note: Figure not drawn to scale.

In the figure,  $RT = TU$ , the measure of angle  $VST$  is  $29^\circ$ , and the measure of angle  $RVS$  is  $41^\circ$ . What is the value of  $x$ ?

22

$$\begin{aligned} -12x + 14y &= 36 \\ -6x + 7y &= -18 \end{aligned}$$

How many solutions does the given system of equations have?

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

23

The expression  $0.35x$  represents the result of decreasing a positive quantity  $x$  by what percent?

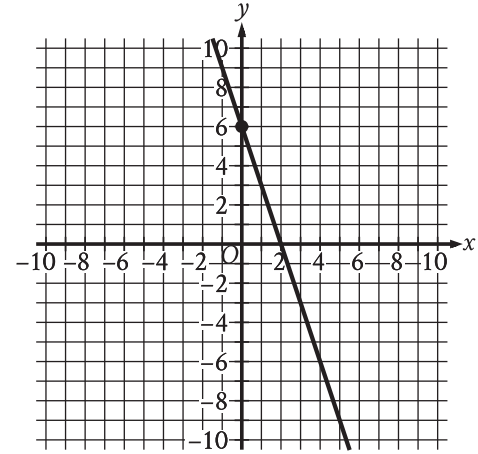
- A) 3.5%
- B) 35%
- C) 6.5%
- D) 65%

24

Objects R and S each travel at a constant speed. The speed of object R is half the speed of object S. Object R travels a distance of  $4x$  inches in  $y$  seconds. Which expression represents the time, in seconds, it takes object S to travel a distance of  $24x$  inches?

- A)  $12y$
- B)  $3y$
- C)  $16y$
- D)  $6y$

25



The graph shows a linear relationship between  $x$  and  $y$ . Which equation represents this relationship, where  $R$  is a positive constant?

- A)  $Rx + 18y = 36$
- B)  $Rx - 18y = -36$
- C)  $18x + Ry = 36$
- D)  $18x - Ry = -36$

26

A sample of a certain alloy has a total mass of 50.0 grams and is 50.0% silicon by mass. The sample was created by combining two pieces of different alloys. The first piece was 30.0% silicon by mass and the second piece was 80.0% silicon by mass. What was the mass, in grams, of the silicon in the second piece?

- A) 9.0
- B) 16.0
- C) 20.0
- D) 30.0

27

The product of two positive integers is 462. If the first integer is 5 greater than twice the second integer, what is the smaller of the two integers?

**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

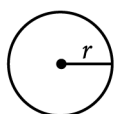
The questions in this section address a number of important math skills.  
Use of a calculator is permitted for all questions.

### NOTES

Unless otherwise indicated:

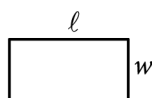
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function  $f$  is the set of all real numbers  $x$  for which  $f(x)$  is a real number.

### REFERENCE

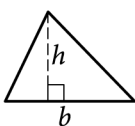


$$A = \pi r^2$$

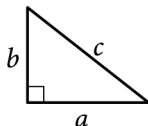
$$C = 2\pi r$$



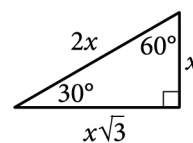
$$A = \ell w$$



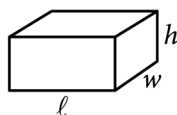
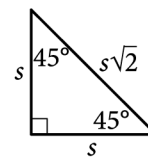
$$A = \frac{1}{2}bh$$



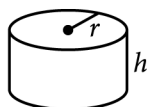
$$c^2 = a^2 + b^2$$



Special Right Triangles



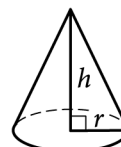
$$V = \ell wh$$



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



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



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



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

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

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

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



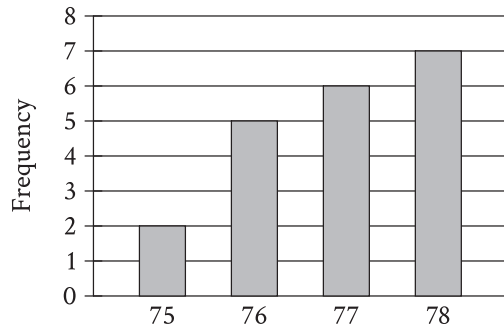
**For multiple-choice questions**, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one 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

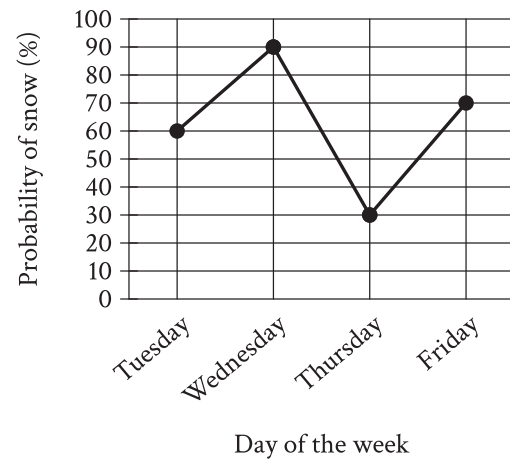
The bar graph shows the distribution of the number of walnuts per container for 20 containers at a grocery store.



How many of these containers of walnuts contain exactly 78 walnuts?

- A) 2
- B) 7
- C) 20
- D) 78

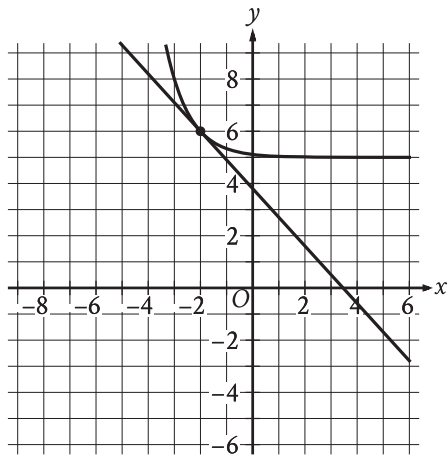
2



The line graph shows the probability of snow, as a percent, at a certain location for each day during a four-day period. According to the line graph, for which day during this four-day period is the probability of snow 30%?

- A) Tuesday
- B) Wednesday
- C) Thursday
- D) Friday

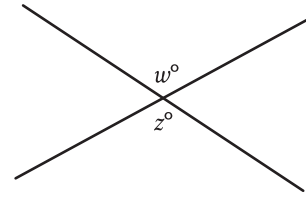
3



The graph of a system of a linear equation and a nonlinear equation is shown. What is the solution  $(x, y)$  to this system?

- A)  $(6, 0)$
- B)  $(-2, 6)$
- C)  $(0, -2)$
- D)  $(0, 0)$

4



Note: Figure not drawn to scale.

In the figure, two lines intersect at a point. If  $w = 136$ , what is the value of  $z$ ?

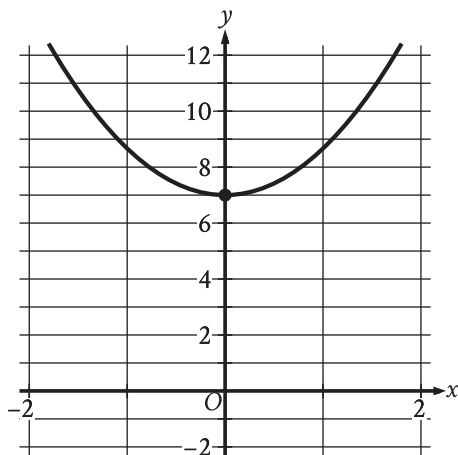
- A) 36
- B) 44
- C) 68
- D) 136

5

Which expression is equivalent to  $19(x^2 - 7)$ ?

- A)  $19x^2 - 133$
- B)  $19x^2 - 26$
- C)  $19x^2 - 7$
- D)  $19x^2 + 12$

6



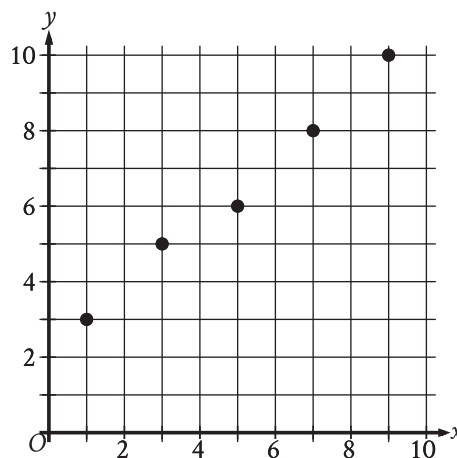
The parabola shown intersects the  $y$ -axis at the point  $(x, y)$ . What is the value of  $y$  ?

7

If  $2x + 3 = 9$ , what is the value of  $6x - 1$  ?

8

The scatterplot shows the relationship between two variables,  $x$  and  $y$ .



Which equation is the most appropriate linear model for this relationship?

- A)  $y = -0.9x - 2.2$
- B)  $y = -0.9x + 2.2$
- C)  $y = -0.9x$
- D)  $y = 0.9x + 2.2$

9

$$d = 16 - \frac{x}{30}$$

The equation shown gives the estimated amount of diesel  $d$ , in gallons, that remains in the gas tank of a truck after being driven  $x$  miles, where  $0 \leq x \leq 480$ . What is the estimated amount of diesel, in gallons, that remains in the gas tank of the truck when  $x = 300$  ?

- A) 0
- B) 6
- C) 14
- D) 16

10

$$g(x) = 11x + 4$$

For the given linear function  $g$ , which table shows three values of  $x$  and their corresponding values of  $g(x)$ ?

A) 

$x$	$g(x)$
-1	7
0	11
1	15

B) 

$x$	$g(x)$
-1	-4
0	0
1	4

C) 

$x$	$g(x)$
-1	-7
0	4
1	15

D) 

$x$	$g(x)$
-1	-11
0	0
1	11

11

The pressure exerted on a scuba diver at sea level is 14.70 pounds per square inch (psi). For each foot the scuba diver descends below sea level, the pressure exerted on the scuba diver increases by 0.44 psi. What is the total pressure, in psi, exerted on the scuba diver at 105 feet below sea level?

- A) 60.90
- B) 31.50
- C) 14.70
- D) 0.44

12

The function  $f$  is defined by  $f(x) = 4x^{-1}$ . What is the value of  $f(21)$ ?

- A) -84
- B)  $\frac{1}{84}$
- C)  $\frac{4}{21}$
- D)  $\frac{21}{4}$

13

The area of a rectangle is 57 square inches. The length of the longest side of the rectangle is 19 inches. What is the length, in inches, of the shortest side of this rectangle?

14

How many yards are equivalent to 77 rods?  
(5.5 yards = 1 rod)

15

$$x^2 - 12x + 27 = 0$$

How many distinct real solutions does the given equation have?

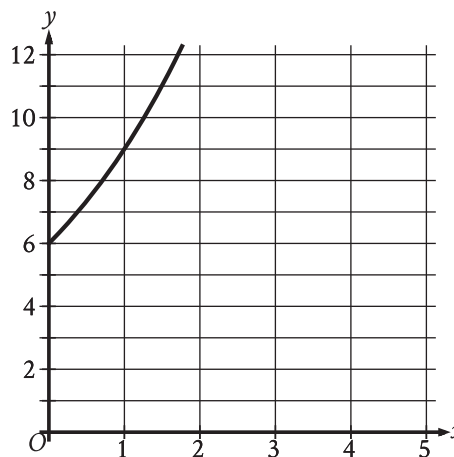
- A) Exactly two
- B) Exactly one
- C) Zero
- D) Infinitely many

16

For the linear function  $g$ , the graph of  $y = g(x)$  in the  $xy$ -plane has a slope of 2 and passes through the point  $(1, 14)$ . Which equation defines  $g$ ?

- A)  $g(x) = 2x$
- B)  $g(x) = 2x + 2$
- C)  $g(x) = 2x + 12$
- D)  $g(x) = 2x + 14$

17



The graph gives the estimated population  $y$ , in thousands, of a town  $x$  years since 2003, where  $0 \leq x \leq 5$ . Which of the following best describes the increase in the estimated population from  $x = 0$  to  $x = 1$ ?

- A) The estimated population at  $x = 1$  is 0.5 times the estimated population at  $x = 0$ .
- B) The estimated population at  $x = 1$  is 1.5 times the estimated population at  $x = 0$ .
- C) The estimated population at  $x = 1$  is 2.5 times the estimated population at  $x = 0$ .
- D) The estimated population at  $x = 1$  is 3.5 times the estimated population at  $x = 0$ .

18

In March, the price of a collectible card was \$15.50. In April, the price of the collectible card was \$17.36. The price of the collectible card in April was  $p\%$  of the price of the collectible card in March. What is the value of  $p$ ?

- A) 12
- B) 88
- C) 112
- D) 188

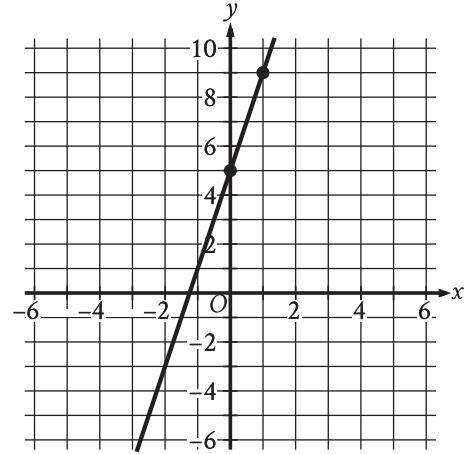
19

$$x = 8a(b + 9)$$

The given equation relates the positive numbers  $a$ ,  $b$ , and  $x$ . Which equation correctly expresses  $a$  in terms of  $b$  and  $x$ ?

- A)  $a = \frac{x}{8} - (b + 9)$
- B)  $a = \frac{x}{8(b + 9)}$
- C)  $a = \frac{8(b + 9)}{x}$
- D)  $a = 8x(b + 9)$

20



Line  $j$  is shown in the  $xy$ -plane. Line  $k$  (not shown) is parallel to line  $j$ . What is the slope of line  $k$ ?

21

A line segment that has a length of 115 centimeters (cm) is divided into three parts. One part is 47 cm long. The other two parts have lengths that are equal to each other. What is the length, in cm, of one of the other two parts of equal length?

22

$$p(x) + 57 = x^2$$

The given equation relates the value of  $x$  and its corresponding value of  $p(x)$  for the function  $p$ . What is the minimum value of the function  $p$ ?

- A)  $-3,249$
- B)  $-57$
- C)  $57$
- D)  $3,249$

23

$x$	$y$
$-18$	$-48$
$7$	$52$

The table shows two values of  $x$  and their corresponding values of  $y$ . In the  $xy$ -plane, the graph of the linear equation representing this relationship passes through the point  $\left(\frac{1}{7}, a\right)$ . What is the value of  $a$ ?

- A)  $-\frac{4}{11}$
- B)  $-\frac{4}{77}$
- C)  $\frac{4}{7}$
- D)  $\frac{172}{7}$

24

$$y = 576^{(2x+2)}$$

The graph of the given equation in the  $xy$ -plane has a  $y$ -intercept of  $(r, s)$ . Which of the following equivalent equations displays the value of  $s$  as a constant, a coefficient, or the base?

- A)  $y = 331,776^{(x+1)}$
- B)  $y = 24^{(4x+4)}$
- C)  $y = \frac{1}{24}(24)^{(4x+5)}$
- D)  $y = \frac{1}{576}(576)^{(2x+3)}$

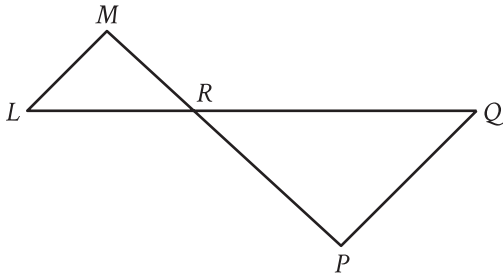
25

If  $k - x$  is a factor of the expression  $-x^2 + \frac{1}{29}nk^2$ , where  $n$  and  $k$  are constants and  $k > 0$ , what is the value of  $n$ ?

- A)  $-29$
- B)  $-\frac{1}{29}$
- C)  $\frac{1}{29}$
- D)  $29$



26



Note: Figure not drawn to scale.

In the figure,  $\overline{LQ}$  intersects  $\overline{MP}$  at point  $R$ , and  $\overline{LM}$  is parallel to  $\overline{PQ}$ . The lengths of  $\overline{MR}$ ,  $\overline{LR}$ , and  $\overline{RP}$  are 6, 7, and 11, respectively. What is the length of  $\overline{LQ}$ ?

- A)  $\frac{119}{11}$
- B)  $\frac{77}{6}$
- C)  $\frac{113}{6}$
- D)  $\frac{119}{6}$

27

$$5(x + 7) = 15(x - 17)(x + 7)$$

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

**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.

# PSAT/NMSQT®

Preliminary SAT/National Merit Scholarship Qualifying Test

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# Practice Test #2

## ANSWER EXPLANATIONS

These answer explanations are for students taking the digital PSAT/NMSQT in nondigital format.

**PSAT/NMSQT®**

 CollegeBoard

 NATIONAL MERIT  
SCHOLARSHIP CORPORATION

# Reading and Writing

## Module 1

(33 questions)

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### QUESTION 1

**Choice C** is the best answer because it most logically completes the text's discussion of novelist Leon Forrest's admiration of William Faulkner's writing style. In this context, "imitation" means something that resembles or reproduces something else. The text states that Forrest admired Faulkner's style and that anyone familiar with Faulkner's style would be able to see the stylistic similarities between a particular passage in Forrest's novel *Divine Days* and Faulkner's writing, a fact that supports the idea that Forrest's novel pays tribute to Faulkner by reproducing, or imitating, Faulkner's style.

**Choice A** is incorrect because in this context, a "forgetting" would mean an instance in which something is overlooked or not remembered. The text emphasizes Forrest's admiration for Faulkner's style and the fact that Forrest's writing in some instances closely resembles Faulkner's stylistically. It therefore wouldn't make sense to say that in trying to pay tribute to Faulkner's style, Forrest failed to remember it. **Choice B** is incorrect because in this context, a "rejection" would mean a dismissal of something as unworthy. The text emphasizes Forrest's admiration for Faulkner's writing style, stating that parts of Forrest's writings indicate efforts to copy that style. It wouldn't make sense therefore to suggest that Forrest had rejected or dismissed Faulkner's style as unworthy. **Choice D** is incorrect because in this context, an "opinion" would mean a view or judgment. Although the text focuses on Forrest's admiration of Faulkner, which suggests that Forrest had formed a positive judgment of Faulkner's style, the word opinion wouldn't make sense in this sentence: the sentence doesn't say that the passage from Forrest's novel expresses his view of Faulkner's style; rather, it suggests that stylistically, the passage closely resembles, or imitates, Faulkner's writing.

## QUESTION 2

**Choice A** is the best answer because it most logically completes the text's discussion of programs that encourage money to cycle within a community. In this context, "instituting" means initiating. The text indicates that making purchases at small local businesses can help keep money cycling within a community. The text goes on to state that some cities are establishing incentives to promote small business shopping. This context supports the idea that some cities are instituting programs to encourage this consumer behavior.

**Choice B** is incorrect because saying that some cities are "occupying," or forcibly holding possession or control of, programs that encourage shoppers to make purchases at small local businesses wouldn't make sense in context. The text doesn't discuss who controls these programs but instead indicates that some cities are establishing incentives that encourage shoppers to make purchases at small local businesses. Furthermore, it wouldn't make sense to say that a city is occupying a program. **Choice C** is incorrect because nothing in the text suggests that cities are "underestimating," or failing to understand the value of, programs that encourage consumers to shop at small local businesses. The text indicates that some cities are establishing incentives to encourage small business shopping, which suggests that these cities understand the value of such programs. **Choice D** is incorrect because saying that some cities are "encountering," or coming into contact with, programs that encourage consumers to shop at small local businesses wouldn't make sense in context. The text indicates that some cities are already establishing incentives to encourage shoppers to make purchases at small businesses. This context suggests that the cities are instituting the programs, not that they are encountering them.

## QUESTION 3

**Choice B** is the best answer because it most logically completes the text's discussion of solar energy collection and storage. In this context, "fluctuations in" means irregular changes in. The text notes that economists recommend that countries that want to rely more on solar energy (energy captured from sunlight) should attempt to expand their storage capacity. The text goes on to explain that having a large amount of stored solar energy can lessen the negative effect of "unpredictable shifts in cloud cover and haze"—that is, unpredictable changes in environmental conditions that at times limit sunlight. This context suggests that having ample solar energy stored and ready to use can mitigate the issue of fluctuations in solar energy collection caused by irregular patterns of sunlight availability.

**Choice A** is incorrect because in this context, "developments of solar energy collection" would most clearly refer to the creation of ways to collect solar energy (energy captured from sunlight). The text focuses on collection and the idea that having stored energy can mitigate, or make less bad, the effects of a problem caused by unpredictable changes that affect sunlight ("cloud cover and haze"); there's no reason to think that the creation of new collection methods would be viewed as a problem that would need to be mitigated. **Choice C** is incorrect because in this context, "calibrations with" would most clearly refer to precise adjustments for a particular purpose. The text focuses on the collection of solar energy (energy captured from sunlight) and the idea that having stored energy

can mitigate, or make less bad, the effects of a problem caused by unpredictable changes that affect sunlight (“cloud cover and haze”); there’s no reason to think that precision in something related to solar energy collection would be viewed as a problem that would need to be mitigated. *Choice D* is incorrect. The text focuses on the collection of solar energy (energy captured from sunlight) and the idea that having stored energy can mitigate, or make less bad, the effects of a problem caused by unpredictable changes that affect sunlight (“cloud cover and haze”); nothing in the text suggests that “incentives for,” or rewards for, solar energy collection would be viewed as a problem that would need to be mitigated, especially in countries that want to rely more on solar energy than they already do.

## QUESTION 4

**Choice A** is the best answer because it most logically completes the text’s discussion of artworks that were produced for exhibition on the internet. In this context, “defunct” means no longer existing or functioning. According to the text, many artworks that were produced in the mid-1990s to the early 2000s for exhibition on the internet have become inaccessible due to their reliance on certain software. As an example, the text cites Sinae Kim’s *Genesis*, which relied on software that was discontinued in 2021. This context supports the idea that the software is defunct.

*Choice B* is incorrect because the text indicates that viewing artworks produced in the mid-1990s to the early 2000s for exhibition on the internet requires the use of software. Artists generally want their works to be seen by many people, so it wouldn’t make sense for creators of internet art to require the use of software that is “arcane,” or known or knowable to only a few people. Moreover, the text states that a prominent example of software used to view these artworks is Adobe Flash, which was discontinued in 2021, meaning it’s now defunct. *Choice C* is incorrect because “ubiquitous” would mean found everywhere, which wouldn’t make sense in this context. The text indicates that the reason why many artworks that were produced in the mid-1990s to the early 2000s for exhibition on the internet have become inaccessible has to do with the software required for viewing them. According to the text, one example of such software is Adobe Flash, which was discontinued in 2021, meaning it’s now defunct. *Choice D* is incorrect because nothing in the text suggests that the software used to view artworks produced in the mid-1990s to the early 2000s for exhibition on the internet is “extraneous,” or irrelevant. Instead, the text indicates that use of specific software is required to view certain artworks from this period and that the discontinuation of the software renders the works inaccessible.

## QUESTION 5

**Choice B** is the best answer because as used in the text “determine” most nearly means “dictate.” The text describes the relationship between the main character and those who exhibit, praise, and purchase his artwork. The text states that the main character is often asked to change his art or himself based on outside influences, and he usually acquiesces. Because the main character admits that those who support his work often shape it based on their demands, it follows

that those outside influences dictate, or guide or dominate, the direction his work takes.

*Choice A* is incorrect because the text doesn't suggest that outside influences "conclude," or end, the main character's work. The text states that many supporters of the main character's art "demand its proliferation," not its conclusion. *Choice C* is incorrect because the text doesn't suggest that outside influences are "evaluating," or judging the main character's work. According to the text, the main character's art has already achieved great commercial success, with many people exhibiting, purchasing, and praising his work. Thus, outsiders have already supported the main character's work and are not questioning or evaluating its success or worth. They are instead influencing its initial direction. *Choice D* is incorrect because the text doesn't suggest that outside influences "select," or choose the main character's work. According to the text, the main character's art has already achieved great commercial success, with many people exhibiting, purchasing, and praising his work. Thus, outsiders have already supported the main character's work and are not selecting it. They are instead influencing its initial direction.

## QUESTION 6

**Choice A** is the best answer because it describes how the underlined portion of the sentence functions in the text as a whole. The text begins by discussing ordinary soap bubbles, objects that usually exist for less than a minute before popping due to either evaporation or gravity-induced drainage. The text then goes on to mention work by researchers Aymeric Roux and colleagues, who have discovered how to increase the longevity of bubbles by altering their chemical composition. Finally, the underlined portion of the text describes how this process works: since the bubble contains both water and glycerol, it can draw water molecules from the surrounding air to replace those lost to evaporation. Therefore, the underlined portion of the sentence describes the effects of a process devised by researchers that increases the longevity of an object described in the text.

*Choice B* is incorrect because the circumstance that prompted the research is discussed in the first sentence of the text, not the underlined portion. *Choice C* is incorrect because the underlined portion of the text does not address why soap bubbles must eventually rupture. Rather, it explains how the longevity of soap bubbles can be extended. *Choice D* is incorrect because the underlined portion of the text does not mention any future experiments.

## QUESTION 7

**Choice C** is the best answer because it best states how the underlined portion functions in the text as a whole. The first sentence states that Tule geese typically take four days to migrate south. Then in the next sentence, which contains the underlined portion, the text describes the first part of that journey, which begins with the geese flying over the Gulf of Alaska while keeping about 100 miles from the Canadian shore. The rest of the text details the remainder of the geese's typical journey and then mentions circumstances in 2020 that resulted in the

geese taking an unusually long time to complete it. Thus, the underlined portion describes part of the Tule geese's typical winter migration journey.

*Choice A* is incorrect. Although the text concludes by stating that in 2020, Tule geese took twice as long to complete their typical migration, which suggests a change in their usual flight behavior, the underlined portion doesn't discuss this. Instead, the underlined portion describes the first part of the Tule geese's typical winter migration journey over the Gulf of Alaska. *Choice B* is incorrect. Although the sentence containing the underlined portion mentions that Tule geese breed in Alaska, the underlined portion doesn't explain why the geese breed in that location. Rather, the text mentions Alaska to explain that it's the starting point of the Tule geese's typical winter migration. *Choice D* is incorrect because the underlined portion doesn't discuss any other birds that migrate south for the winter. In fact, the text is only concerned with the migration of Tule geese.

## QUESTION 8

**Choice C** is the best answer because it most accurately states the main purpose of the text, which is to describe a collection of medieval maps and how it was created. The text begins by mentioning Muhammad al-Idrisi's collection of maps of lands known to medieval Arabic and European scholars. It then states that the Norman king Roger II hired al-Idrisi to create the collection and details al-Idrisi's methods of creation: consulting Arabic and Greek maps and interviewing travelers. In short, the text presents a collection of medieval maps and then goes on to describe how that collection came to be.

*Choice A* is incorrect because the text describes a collection of maps and the process of creating that collection but does not discuss the benefits of studying mapmaking in general. *Choice B* is incorrect because though the text mentions that al-Idrisi interviewed travelers, the text does not describe how those travelers created maps. *Choice D* is incorrect because though the text mentions that al-Idrisi consulted Arabic and Greek maps, the text does not offer a comparison of Arabic and Greek mapmaking techniques.

## QUESTION 9

**Choice D** is the best answer because it most accurately describes the main purpose of the text, which is to explain a study's conclusion and how researchers involved in the study arrived at that conclusion. The text begins by summarizing the main conclusion of the study conducted by Paul Hanel and colleagues: when confronted with ideas they disagree with in discussions about controversial topics, people are more likely to respond politely if they think about their personal values before engaging in such discussions. The text then goes on to describe the design of Hanel and colleagues' experiment. By comparing interactions between members of an experimental group (who had been prompted to write about their personal values beforehand) to those between members of a control group (who had been prompted to write about a beverage), the team found that people in the experimental group behaved more civilly, or politely, than people in the control group did during discussions about a controversial topic. This finding led to the conclusion described at the beginning of the text.

*Choice A* is incorrect. Although the text discusses the results of a study, it doesn't provide any indication that the conclusion the study supported—that when facing disagreement, people behave more politely when they have thought about their values—is a belief that is widely held. *Choice B* is incorrect because the text doesn't indicate that the researchers found the results of their study to be surprising, or contrary to what they expected. In fact, there's no indication provided in the text about how the researchers felt about the study's results or that the results should be considered surprising. *Choice C* is incorrect. Although the text discusses the experimental design of a study, it doesn't suggest any improvements to that design; instead, it focuses on how the design enabled the researchers to draw a particular conclusion.

## QUESTION 10

**Choice D** is the best answer because it accurately describes an aspect of Chavela Vargas that the text indicates is unusual among ranchera artists. According to the text, Vargas differed from other ranchera singers by slowing the tempo of classic songs, which allowed her to express the emotional quality of the lyrics more fully.

*Choice A* is incorrect because the text states that Vargas possessed an unusually raspy voice for a ranchera singer, not a clear and polished voice. *Choice B* is incorrect because the text indicates that Vargas was known to perform songs written from a male point of view, not that she avoided such songs. *Choice C* is incorrect because nothing in the text suggests that Vargas disliked performing classic songs. Rather, it suggests that she found innovative ways of performing them to emphasize their emotional content, which seems to suggest an affinity for such songs, not dislike.

## QUESTION 11

**Choice B** is the best answer because it most accurately states the main topic of the text. The text begins by stating that archaeologists in Norway have discovered what may be the oldest known runestone (a stone with an inscription in the runic alphabets used in the region in ancient times). According to the text, the object was created between 1 and 250 CE. The text then mentions a researcher who comments on the runestone's significance to the study of runic alphabets. Thus, the main focus throughout the text is a runestone found in Norway.

*Choice A* is incorrect because the text mentions the Iron Age only to indicate the era when the runestone was created and when runic alphabets were in use; there's no discussion of battles during this era. *Choice C* is incorrect because the text mentions the carbon dating method just once and does so only to indicate the age of the runestone; moreover, the text doesn't suggest that this method is new. *Choice D* is incorrect. Although the text indicates that Zilmer is a runologist, or a scholar of runestones, it does so in a single sentence, so Zilmer's scholarly interests are therefore not a primary focus of the text.



## QUESTION 12

**Choice C** is the best answer because it describes the songs sung by Gertrude “Ma” Rainey and Bessie Smith in a way the text implies is accurate. The text describes Angela Y. Davis’s research on Rainey and Smith for her book *Blues Legacies and Black Feminism*, focusing on her efforts to transcribe the improvised lyrics in Rainey’s and Smith’s songs. The text calls Davis’s transcription process “labor intensive” since the lack of clarity in the recordings required her to listen to each repeatedly to verify the accuracy of her transcripts. The fact that Davis undertook a painstaking transcription process using only fairly low-fidelity recordings suggests that reliable transcriptions were otherwise unavailable to her.

**Choice A** is incorrect. The text doesn’t discuss the popularity of Rainey’s and Smith’s songs either in the 1920s or after. Although it is plausible that the music of Rainey and Smith is more widely enjoyed than it was in the 1920s, this isn’t supported by the text. **Choice B** is incorrect. The text doesn’t discuss which of Rainey and Smith was the more prolific recording artist and so provides no support for such a claim. **Choice D** is incorrect. The text discusses the creativity of both Rainey and Smith, but it does so only to note similarities between them in terms of improvisation and wit, not to emphasize differences between them or Davis’s relative views of the artists’ inventiveness.

## QUESTION 13

**Choice A** is the best answer because it most effectively uses a quotation from *Happy House* to illustrate the claim that the young woman is unimpressed with the house she is visiting. In the quotation, it says the young woman’s “first feeling was of disappointment” and that “there was little claim to beauty” when referring to the house. This disappointment and the overall lack of beauty in the house suggest that the young woman isn’t impressed by the house she is visiting.

**Choice B** is incorrect because the quotation doesn’t describe what the young woman thinks about the house. Instead, it indicates that there is more light because window blinds have been opened. **Choice C** is incorrect because the quotation describes a door and a path outside of the house but doesn’t include anything to indicate the young woman’s feelings about the house. **Choice D** is incorrect because the quotation states what the young woman did in the house (“tip-toed through the hall” and “opened the door”), but it doesn’t show what she thinks about it.

## QUESTION 14

**Choice B** is the best answer because it presents a finding that, if true, would support Garza and Robles’s hypothesis that a layer of fresh water forms a barrier to ochre sea stars. The text explains that the sea stars tend to move to higher shore levels at night in search of prey, but after a heavy rain, the sea stars stay at lower shore levels. Garza and Robles hypothesize that rainfall results in a layer of fresh water that the sea stars don’t cross. To determine whether fresh water forms a barrier to sea stars, Garza and Robles observed how sea stars behaved in a tank of only seawater and in a tank of seawater with a layer of fresh water on top. If the sea stars climbed to the top of the tank with only seawater but stopped climbing

just below the layer of fresh water in the other tank, that would suggest that fresh water does indeed serve as a barrier to the sea stars, thereby supporting Garza and Robles's hypothesis.

*Choice A* is incorrect because finding that sea stars in the tank with only seawater moved around the bottom of the tank more than sea stars in the other tank did but that none of the stars in either tank climbed to the top would be irrelevant to Garza and Robles's hypothesis. Such a finding would reveal nothing about whether fresh water serves as a barrier to sea stars. *Choice C* is incorrect because finding that sea stars climbed to the top of both tanks would weaken, not support, Garza and Robles's hypothesis, since it would indicate that the layer of fresh water wasn't a barrier to the sea stars. *Choice D* is incorrect because finding that sea stars in the tank with only seawater mostly stayed near the bottom of the tank but sea stars in the other tank climbed into the layer of fresh water wouldn't support Garza and Robles's hypothesis. Instead, such a finding would suggest that the layer of fresh water wasn't a barrier to the sea stars, thereby weakening Garza and Robles's hypothesis.

## QUESTION 15

**Choice B** is the best answer because it uses data from the graph to effectively complete the statement regarding what the student notices about the number of jobs in computer services in 2010. The graph shows that in 2010, the number of computer services jobs was approximately 6,000, which is the same approximate number of jobs in engineering services. Additionally, the graph shows that in 2019, the number of jobs in technical consulting services and the number of jobs in computer services were about the same, at approximately 5,000.

*Choice A* is incorrect. While the graph shows that in 2010 the number of computer services jobs (about 6,000) was higher than the number of technical consulting services jobs (about 4,000), in 2019 the number of computer services jobs (about 5,000) was not about the same as the number of engineering services jobs (about 6,000). *Choice C* is incorrect because according to the graph, the number of jobs in computer services was lower than the number of jobs in engineering services in 2019, not 2010. Additionally, the graph shows that in 2019, the number of computer services jobs (about 5,000) was not higher than the number of jobs in engineering services (about 6,000). *Choice D* is incorrect because the graph shows that the number of computer services jobs was about the same as the number of technical consulting services jobs in 2019, not 2010. This also means the number of computer services jobs could not have been lower than the technical consulting services jobs in 2019 if they were about the same.

## QUESTION 16

**Choice C** is the best answer because it describes data in the graph that support the researchers' conclusion that their hypothesis about workplace leaders and humility was correct. According to the text, Jia Hu and colleagues "hypothesized that workplace leaders who reflect on lessons learned from past mistakes are likely to exhibit more humility than leaders who don't engage in such reflection." The bar graph shows the humility scores for managers who participated in Jia

Hu and colleagues' study. It shows average humility scores for managers who reflected on a past mistake that they learned from, managers who reflected on a past mistake that they didn't learn from, and managers who were in the control group that, according to the text, simply reflected on their daily routines. The graph shows that managers who reflected on a past mistake they learned from received an average humility score between 3.0 and 3.5. Both the control group and managers who reflected on a mistake they didn't learn from received a lower average humility score of between 2.5 and 3.0. Thus, the managers who reflected on a past mistake that resulted in learning exhibited more humility on average than the managers in the other two groups did. This supports the researchers' conclusion that their initial hypothesis that workplace leaders who reflect on past mistakes they learned from exercise greater humility was correct.

*Choice A* is incorrect. Although according to the graph it's true that none of the group's humility scores exceeded 3.5, this idea does not support the researchers' conclusion that their initial hypothesis was correct. The statement that none of the three groups' average humility scores exceeded 3.5 does not distinguish between those leaders who reflected on lessons learned from past mistakes and those who didn't, so it would not support Hu and colleagues' hypothesis that workplace leaders who reflect on past mistakes they learned from exercise greater humility. *Choice B* is incorrect. While the graph shows that managers in the control group did exhibit less humility than the experimental group of managers who reflected on a mistake they learned from, the graph also shows that the control group exhibited more (not less) humility than the experimental group that reflected on a mistake they didn't learn from. Furthermore, the idea that the managers in the control group exhibited only slightly less humility on average than the managers in the two experimental groups did would not support the researchers' conclusion that their initial hypothesis that workplace leaders who reflect on past mistakes they learned from exercise greater humility was correct. *Choice D* is incorrect because there is no indication in the graph that all three groups of participants exhibited less humility on average than the researchers expected. The graph and text don't cite any specific expectations that the researchers had with regard to the humility scores for each group.

## QUESTION 17

**Choice B** is the best answer because it most logically completes the text's discussion of a hypothesis by one group of scientists about how to determine the colors of a long-extinct animal. The text explains that the scientists found melanosomes in the fossilized feather of an extinct bird and that melanosomes are responsible for producing color inside cells. The text also explains that melanosomes have different shapes depending on the colors they produce. Given this information, it follows that the scientists hypothesized that they could determine the colors of the extinct bird by examining the shapes of the melanosomes in the feather.

*Choice A* is incorrect because the text never suggests that the scientists were seeking to show how melanosomes can be found in fossils belonging to animals from other extinct species. Rather, the text indicates that the scientists were seeking to identify an extinct bird's colors, and the text strongly suggests that

the scientists hypothesized that they could achieve their goal by examining the shapes of the melanosomes in the bird's fossilized feather. *Choice C* is incorrect because the text never suggests that the scientists were seeking to explain why the melanosomes in the feather were so well preserved. Rather, the text indicates that the scientists were seeking to identify an extinct bird's colors, and the text strongly suggests that the scientists hypothesized that they could achieve their goal by examining the shapes of the melanosomes in the bird's fossilized feather. *Choice D* is incorrect because the text suggests only one method of identifying the colors of extinct animals: by examining the shapes of melanosomes found in fossils. The text doesn't discuss other methods for learning the colors of extinct animals and therefore provides no support for the idea that the scientists could identify the colors of extinct animals whose fossils lack melanosomes.

## QUESTION 18

**Choice A** is the best answer because it presents the conclusion that most logically completes the text's discussion of the efficiency of various photovoltaic cells. The text indicates that Miranda-Pérez and her team found that adding a layer of perovskite to silicon-based cells increased the percentage of sunlight converted to usable electricity relative to the percentage converted to electricity by silicon-based cells. Using cells with only perovskite and no silicon, however, resulted in no improvement in efficiency over silicon-based cells. The text also states that perovskite captures light in the blue range of the solar spectrum and silicon captures light in the red range of the spectrum. If perovskite and silicon capture different parts of the solar spectrum and the combination of perovskite and silicon results in greater efficiency than the use of either perovskite or silicon alone does, then it is reasonable to infer that the improved efficiency of perovskite-silicon cells could be attributable to their making use of more of the solar spectrum than perovskite-based or silicon-based cells do.

*Choice B* is incorrect because it is directly contradicted by the text, which says that silicon-based cells convert 18%–22% of the sunlight that reaches them to electricity and that cells with only perovskite are no more efficient than silicon-based cells are. Perovskite-only cells thus must convert 22% or less—not more than 29.5%—of the sunlight that reaches them to electricity. *Choice C* is incorrect because the text focuses on a possible improvement to photovoltaic cells and makes no mention of any alternatives to those cells, so there is no reason to conclude that photovoltaic cells must be replaced with some other technology. Additionally, the text presents solar power as something that currently exists, so it wouldn't make sense to conclude that solar power will remain elusive. *Choice D* is incorrect because nothing in the text suggests that there is a need to evaluate the effectiveness of other minerals than perovskite. In fact, the text gives no indication that it is even possible to use other minerals than silicon and perovskite in photovoltaic cells. Instead, the text is focused on the effect of combining perovskite and silicon and the different parts of the solar spectrum that perovskite and silicon capture.

## QUESTION 19

**Choice B** is the best answer. The convention being tested is punctuation use between a verb and its object. No punctuation is needed between the verb “preferred” and its object “the sound of a bent bell over that of a straight one.” The object helps complete the idea of the verb—in this case, it explains what type of sound Gillespie preferred—and any punctuation between the two results in an ungrammatical sentence.

*Choice A* is incorrect because no punctuation is needed between the verb and its object. *Choice C* is incorrect because no punctuation is needed between the verb and its object. *Choice D* is incorrect because no punctuation is needed between the verb and its object.

## QUESTION 20

**Choice B** is the best answer. The conventions being tested are the use of verbs to express tense and the use of verb forms within a sentence. In this choice, the past tense verb “became” is consistent with the other past tense verbs (“owned,” “operated,” and “was”) used to indicate that, at a period of time in the past, Bass’s leadership resulted in her newspaper becoming one of the most influential Black-owned newspapers in the US. In addition, “became” supplies the main clause with a finite (tensed) verb, which is required to perform the action of the subject (in this case, “*The Eagle*”).

*Choice A* is incorrect because the future tense verb “will become” isn’t consistent with the other past tense verbs used to discuss Bass and her newspaper.

*Choice C* is incorrect because the present progressive verb “is becoming” isn’t consistent with the other past tense verbs used to discuss Bass and her newspaper. *Choice D* is incorrect because it results in an ungrammatical sentence. The nonfinite to-infinitive “to become” doesn’t supply the main clause with a finite verb.

## QUESTION 21

**Choice D** is the best answer. The convention being tested is the use of plural nouns and possessive determiners. The plural noun “jugglers” and the plural possessive determiner “their” correctly indicate that there are multiple jugglers whose motion is being discussed.

*Choice A* is incorrect because the context requires the plural noun “jugglers” and the plural possessive determiner “their,” not the plural possessive noun “jugglers” and the contraction “they’re.” *Choice B* is incorrect because the context requires the plural possessive determiner “their,” not the word “there,” which means “in that place.” *Choice C* is incorrect because the context requires the plural noun “jugglers,” not the singular possessive noun “juggler’s.”

## QUESTION 22

**Choice C** 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 ("The measurement...moved") and the second main clause ("for example...second").

*Choice A* is incorrect because it results in a comma splice. Without a coordinating conjunction, a comma can't be used in this way to join the two main clauses ("The measurement...moved" and "for example...second"). *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 the two main clauses ("The measurement...moved" and "one unit...second"). *Choice D* is incorrect because it results in a run-on sentence. The two main clauses ("The measurement...moved" and "one unit...second") are fused without punctuation and/or a conjunction.

## QUESTION 23

**Choice C** is the best answer. The convention being tested is subject-verb agreement. The singular verb "powers" agrees in number with the singular subject "an artificial intelligence."

*Choice A* is incorrect because the plural verb "have been powering" doesn't agree in number with the singular subject "an artificial intelligence." *Choice B* is incorrect because the plural verb "power" doesn't agree in number with the singular subject "an artificial intelligence." *Choice D* is incorrect because the plural verb "are powering" doesn't agree in number with the singular subject "an artificial intelligence."

## QUESTION 24

**Choice B** is the best answer. The convention being tested is the use of a colon within a sentence. In this choice, the colon correctly introduces the following description of how the painting makes use of the entire visual light spectrum by depicting a rainbow-hued swimmer.

*Choice A* is incorrect because it results in a run-on sentence. The main clauses ("Like...spectrum" and "sporting...water") are fused without punctuation and/or a conjunction. *Choice C* is incorrect because it results in a run-on sentence. The main clauses ("Like...spectrum" and "while...water") are fused without punctuation. Furthermore, the conjunction "while" fails to indicate that what follows is a description of how the painting makes use of the entire visual light spectrum. *Choice D* is incorrect because it results in a logically confusing sentence. The conjunction "while," which suggests that what follows is occurring at the same time as or despite what came before, fails to indicate that what follows is a description of how the painting makes use of the entire visual light spectrum.

## QUESTION 25

**Choice D** is the best answer. The convention being tested is the use of a colon within a sentence. In this choice, the colon correctly introduces the following explanation of the different functions of genomes and epigenomes.

*Choice A* is incorrect because it results in a run-on sentence. The two main clauses (“The relationship...functions” and “whereas...expressed”) are fused without punctuation and/or a conjunction. *Choice B* is incorrect because it results in a comma splice. A comma can’t be used in this way to join two main clauses (“The relationship...functions” and “whereas...expressed”). *Choice C* is incorrect. Without a comma preceding it, the conjunction “and” can’t be used in this way to join two main clauses. Furthermore, “and” fails to indicate that what follows is an explanation of how cells with identical DNA develop different functions.

## QUESTION 26

**Choice A** is the best answer. “Ultimately” logically signals that West’s completion of the computer program was the conclusion of the process described in the previous sentence, in which scientists working on GPS sought to develop a mathematical model of Earth.

*Choice B* is incorrect because “in other words” illogically signals that the information about West’s program is a restatement of the information about the scientists’ efforts to develop a mathematical model of Earth. Instead, West’s program was the conclusion of those efforts. *Choice C* is incorrect because “secondly” illogically signals that West’s completion of the computer program was merely the next step in the scientists’ efforts to develop a mathematical model of Earth. Instead, West’s program was the conclusion of those efforts. *Choice D* is incorrect because “in addition” illogically signals that West’s completion of the computer program was merely additional information related to the scientists’ work on GPS. Instead, West’s program was the conclusion of the scientists’ efforts to develop a mathematical model of Earth.

## QUESTION 27

**Choice B** is the best answer. “Then” logically signals that the event described in this sentence—lawmakers’ 2017 declaration of Alaska Highway Day—is part of a chronological sequence of events, occurring after the decades-long period in which the soldiers’ contribution was overlooked.

*Choice A* is incorrect because “lastly” illogically signals that this sentence presents the last of a series of points or reasons. Instead, it describes a later event occurring in a chronological sequence of events. *Choice C* is incorrect because “similarly” illogically signals that the information in this sentence is similar to the previous information about the soldiers’ contribution being overlooked for decades. Instead, it describes an event occurring after that decades-long period. *Choice D* is incorrect because “for example” illogically signals that this sentence provides an example illustrating the previous information about the soldiers’ contribution being overlooked for decades. Instead, it describes an event occurring after that decades-long period.

## QUESTION 28

**Choice D** is the best answer. “Thus” logically signals that the information in this clause—that listeners can “hear” carbon levels increasing—is a result of the previous information about the audio distorting as carbon levels increase.

**Choice A** is incorrect because “furthermore” illogically signals that the information in this clause merely adds to the previous information about the audio distorting as carbon levels rise. Instead, the listeners’ ability to “hear” carbon levels increasing is a result of that distortion. **Choice B** is incorrect because “by comparison” illogically signals that the information in this clause is being compared to the information about the audio distorting as carbon levels rise. Instead, the listeners’ ability to “hear” carbon levels increasing is a result of that distortion. **Choice C** is incorrect because “for instance” illogically signals that the information in this clause is an example of how the audio distorts as carbon levels rise. Instead, the audio was distorted for the express purpose of representing ecological data; the listeners’ ability to “hear” carbon levels increasing is a direct, intended result of the distortion, not merely an example of it.

## QUESTION 29

**Choice B** is the best answer. “For this reason” logically signals that the reason Joseph Priestley termed oxygen “dephlogisticated air” was that he accepted the theory mentioned in the previous sentence—that the presence of phlogiston, rather than the absence of oxygen, causes fire in a closed container to go out.

**Choice A** is incorrect because “in other words” illogically signals that the information about Priestley terming oxygen “dephlogisticated air” is a restatement of the previous theory concerning phlogiston. Instead, Priestley chose the term as a result of this theory. **Choice C** is incorrect because “alternatively” illogically signals that Priestley termed oxygen “dephlogisticated air” as an alternative to the previous theory concerning phlogiston. Instead, Priestley chose the term as a result of this theory. **Choice D** is incorrect because “nevertheless” illogically signals that Priestley termed oxygen “dephlogisticated air” despite the previous theory concerning phlogiston. Instead, Priestley chose the term as a result of this theory.

## QUESTION 30

**Choice C** is the best answer. The sentence emphasizes the number of islands in Komodo National Park that have Komodo dragons living on them, noting that four of the park’s twenty-nine islands have Komodo dragons.

**Choice A** is incorrect. While the sentence does explain that Komodo dragons live on the islands of Komodo National Park, it doesn’t emphasize how many of those islands Komodo dragons live on. **Choice B** is incorrect. The sentence explains that Komodo National Park contains the world’s largest lizards; it doesn’t identify these lizards as Komodo dragons or emphasize how many of the park’s islands the lizards live on. **Choice D** is incorrect. The sentence specifies the total number of islands in Komodo National Park; it doesn’t emphasize how many of those islands have Komodo dragons.



## QUESTION 31

**Choice A** is the best answer. The sentence provides Acquah's quotation about pointillism's "illusion of movement" to explain that she used pointillism to create the illusion of movement in her painting of women dancing.

**Choice B** is incorrect. The sentence explains pointillism and indicates that Acquah used the technique in her painting, but it doesn't provide a quotation or explain why. **Choice C** is incorrect. While the sentence provides a quotation from Acquah about pointillism, the quotation merely describes a specific aspect of the technique; the sentence doesn't explain why Acquah used pointillism in her painting. **Choice D** is incorrect. While the sentence provides a quotation from Acquah, the quotation illustrates Acquah's views on Ghanaian women; the sentence doesn't explain why Acquah used pointillism in her painting.

## QUESTION 32

**Choice C** is the best answer. The sentence emphasizes whose point of view the novel *Kaikeyi* is told from: the character Kaikeyi's.

**Choice A** is incorrect. While the sentence does discuss point of view, it focuses on that of the epic poem rather than the novel. **Choice B** is incorrect. While the sentence seems to be referring to Patel's novel, it doesn't establish whose point of view the novel is told from. **Choice D** is incorrect. The sentence discusses the character Kaikeyi in the context of the epic poem; it doesn't discuss the novel's point of view.

## QUESTION 33

**Choice B** is the best answer. The sentence describes the 2018 exhibition Guerrero curated, noting that the exhibition, which was titled *Pacha, Llaqta, Wasichay: Indigenous Space, Modern Architecture, New Art*, featured the works of seven emerging Latino artists.

**Choice A** is incorrect. The sentence describes the exhibition Guerrero curated in 2020; it doesn't describe her 2018 exhibition. **Choice C** is incorrect. The sentence emphasizes a similarity between the two exhibitions Guerrero curated; it doesn't describe her 2018 exhibition. **Choice D** is incorrect. The sentence emphasizes a difference between the two exhibitions Guerrero curated; it doesn't describe her 2018 exhibition.

# Reading and Writing

## Module 2

(33 questions)

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### QUESTION 1

**Choice A** is the best answer because it most logically completes the text's discussion of the origins of the unique dialect of Spanish spoken in Puerto Rico. In this context, "traced" means tracked back to. The text notes that the regional variety of Spanish spoken in Puerto Rico has its roots in the language of the Taínos and in the West African language of Yoruba. This context supports the idea that the way certain vowel sounds are pronounced in the Puerto Rican dialect can be traced back to Yoruba.

*Choice B* is incorrect because the text presents the statement about the relationship between vowel pronunciation in the Puerto Rican dialect of Spanish and in Yoruba as an example to support the claim that African languages have contributed to the Puerto Rican dialect. It therefore wouldn't make sense to say that the pronunciation of certain vowel sounds in the Puerto Rican dialect can be "surrendered," or handed over on demand, to the pronunciation in Yoruba. *Choice C* is incorrect because the text gives no indication that the way certain vowel sounds are pronounced in the Puerto Rican dialect of Spanish has been "announced," or officially declared or proclaimed. According to the text, elements of the dialect have been inherited or borrowed from African languages, and the relationship between the pronunciation of certain vowels in the Puerto Rican dialect and in Yoruba is an example of this inheritance, suggesting that the pronunciation in the Puerto Rican dialect can be traced to Yoruba. *Choice D* is incorrect because the text presents the statement about the relationship between vowel pronunciation in the Puerto Rican dialect of Spanish and in Yoruba as an example to support the claim that African languages have contributed to the Puerto Rican dialect. It therefore wouldn't make sense to say that the pronunciation of certain vowel sounds in the Puerto Rican dialect can be "offered," or presented as a gift, to the pronunciation in Yoruba.

## QUESTION 2

**Choice B** is the best answer because it most logically completes the text's discussion of wild rice. As used in this context, "sensitive" means vulnerable or easily affected. The text indicates that climate change is causing the lakes to get deeper, which consequently threatens the wild rice that grows in the area. The text goes on to state that deep water can cause young wild-rice plants to uproot from the bottom of the lake. This context supports the idea that the plants are sensitive to water depth during early stages of development.

*Choice A* is incorrect because "immune" means protected or shielded, which wouldn't make sense in this context. The text explains that deep water can cause young wild-rice plants to become uprooted and destroyed, indicating that these plants are harmed by deep water, not protected from it. *Choice C* is incorrect because "limited" means confined or restrained, which wouldn't make sense in this context. The text explains that water depth can negatively affect young wild-rice plants but doesn't suggest that water depth limits or restrains the plants. *Choice D* is incorrect because "receptive" means open or tolerant, which wouldn't make sense in this context. The text doesn't indicate that the wild-rice plants are open to or tolerant of an increase in water depth but rather the opposite: an increase in water depth can harm young wild-rice plants.

## QUESTION 3

**Choice D** is the best answer because it most logically completes the text's discussion of the invention of the integrated circuit. As used in this context, "transformed" means substantially changed in some way. The text states that the invention radically altered the semiconductor industry, with some historians claiming that it had a fundamental effect on the industry by allowing for mass production for the first time. This context conveys that the invention of the integrated circuit transformed the semiconductor industry.

*Choice A* is incorrect. Although the text indicates that the invention of the integrated circuit significantly affected ("radically altered") the semiconductor industry, it doesn't indicate that the invention "overwhelmed" the industry, which in this context would mean that it overcame the industry such that the industry struggled or was defeated. Instead, the text conveys that the invention's effect was positive, since it allowed the semiconductor industry to begin making use of mass production methods. *Choice B* is incorrect because it wouldn't make sense in context to say that the invention of the integrated circuit "bypassed" the semiconductor industry, which would mean it intentionally avoided the industry. The text indicates that the invention directly affected the semiconductor industry, since it made it possible for the industry to begin engaging in mass production methods. *Choice C* is incorrect because the text doesn't indicate that the invention of the integrated circuit "obstructed" the semiconductor industry, which would mean that it blocked or hindered the industry in some way. Instead, the text indicates that the invention's effect was positive, since it made it possible for the semiconductor industry to begin engaging in mass production methods.

## QUESTION 4

**Choice C** is the best answer because it most logically completes the text's discussion of the early British postal system. In this context, "reforms" most nearly means attempts at improving something. The text indicates that the pay-upon-delivery postage method led to fee avoidance on the part of recipients. It then says that action was taken to improve the postal system, giving examples such as the move to having the sender pay and affixing stamps to indicate payment had been received. These represent revisions to the system intended to improve its functioning; therefore, "reforms" most logically completes the text.

**Choice A** is incorrect. In this context, "investigations" most nearly means attempts to understand something. And although it is plausible that an attempt to improve the postal system would involve investigations, nothing in the text provides a logical basis for understanding the example of changes like affixing stamps to letters as an investigation. **Choice B** is incorrect. In this context, "expansions" most nearly means additions to something. Although the text indicates that some new policies were adopted, nothing in the text suggests that the overall number of policies increased, which expansions would seem to entail. **Choice D** is incorrect. In this context, "possessions" most nearly means items of personal property or things that otherwise belong to, or are part of, something. The text provides no logical context for understanding changes like affixing stamps to letters as possessions.

## QUESTION 5

**Choice A** is the best answer because it logically completes the text's discussion of imported goods and consumer prices. In this context, "nullify" most nearly means negate or undermine. The text indicates that importing goods to a country can reduce consumer prices in that country, then cautions that the costs of transporting goods within the country is also a factor. These transportation costs likely raise the prices that must be paid by people who live far from the ports of entry. Therefore, the intranational transportation costs could nullify the price advantages to consumers of importing goods.

**Choice B** is incorrect. In this context, "denigrate" would most nearly mean disparage or deny the importance of. Since transportation costs would not be capable of denying the importance of price advantages, it would not make sense to state that intranational transportation costs denigrate the price advantages of importing goods. **Choice C** is incorrect. In this context, "underestimate" would most nearly mean predict a lower value for, or to undervalue, someone or something. Though transportation costs might be undervalued, they cannot themselves undervalue something else, so it would not make sense to state that intranational transportation costs underestimate the price advantages of importing goods. **Choice D** is incorrect. In this context, "misconstrue" would most nearly mean misunderstand. Since transport costs are not capable of understanding, it would not make sense to claim that intranational transportation costs misconstrue the price advantages of importing goods.

## QUESTION 6

**Choice B** is the best answer because it best describes the overall structure of the text. The text first establishes the setting, a “still lagoon,” and then goes on to provide more details about the lagoon by presenting several descriptive images of nature, including a lizard that “shrills his tune,” “oozing lichens,” and “thick, grey and humid” vapors.

*Choice A* is incorrect. Instead of simply naming species, the text presents descriptive images of nature; further, instead of naming animals and then moving on to name plants, the text refers first to a plant (“the wild rice”), then to two animals (“the lizard,” “the wild goose”), then to another plant (“rushes”), and so on. *Choice C* is incorrect because the text does not draw any comparison between nature and human emotions; it does not refer to human emotions at all. *Choice D* is incorrect. While the text does begin by identifying a specific location, a “still lagoon,” it makes no mention of a person living there.

## QUESTION 7

**Choice B** is the best answer because it accurately describes how the underlined portion functions in the text as a whole. In the text, the narrator explains that she walks around her neighborhood, making a “mental map” of the area that she imagines herself navigating through. She then states that she rehearses “the small world’s scheme”—that is, imagines moving through her mental map—and challenges herself to use the map in her mind while lying in bed at night. The underlined portion presents two such challenges (getting to the store through backyards and traveling from school to a friend’s house) and thus provides examples of what the narrator thinks about at night.

*Choice A* is incorrect because the underlined portion makes no mention of memorizing a telephone number. Although the narrator mentions that she had to learn the home telephone number before her mother would give her permission to walk around the neighborhood, there is nothing in the underlined portion or the rest of the text about memorizing the telephone number. *Choice C* is incorrect. Although the underlined portion refers to navigation tasks like finding a route to a store only through backyards, the text contains no specific directions to any store, nor is any store identified as the narrator’s favorite. *Choice D* is incorrect because the underlined portion makes no mention of the narrator’s mother and doesn’t address the narrator’s relationship with her. Although the narrator mentions that her mother gave her permission as a child to walk around the neighborhood, there is nothing in the underlined portion or the rest of the text about the mother or her relationship to her child.

## QUESTION 8

**Choice C** is the best answer because it most accurately describes the overall structure of the text. The text begins by introducing the natural phenomenon of intermittent mass loss with regard to Asteroid 6478 Gault and notes that it curiously has not lost mass at its perihelion like other asteroids typically do. The text then refutes “solar energy–driven ice vaporization” and “the singular nature of impact ejection” as two possible explanations for Asteroid 6478 Gault’s

intermittent mass loss. Finally, the text presents Luu et al.'s explanation that "6478 Gault is shedding mass due to rotational instability," which the author says is "likely correct." Thus, the overall structure of the text is that it introduces a natural phenomenon, refutes two potential explanations for that phenomenon, and then presents a third explanation for that phenomenon that the author regards as plausible.

*Choice A* is incorrect because the text doesn't distinguish between multiple observations. It focuses on the single observation that Asteroid 6478 Gault is losing mass and evaluates multiple explanations for the phenomenon. The text also asserts that Luu et al.'s explanation is credible and "likely correct." *Choice B* is incorrect because the text describes a natural phenomenon, not a specific astronomical finding. In addition, although the text does note flawed reasons for Asteroid 6478 Gault's intermittent mass loss, it doesn't mention that Asteroid 6478 Gault's intermittent mass loss is based on new evidence. *Choice D* is incorrect. Although the text does evaluate explanations for the cause of Asteroid 6478 Gault's intermittent mass loss, the text also asserts that Luu et al.'s explanation that they have put forth is persuasive and "likely correct."

## QUESTION 9

**Choice B** is the best answer because it reflects how the author of Text 1 would most likely respond to the study findings described in Text 2. The author of Text 2 discusses a study by Florian Humpenöder and his colleagues that found that deforestation would be reduced by half over the next thirty years if 20% of the beef consumed worldwide were replaced with mycoprotein. The author of Text 1 points out that mycoprotein is not widely available because of its high production cost, but goes on to note that this problem could be addressed by the creation of a cheaper substrate to feed mycoprotein. This suggests that the author of Text 1 would assert that the development of a less expensive mycoprotein substrate would contribute to the reduction in deforestation described in the study findings discussed in Text 2: if reducing the cost of mycoprotein increases people's access to it, then mycoprotein may be able to replace beef in more people's diets, thereby reducing the deforestation associated with beef production.

*Choice A* is incorrect because the author of Text 1 indicates that the environmental impact of mycoprotein production is close to that of chicken or pork production, so there is no reason to think that the author would assert that replacing chicken or pork with mycoprotein would be environmentally beneficial: such a replacement would not lessen the total environmental impact of food manufacture. Additionally, the specific issue of agricultural water consumption is never mentioned in Text 1, so there is no evidence indicating what the author of Text 1 would say about that issue. *Choice C* is incorrect. Although Text 1 does compare the environmental effects of producing mycoprotein to those of producing chicken or pork, nothing in Text 1 suggests that the author believes that people are more likely to replace chicken or pork with mycoprotein than they are to replace beef with mycoprotein. *Choice D* is incorrect because Text 1 makes no mention of countries' varying contributions to deforestation, so there is no evidence that the author of Text 1 would respond to the finding described in Text 2 by saying that some countries will have to replace more than 20% of their beef consumption with mycoprotein.

## QUESTION 10

**Choice B** is the best answer because it presents the most likely consequence if New had not begun using sewing machines. The text states that New gained new customers and that sewing machines allowed him to make bags more efficiently, or in less time than he could when sewing by hand. It's reasonable to conclude that if New hadn't reduced the time it took to make each bag by starting to use sewing machines, it would have been hard for him to keep up with the increased demand.

*Choice A* is incorrect because the text indicates that New added unique, handcrafted details to his bags before he started using sewing machines and continued to do so after he started using them. *Choice C* is incorrect because the text doesn't suggest that individually designing each bag would have been a consequence of not using sewing machines, since New was already designing unique details for each bag before he started using sewing machines and continued to do so after he started using them. *Choice D* is incorrect because the text indicates that people were already interested in New's bags before he started using sewing machines. Rather than allowing New to generate more interest in his bags, sewing machines helped New keep up with the interest that had already grown.

## QUESTION 11

**Choice B** is the best answer because it presents a statement about the Turkins that is suggested by the text. The text explains that while many pleasant families live in the city of S., inhabitants of the city consider the Turkins to be "the most accomplished and most enlightened family of all." Thus, by indicating that they are seen as more accomplished and more enlightened than all the other families in the city of S., the text suggests that the Turkins have a unique status there.

*Choice A* is incorrect because the text doesn't indicate that the Turkins have recently moved to the city of S.; it provides no information about when the Turkins arrived. *Choice C* is incorrect because the text explains how the Turkins are viewed by others in the city of S. but gives no indication of how the Turkins feel about living there. *Choice D* is incorrect because the text explains how the Turkins are viewed by other residents of the city of S. but gives no indication of how the Turkins view the other residents.

## QUESTION 12

**Choice A** is the best answer because it most accurately states the main idea of the text. The text begins by stating that Tomas and Tereza's dog Karenin felt disrupted by a recent move because of his dislike of change. The text then goes on to suggest that this is because the way a dog experiences time differs from the way humans experience time: time for a dog doesn't move linearly, going "on and on, from one thing to the next," but instead moves circularly, "like the hands of a clock." That is, time for a dog is experienced as a cyclical pattern characterized by routine and predictability, with each day "following the same path." The text then concludes by providing examples of seemingly insignificant changes in routine that profoundly "disturbed [Karenin's] sense of time," causing him to feel

displeasure. Thus, the main idea of the text is that Karenin's sense of time as a dog involves a strong preference for predictability and an aversion to disruption.

*Choice B* is incorrect. Although the text emphasizes Karenin's displeasure with the recent move to a new home, it doesn't suggest that the move has made his negative responses more pronounced than they once were. Rather, in accounting for Karenin's displeasure with the move to Switzerland, the text explains that Karenin generally has a negative response to any kind of change. *Choice C* is incorrect because the text doesn't suggest that Karenin comprehends time similarly to how Tomas and Tereza comprehend it. On the contrary, the text strongly implies a contrast between dogs' circular experience of time with the way humans experience time as a straightforward progression that can be "plotted on a straight line." *Choice D* is incorrect because the text provides no indication that a change in the places and objects surrounding Karenin causes him to feel as though time is accelerating. Although the text does use the language of "dash[ing] madly ahead" in relation to time, the phrase appears in the context of a comparison illustrating how dogs experience time: time for a dog moves just as the hands of a clock do, in a circle and "unwilling to dash madly ahead"—that is, always in a regular and predictable way.

## QUESTION 13

**Choice D** is the best answer because it most effectively uses data from the table to complete the text. The text discusses self-employed workers in the US, and the table shows the US incorporated and unincorporated self-employment rates in four occupational fields in 2015. According to the table, the incorporated self-employment rate was 8.9% for the management, business, and financial services occupational field, which is higher than the incorporated self-employment rate shown for any other occupational field.

*Choice A* is incorrect because according to the table, the incorporated self-employment rate was 5.8% for the sales and related occupational field, which is lower than the 8.9% for the management, business, and financial services occupational field. *Choice B* is incorrect because according to the table, the incorporated self-employment rate was 2.7% for the installation, maintenance, and repair occupational field, which is lower than the 8.9% for the management, business, and financial services occupational field. *Choice C* is incorrect because according to the table, the incorporated self-employment rate was 4.4% for the construction and resource extraction occupational field, which is lower than the 8.9% for the management, business, and financial services occupational field.

## QUESTION 14

**Choice A** is the best answer because it most effectively presents a quotation from *There Is Confusion* that illustrates the claim that the narrator portrays Joanna as admiring the quality of ambition, or the determination to achieve something, and no other qualities in other people. By describing Joanna as not being interested in people unless they have "a 'purpose' in life"—that is, a goal they are determined to achieve—in which case she is very interested in them, the quotation reveals that Joanna cares only about others' ambition.



*Choice B* is incorrect because this quotation indicates only that Joanna has a preference for her father, without giving a reason for that preference; therefore, it doesn't illustrate the claim that Joanna cares only about others' ambition. *Choice C* is incorrect because this quotation doesn't illustrate that Joanna greatly admires the quality of ambition in others; it refers to Joanna's similarity to her father "so far as ambition was concerned" but doesn't reveal how she (or her father) views that quality. *Choice D* is incorrect because this quotation describes qualities Joanna possesses—praising her logic, concentration, and memory—instead of Joanna's interest in other people's qualities.

## QUESTION 15

**Choice C** is the best answer because it most effectively uses data from the graph to complete the text about the effect of messaging on participative pricing. The graph shows mean ticket prices chosen by participants in response to three messages across two studies: Study 1, which the text indicates was conducted with an age-diverse group recruited online, and Study 2, which was conducted with student participants. The graph indicates that in the "pay what you think it's worth" condition, the mean price of the concert tickets in Study 2 was about \$74, which is greater than the mean price of about \$55 in Study 1. In other words, when participants were asked to consider their valuation of the tickets, the response was heterogeneous, or mixed. Moreover, according to the graph, both Study 1 and Study 2 show higher prices for the tickets under the "pay what you think it's worth" condition than they do under both the "pay what you can" and the "pay what you want" conditions. That is, the data suggest that both groups of participants named higher prices when considering the value of the tickets than when considering either what they could afford or wanted to pay, a finding that supports the idea that sellers can benefit when prompting consumers to consider their own valuations when they choose prices.

*Choice A* is incorrect because it contradicts information in the graph. Although the graph shows that students in Study 2 assigned a higher value to the tickets than did the age-diverse group in Study 1, which would support the idea that consumer valuations were heterogeneous, the graph shows that in the "pay what you can" (i.e., what you can afford) condition, the students in Study 2 assigned a higher price (about \$40), not a lower price, than the age-diverse group in Study 1 did (about \$30). Moreover, even if it were true that the students had assigned a lower price in this condition, it wouldn't support the result described in the text, only that the participants across the two studies had different ideas of what they can afford to pay. *Choice B* is incorrect. Although a finding that participants tended to choose prices that were closest to the actual ticket costs in the "pay what you think it's worth" condition would support the idea that sellers benefit by prompting consumers to think about their own valuations (since it's implied that sellers would lose money in the other conditions, where chosen prices were lower than the participants' valuations), neither the text nor the graph addresses how any of the prices chosen by the study participants relate to the tickets' actual market price. *Choice D* is incorrect. Although the wide variation in participant valuations would support the idea that consumer valuations tend to be heterogeneous, neither the text nor the graph provides any information from which to discern the relative levels of variance among the responses from participants in either study.

## QUESTION 16

**Choice D** is the best answer because it presents findings that, if true, would support the claim made by Bergner and colleagues that the nongravitational acceleration of 'Oumuamua is due to the expulsion of entrapped hydrogen. The text first introduces the observation of a unique interstellar object named 'Oumuamua and goes on to explain that the object exhibited nongravitational acceleration that could not be fully attributed to the expected cause: gravitational pull of nearby celestial bodies. The text concludes by stating that Bergner and colleagues claim that the nongravitational acceleration is caused by expulsion of hydrogen gas from 'Oumuamua's water-rich icy body. To support this claim requires evidence that hydrogen gas could be present within 'Oumuamua at all, which this answer choice presents: cosmic radiation can result in embedded pockets of hydrogen gas in water ice. Additionally, evidence that this gas can be released from such a body is required to fully support the claim, which this answer choice goes on to provide: 'Oumuamua experienced sufficient warming as it traveled through the solar system to alter its icy structure and release the hydrogen gas. Thus, this answer choice provides the best evidence to support Bergner and colleagues' claim.

*Choice A* is incorrect because this answer choice concerns faults with previous models of outgassing from 'Oumuamua of carbon monoxide and nitrogen, which would not support a claim regarding hydrogen outgassing. Furthermore, inconsistencies in other models would not provide evidence in support of a different model or explanation. *Choice B* is incorrect. The evidence presented in this answer choice would weaken the claim proposed by Bergner and colleagues that the nongravitational acceleration of 'Oumuamua is caused by the expulsion of hydrogen gas because this answer choice suggests that there is evidence that refutes this claim: 'Oumuamua's trajectory is inconsistent with a nongravitational acceleration caused by the release of hydrogen gas. Furthermore, the remaining portion of this answer choice is unrelated to the claim. *Choice C* is incorrect because the claim being made by Bergner and colleagues concerns the expulsion of entrapped hydrogen gas, but this answer choice is concerned solely with the differences in magnitude of gravitational and nongravitational acceleration, which would not support Bergner's claim. Furthermore, this answer choice discusses interstellar objects similar to 'Oumuamua, but the text states that 'Oumuamua is the first observed object of its kind in our solar system, so evidence from other, similar bodies would not be available.

## QUESTION 17

**Choice B** is the best answer because it presents the conclusion that most logically follows from the text's discussion of the relationship between the AACM's use of mentors to support young Black musicians and similar support that other organizations offer their young artists. According to the text, in service of AACM's goal to support new works by Black musicians, AACM mentors provide beneficial training and guidance to young artists. The text goes on to say that many other art organizations support new artists in similar ways, suggesting that these organizations recognize the importance of providing opportunities for young artists to learn from mentors who are established in their field.

*Choice A* is incorrect because the text gives no indication that technical training is more beneficial than creative guidance. The text states that AACM mentors offer both technical training and creative guidance to young artists and that other arts organizations offer similar kinds of support; however, nothing in the text suggests that young artists, or artists of any age, benefit more from technical training. *Choice C* is incorrect because the text is mainly concerned with the fact that established artists are mentoring young artists through AACM and other arts organizations. The text states that young musicians benefit from AACM mentors but does not address what mentors gain from the relationship, so there is no reason to conclude that most established artists could improve as artists by serving as mentors. *Choice D* is incorrect. Although the text indicates that mentors are beneficial to young musicians and that young people pursuing other kinds of art (including painting and writing) can also find mentors through arts organizations, the text gives no indication that mentors are more important for musicians than for other types of artists.

## QUESTION 18

**Choice D** is the best answer because it presents the conclusion that most logically follows from the text's discussion of the researchers' findings about purple sea urchins and sunflower sea stars. The text explains that urchin barrens are areas that used to be kelp forests but are now covered by purple sea urchins. The text suggests that because there is no more vegetation to be consumed in those areas, the urchins exist in a state of starvation that makes them less nutritional for many predators. The text goes on to explain that in a study with a choice between two purple sea urchins, sunflower sea stars (a predator species that has been substantially declining) consumed a nutritionally rich urchin 42.7% of the time and a nutritionally poor urchin 37.5% of the time. Because the sunflower sea stars didn't always avoid consuming nutritionally poor urchins, even when nutritionally rich ones were available, it follows that helping sunflower sea star populations to grow could help control urchin barrens by increasing the number of sea stars that may consume and thus remove nutritionally poor purple sea urchins from barrens.

*Choice A* is incorrect because the text indicates only that when presented with purple sea urchins, the sunflower sea stars in the study consumed both nutritionally rich and nutritionally poor ones. It doesn't suggest that sunflower sea stars generally prefer other marine animals that are more nutritious; there's no mention of other marine animals. *Choice B* is incorrect because the text doesn't suggest that sunflower sea stars are generally reluctant to feed on sea urchins. In fact, the text indicates that the sunflower sea stars in the study did consume sea urchins, feeding on both nutritionally poor and nutritionally rich ones. *Choice C* is incorrect because the text addresses only the willingness of sunflower sea stars to consume the type of sea urchins found in barrens (nutritionally poor sea urchins), not how likely other species of sea stars are to consume them.

## QUESTION 19

**Choice D** is the best answer. The convention being tested is subject-verb agreement. The singular verb “is” agrees in number with the singular subject “the country’s name.”

*Choice A* is incorrect because the plural verb “are” doesn’t agree in number with the singular subject “the country’s name.” *Choice B* is incorrect because the plural verb “have been” doesn’t agree in number with the singular subject “the country’s name.” *Choice C* is incorrect because the plural verb “are being” doesn’t agree in number with the singular subject “the country’s name.”

## QUESTION 20

**Choice C** is the best answer. The convention being tested is subject-verb agreement. The singular verb “stands” agrees in number with the singular subject “sculpture.”

*Choice A* is incorrect because the plural verb “are standing” doesn’t agree in number with the singular subject “sculpture.” *Choice B* is incorrect because the plural verb “have been standing” doesn’t agree in number with the singular subject “sculpture.” *Choice D* is incorrect because the plural verb “were standing” doesn’t agree in number with the singular subject “sculpture.”

## QUESTION 21

**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 (“The short...*Stars*”) and the supplementary element (“an anthology...descent”) that provides additional information about what *Reclaim the Stars* is.

*Choice A* is incorrect because it results in a rhetorically unacceptable sentence fragment beginning with “an anthology.” *Choice B* is incorrect. Joining the main clause and the following supplementary element with the conjunction “while” results in a confusing and ungrammatical sentence. *Choice C* is incorrect because it fails to mark the boundary between the main clause and the supplementary element with appropriate punctuation.

## QUESTION 22

**Choice A** is the best answer. The convention being tested is the use of plural and possessive nouns. The singular possessive proper noun “Austen’s” and the plural noun “novels” correctly indicates that Austen wrote multiple novels that were famous.

*Choice B* is incorrect because the context requires the singular possessive proper noun “Austen’s” and the plural noun “novels,” not the plural possessive nouns “Austens’” and “novels’.” *Choice C* is incorrect because the context requires the singular possessive proper noun “Austen’s,” not the plural proper noun “Austens.” *Choice D* is incorrect because the context requires the plural noun “novels,” not the singular possessive noun “novel’s.”

## QUESTION 23

**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 the coordinating conjunction “and” to join the first main clause (“This idea...paradox”) and the second main clause (“research...retention”).

*Choice A* 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 B* is incorrect because it results in a run-on sentence. The two main clauses are fused without punctuation and/or a conjunction. *Choice D* is incorrect because when coordinating two longer main clauses such as these, it’s conventional to use a comma before the coordinating conjunction, not after it.

## QUESTION 24

**Choice A** is the best answer. The convention being tested is the use of plural nouns. The plural nouns “terms” and “presidents” correctly indicate that the amendment involves multiple terms and applies to presidents in general.

*Choice B* is incorrect because the context requires the plural noun “terms,” not the singular possessive noun “term’s.” *Choice C* is incorrect because the context requires the plural nouns “terms” and “presidents,” not the singular possessive nouns “term’s” and “president’s.” *Choice D* is incorrect because the context requires the plural noun “presidents,” not the singular possessive noun “president’s.”

## QUESTION 25

**Choice A** is the best answer. The convention being tested is the use of verbs to express tense in a sentence. In this choice, the present tense verb “goes” is consistent with the other present tense verbs (“appears” and “symbolizes”) used to describe the tortoise in Stoppard’s play. Furthermore, it’s conventional to use the present tense when discussing a literary work.

*Choice B* is incorrect because the future perfect tense verb “will have gone” isn’t consistent with the other present tense verbs used to describe the tortoise in Stoppard’s play. *Choice C* is incorrect because the past tense verb “went” isn’t consistent with the other present tense verbs used to describe the tortoise in Stoppard’s play. *Choice D* is incorrect because the past perfect tense verb “had gone” isn’t consistent with the other present tense verbs used to describe the tortoise in Stoppard’s play.

## QUESTION 26

**Choice A** is the best answer. The convention being tested is the use of punctuation within a sentence. The dash after “stratigraphy” pairs with the dash after “(strata)” to separate the supplementary element “the analysis of Earth’s sediment layers (strata)” from the rest of the sentence. This supplementary element functions to define the term “stratigraphy,” and the pair of dashes indicates that this element could be removed without affecting the grammatical coherence of the sentence.

*Choice B* is incorrect because a parenthesis can't be paired with a dash in this way to separate the supplementary element from the rest of the sentence. *Choice C* is incorrect because a colon can't be paired with a dash in this way to separate the supplementary element from the rest of the sentence. *Choice D* is incorrect because a comma can't be paired with a dash in this way to separate the supplementary element from the rest of the sentence.

## QUESTION 27

**Choice C** 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 ("In modern...audience") and another ("To do...performance").

*Choice A* is incorrect because it results in a rhetorically unacceptable sentence fragment beginning with "as." *Choice B* is incorrect because it results in a run-on sentence. The sentences ("In modern...audience" and "To do...performance") are fused without punctuation and/or a conjunction. *Choice D* is incorrect because it results in a comma splice. A comma can't be used in this way to mark the boundary between sentences.

## QUESTION 28

**Choice B** is the best answer. "In comparison" logically signals that the description of savannas in this sentence—that they are drier and their trees are spaced further apart—forms a comparison with the description of tropical forests in the previous sentence.

*Choice A* is incorrect because "for instance" illogically signals that the description of savannas in this sentence exemplifies the description of tropical forests in the previous sentence. Instead, this description forms a comparison with the description of tropical forests. *Choice C* is incorrect because "firstly" illogically signals that the description of savannas in this sentence indicates the first in a series of things. Instead, this description forms a comparison with the description of tropical forests in the previous sentence. *Choice D* is incorrect because "in conclusion" illogically signals that the description of savannas in this sentence concludes or summarizes information in the previous sentences. Instead, this description forms a comparison with the description of tropical forests in the previous sentence.

## QUESTION 29

**Choice B** is the best answer. "Instead" logically signals that the information in this sentence—that Bartholdi decided to slim and tilt out the arm of the Statue of Liberty—contrasts with Eiffel's design suggestions for the statue.

*Choice A* is incorrect because "additionally" illogically suggests that the information in this sentence is merely an additional fact related to Eiffel's design suggestions in the previous sentence. Instead, it contrasts with those suggestions. *Choice C* is incorrect because "thus" illogically signals that the information that follows is a result of Eiffel's design suggestions in the previous

sentence. Instead, it contrasts with those suggestions. *Choice D* is incorrect because “for example” illogically signals that the information about Bartholdi’s design decisions in this sentence exemplifies Eiffel’s design suggestions in the previous sentence. Instead, it contrasts with those suggestions.

### QUESTION 30

**Choice A** is the best answer. The sentence emphasizes the thickness of lead-208’s neutron skin, noting that it is about 0.28 trillionths of a millimeter thick.

*Choice B* is incorrect. The sentence makes a generalization about atoms, stating that atoms with excess neutrons will often acquire a neutron skin; it doesn’t emphasize the thickness of lead-208’s neutron skin. *Choice C* is incorrect. The sentence states that lead-208 has a neutron skin; it doesn’t emphasize the thickness of that skin. *Choice D* is incorrect. The sentence indicates that lead-208 is surrounded by neutrons; it doesn’t emphasize the thickness of lead-208’s neutron skin.

### QUESTION 31

**Choice C** is the best answer. The sentence uses “unlike” to emphasize a difference in how katydids and crab spiders use mimicry, noting that crab spiders use mimicry to ambush prey while katydids use it to hide from predators.

*Choice A* is incorrect. While the sentence does contrast katydids and crab spiders, it misrepresents the information in the notes. Katydids mimic the appearance of leaves (not flowers), whereas crab spiders mimic the appearance of flowers (not leaves). *Choice B* is incorrect. While the sentence indicates that katydids and crab spiders use mimicry, it doesn’t emphasize a difference in how they use it. *Choice D* is incorrect. The sentence describes what mimicry is; it doesn’t emphasize a difference in how katydids and crab spiders specifically use mimicry.

### QUESTION 32

**Choice B** is the best answer. The sentence uses a quotation from Guirguis to explain what *Here I Have Returned* represents, noting that Guirguis said the sculpture symbolizes “women who have lifted and supported Egyptian society and culture.”

*Choice A* is incorrect. The sentence explains what Guirguis says she wants her work to achieve and provides an example of her work; it doesn’t use a quotation to explain what the sculpture represents. *Choice C* is incorrect. The sentence mentions the instrument whose shape inspired the sculpture but doesn’t use a quotation to explain what the sculpture represents. *Choice D* is incorrect. While the sentence does use a quotation from Guirguis, the quotation explains what she hopes her works in general achieve, not what the sculpture in particular represents.

## QUESTION 33

**Choice B** is the best answer. The sentence uses the poem “Towards Autumn” to illustrate the form of a sestina, explaining that a sestina’s thirty-nine lines all end in one of six alternating words and showcasing that poem’s specific end words.

*Choice A* is incorrect. The sentence identifies both of Hacker’s poems as sestinas; it doesn’t use one of the poems to illustrate the form of a sestina.

*Choice C* is incorrect. While the sentence appears to use the poem “Forage Sestina” to illustrate a feature of the sestina form, it misrepresents the information in the notes. According to the notes, “Forage Sestina” doesn’t use these six end words; it uses six other words instead. *Choice D* is incorrect. While the sentence uses the poem “Towards Autumn” as an example of one of Hacker’s sestinas, it misrepresents the information in the notes. According to the notes, “Towards Autumn” doesn’t use these six end words; it uses six other words instead.



# Math

## Module 1

(27 questions)

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### QUESTION 1

**Choice A** is correct. The given absolute value equation can be rewritten as two linear equations:  $x + 45 = 48$  and  $-(x + 45) = 48$ , or  $x + 45 = -48$ . Subtracting 45 from both sides of the equation  $x + 45 = 48$  yields  $x = 3$ . Subtracting 45 from both sides of the equation  $x + 45 = -48$  yields  $x = -93$ . Thus, the given equation has two possible solutions, 3 and  $-93$ . Therefore, the positive solution to the given equation is 3.

*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 2

**Choice A** is correct. The first equation in the given system of equations is  $x = 4$ . Substituting 4 for  $x$  in the second equation in the given system of equations yields  $y = 5 - 4$ , or  $y = 1$ .

*Choice B* is incorrect. This is the value of  $x$  in the solution to the given system of equations, not the value of  $y$ . *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 3

**Choice C** is correct. Let  $d$  represent the mass, in grams, of vitamin D in the mixture, and let  $c$  represent the mass, in grams, of calcium in the mixture. It's given that the mixture consists of only vitamin D and calcium and that the total mass of the mixture is 150 grams. Therefore, the equation  $d + c = 150$  represents this situation. It's also given that the mass of vitamin D in the mixture is 50 grams. Substituting 50 for  $d$  in the equation  $d + c = 150$  yields  $50 + c = 150$ . Subtracting

50 from both sides of this equation yields  $c = 100$ . Therefore, the mass of calcium in the mixture is 100 grams.

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

*Choice B* is incorrect. This is the total mass, in grams, of the mixture, not the mass, in grams, of calcium in the mixture. *Choice D* is incorrect. This is the mass, in grams, of vitamin D in the mixture, not the mass, in grams, of calcium in the mixture.

## QUESTION 4

**Choice C** is correct. It's given that this service contract requires a monthly cost of \$23. A monthly cost of \$23 for  $t$  months results in a cost of  $\$23t$ . It's also given that this service contract requires a onetime activation cost of \$35. Adding the onetime activation cost to the monthly cost of the service contract for  $t$  months yields the total cost  $c$ , in dollars, of this service contract for  $t$  months. Therefore, this situation can be represented by the equation  $c = 23t + 35$ .

*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 5

**Choice B** is correct. It's given that the function  $f$  is defined by  $f(x) = 3x - 8$ . The value of  $f(7)$  is the value of  $f(x)$  when  $x = 7$ . Substituting 7 for  $x$  in the given equation yields  $f(7) = 3(7) - 8$ , which is equivalent to  $f(7) = 21 - 8$ , or  $f(7) = 13$ .

*Choice A* is incorrect. This is the value of  $f(7)$  when  $f(x) = 3x + 8$ , rather than  $f(x) = 3x - 8$ . *Choice C* is incorrect. This is the value of  $f(1)$ , rather than  $f(7)$ .

*Choice D* is incorrect. This is the value of  $f(-7)$ , rather than  $f(7)$ .

## QUESTION 6

The correct answer is 40. The  $y$ -intercept of a graph in the  $xy$ -plane is the point  $(x, y)$  on the graph where  $x = 0$ . The  $y$ -intercept of the graph shown is  $(0, 40)$ . Therefore, the value of  $y$  is 40.

## QUESTION 7

The correct answer is 130. It's given that  $8x - 7x + 130 = 260$ . Combining like terms on the left-hand side of this equation yields  $x + 130 = 260$ . Subtracting 130 from each side of this equation yields  $x = 130$ . Therefore, the value of  $x$  that's the solution to the given equation is 130.

## QUESTION 8

**Choice C** is correct. It's given that the geologist has already collected 63 samples from the volcano. Let  $x$  represent the number of additional samples the geologist needs to collect. After collecting  $x$  additional samples, the geologist will have collected a total of  $63 + x$  samples. It's given that the geologist needs to collect

at least 67 samples. Therefore,  $63 + x \geq 67$ . Subtracting 63 from each side of this inequality yields the inequality  $x \geq 4$ . Thus, the geologist needs to collect a minimum of 4 additional samples.

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

*Choice B* is incorrect. This is the number of samples the geologist has already collected, rather than the minimum number of additional samples the geologist needs to collect. *Choice D* is incorrect. If the geologist collects 0 additional samples, the geologist will have collected a total of 63 samples, which is less than 67 samples.

## QUESTION 9

**Choice A** is correct. If one of the gemstones is selected at random, the probability of selecting a gemstone of color Y is equal to the number of gemstones of color Y divided by the total number of gemstones. According to the table, there are 3 gemstones of color Y, and it's given that the total number of gemstones is 157. Therefore, if one of the gemstones is selected at random, the probability of selecting a gemstone of color Y is  $\frac{3}{157}$ .

*Choice B* is incorrect. This is the probability of selecting a gemstone of color Z.

*Choice C* is incorrect. This is the probability of selecting a gemstone of color X.

*Choice D* is incorrect. This is the probability of selecting a gemstone that's not of color Y.

## QUESTION 10

**Choice A** is correct. The equation for the line representing the boundary of the shaded region can be written in slope-intercept form  $y = mx + b$ , where  $m$  is the slope and  $(0, b)$  is the  $y$ -intercept of the line. For the graph shown, the boundary line passes through the points  $(0, -6)$  and  $(9, 0)$ . Given two points on a line,  $(x_1, y_1)$  and  $(x_2, y_2)$ , the slope of the line can be calculated using the equation  $m = \frac{y_2 - y_1}{x_2 - x_1}$ . Substituting the points  $(0, -6)$  and  $(9, 0)$  for  $(x_1, y_1)$  and  $(x_2, y_2)$ , respectively, in this equation yields  $m = \frac{0 - (-6)}{9 - 0}$ , which is equivalent to  $m = \frac{6}{9}$ , or  $m = \frac{2}{3}$ . Since the point  $(0, -6)$  represents the  $y$ -intercept, it follows that  $b = -6$ . Substituting  $\frac{2}{3}$  for  $m$  and  $-6$  for  $b$  in the equation  $y = mx + b$  yields  $y = \frac{2}{3}x - 6$  as the equation of the boundary line. Since the shaded region represents all the points on and above this boundary line, it follows that the shaded region shown represents the solutions to the inequality  $y \geq \frac{2}{3}x - 6$ .

*Choice B* is incorrect. This inequality represents a region whose boundary line has a  $y$ -intercept of  $(0, 6)$ , not  $(0, -6)$ . *Choice C* is incorrect. This inequality represents a region whose boundary line has a  $y$ -intercept of  $(0, -9)$ , not  $(0, -6)$ . *Choice D* is incorrect. This inequality represents a region whose boundary line has a  $y$ -intercept of  $(0, 9)$ , not  $(0, -6)$ .

## QUESTION 11

**Choice A** is correct. In an equilateral triangle, all three sides have the same length. It's given that in triangle  $ABC$ ,  $AB = 4,680$  mm and  $BC = 4,680$  mm. Therefore, if  $AC = 4,680$  mm, then all three sides of triangle  $ABC$  have the same length, so triangle  $ABC$  is equilateral. Therefore,  $AC = 4,680$  mm is sufficient to prove that triangle  $ABC$  is equilateral.

**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 12

**Choice C** is correct. The function  $P$  gives the predicted population, in millions, of a certain country for the period from 1984 to 2018, where  $t$  is the number of years after 1984. Since the value of  $P(8)$  is the value of  $P(t)$  when  $t = 8$ , it follows that " $P(8)$  is approximately equal to 32.91" means that the value of  $P(t)$  is approximately equal to 32.91 when  $t = 8$ . Therefore, the best interpretation of the statement " $P(8)$  is approximately equal to 32.91" is that 8 years after 1984, the predicted population of this country was approximately 32.91 million.

**Choice A** is incorrect. In 1984, the predicted population of this country was 24.8 million, not approximately 8 million. **Choice B** is incorrect. In 1984, the predicted population of this country was 24.8 million, not approximately 32.91 million. **Choice D** is incorrect. 32.91 years after 1984, the predicted population of this country was  $24.8(1.036)^{32.91}$  million, or approximately 79.42 million, not approximately 8 million.

## QUESTION 13

The correct answer is 29. The volume,  $V$ , of a right circular cylinder is given by the formula  $V = \pi r^2 h$ , where  $r$  is the radius of the base of the cylinder and  $h$  is the height of the cylinder. Since the base of the cylinder is a circle with radius  $r$ , the area of the base of the cylinder is  $\pi r^2$ . It's given that a right circular cylinder has a volume of 377 cubic centimeters; therefore,  $V = 377$ . It's also given that the area of the base of the cylinder is 13 square centimeters; therefore,  $\pi r^2 = 13$ .

Substituting 377 for  $V$  and 13 for  $\pi r^2$  in the formula  $V = \pi r^2 h$  yields  $377 = 13h$ . Dividing both sides of this equation by 13 yields  $29 = h$ . Therefore, the height of the cylinder, in centimeters, is 29.

## QUESTION 14

The correct answer is 3,630. The mean of a data set is the sum of the values in the data set divided by the number of values in the data set. The sum of the masses, in grams, of these alpine marmots is  $4,010 + 4,010 + 3,030 + 4,050 + 3,050$ , or 18,150 grams. The number of alpine marmots in the data set is 5. Therefore, the mean mass, in grams, of these 5 alpine marmots is  $\frac{18,150}{5}$ , or 3,630.

## QUESTION 15

**Choice A** is correct. The first equation in the given system of equations is  $x = 3$ . Substituting 3 for  $x$  in the second equation in the given system of equations yields  $y = (15 - 3)^2$ , or  $y = 144$ . Substituting 3 for  $x$  and 144 for  $y$  in the expression  $xy$  yields  $(3)(144)$ , or 432. Therefore, the value of  $xy$  is 432.

*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 16

**Choice B** is correct. The cosine of an acute angle in a right triangle is defined as the ratio of the length of the leg adjacent to the angle to the length of the hypotenuse. In the triangle shown, the length of the leg adjacent to angle  $A$  is 41, and the length of the hypotenuse is 42. Therefore,  $\cos A = \frac{41}{42}$ .

*Choice A* is incorrect. This is the value of  $\frac{1}{\cos A}$ . *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 17

**Choice D** is correct. 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 circle has a radius of 43 meters. Substituting 43 for  $r$  in the formula  $A = \pi r^2$  yields  $A = \pi(43)^2$ , or  $A = 1,849\pi$ . Therefore, the area, in square meters, of the circle is  $1,849\pi$ .

*Choice A* is incorrect. This is the area, in square meters, of a circle with a radius of  $\sqrt{\frac{43}{2}}$  meters. *Choice B* is incorrect. This is the area, in square meters, of a circle with a radius of  $\sqrt{43}$  meters. *Choice C* is incorrect. This is the circumference, in meters, of the circle.

## QUESTION 18

**Choice A** is correct. It's given that the object has a mass of 168 grams and a volume of 24 cubic centimeters. Dividing the mass, in grams, of the object by the volume, in cubic centimeters, of the object gives the density, in grams per cubic centimeter, of the object. It follows that the density of the object is

$\frac{168 \text{ grams}}{24 \text{ cubic centimeters}}$ , which is equivalent to  $\frac{168}{24}$  grams per cubic centimeter, or

7 grams per cubic centimeter.

*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 19

**Choice B** is correct. It's given that in January 2018, there were 1,300 customers subscribed to a company's newsletter and for the next 24 months after January 2018, the total number of customers subscribed to the newsletter each month was 7% greater than the total number subscribed the previous month. It follows that this situation can be represented by the equation  $c = a\left(1 + \frac{r}{100}\right)^m$ , where  $c$  is the total number of customers subscribed to the company's newsletter  $m$  months after January 2018,  $a$  is the number of customers subscribed to the newsletter in January 2018, and the total number of customers subscribed to the newsletter each month was  $r\%$  greater than the total number subscribed the previous month. Substituting 1,300 for  $a$  and 7 for  $r$  in this equation yields  $c = 1,300\left(1 + \frac{7}{100}\right)^m$ , or  $c = 1,300(1.07)^m$ .

**Choice A** is incorrect. This equation represents a situation where the total number of customers subscribed each month was 93% less, not 7% greater, than the total number subscribed the previous month. **Choice C** is incorrect. This equation represents a situation where the total number of customers subscribed each month was 70%, not 7%, greater than the total number subscribed the previous month. **Choice D** is incorrect. This equation represents a situation where the total number of customers subscribed each month was 600%, not 7%, greater than the total number subscribed the previous month.

## QUESTION 20

The correct answer is 6. The line of best fit predicts a greater  $y$ -value than the actual  $y$ -value for any data point that's located below the line of best fit. For the scatterplot shown, 6 of the data points are below the line of best fit. Therefore, the line of best fit predicts a greater  $y$ -value than the actual  $y$ -value for 6 of the data points.

## QUESTION 21

The correct answer is 156. In the figure shown, the sum of the measures of angle  $UVS$  and angle  $RVS$  is  $180^\circ$ . It's given that the measure of angle  $RVS$  is  $41^\circ$ . Therefore, the measure of angle  $UVS$  is  $(180 - 41)^\circ$ , or  $139^\circ$ . The sum of the measures of the interior angles of a triangle is  $180^\circ$ . In triangle  $UVS$ , the measure of angle  $UVS$  is  $139^\circ$  and it's given that the measure of angle  $VST$  is  $29^\circ$ . Thus, the measure of angle  $VUS$  is  $(180 - 139 - 29)^\circ$ , or  $12^\circ$ . It's given that  $RT = TU$ . Therefore, triangle  $TUR$  is an isosceles triangle and the measure of  $VUS$  is equal to the measure of angle  $TRU$ . In triangle  $TUR$ , the measure of angle  $VUS$  is  $12^\circ$  and the measure of angle  $TRU$  is  $12^\circ$ . Thus, the measure of angle  $UTR$  is  $(180 - 12 - 12)^\circ$ , or  $156^\circ$ . The figure shows that the measure of angle  $UTR$  is  $x^\circ$ , so the value of  $x$  is 156.

## QUESTION 22

**Choice D** is correct. A system of two linear equations in two variables,  $x$  and  $y$ , has zero solutions if the lines representing the equations in the  $xy$ -plane are distinct and parallel. Two lines are distinct and parallel if they have the same slope

but different  $y$ -intercepts. Each equation in the given system can be written in slope-intercept form  $y = mx + b$ , where  $m$  is the slope of the line representing the equation in the  $xy$ -plane and  $(0, b)$  is the  $y$ -intercept. Adding  $12x$  to both sides of the first equation in the given system of equations,  $-12x + 14y = 36$ , yields

$14y = 12x + 36$ . Dividing both sides of this equation by 14 yields  $y = \frac{6}{7}x + \frac{18}{7}$ . It follows that the first equation in the given system of equations has a slope of  $\frac{6}{7}$  and a  $y$ -intercept of  $(0, \frac{18}{7})$ . Adding  $6x$  to both sides of the second equation in the given system of equations,  $-6x + 7y = -18$ , yields  $7y = 6x - 18$ . Dividing both sides of this equation by 7 yields  $y = \frac{6}{7}x - \frac{18}{7}$ . It follows that the second equation in the given system of equations has a slope of  $\frac{6}{7}$  and a  $y$ -intercept of  $(0, -\frac{18}{7})$ . Since the slopes of these lines are the same and the  $y$ -intercepts are different, it follows that the given system of equations has zero solutions.

Alternate approach: To solve the system by elimination, multiplying the second equation in the given system of equations,  $-6x + 7y = -18$ , by  $-2$  yields  $12x - 14y = 36$ . Adding this equation to the first equation in the given system of equations,  $-12x + 14y = 36$ , yields  $(-12x + 12x) + (-14y + 14y) = 36 + 36$ , or  $0 = 72$ . Since this equation isn't true, the given system of equations has zero solutions.

*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 23

**Choice D** is correct. Let  $n\%$  represent the percent by which the positive quantity  $x$  is decreased to result in  $0.35x$ . The value of  $n$  can be found by solving the equation  $x - (\frac{n}{100})x = 0.35x$ . Since  $x$  is a common factor of each of the terms on the left-hand side of this equation, the equation can be rewritten as

$x(1 - \frac{n}{100}) = 0.35x$ . Dividing each side of this equation by  $x$  yields  $1 - \frac{n}{100} = 0.35$ .

Multiplying each side of this equation by 100 yields  $100 - n = 35$ . Subtracting 100 from each side of this equation yields  $-n = -65$ . Dividing each side of this equation by  $-1$  yields  $n = 65$ . Therefore, the expression  $0.35x$  represents the result of decreasing the positive quantity  $x$  by 65%.

*Choice A* is incorrect. Decreasing the quantity  $x$  by 3.5% yields  $x - 0.035x$ , or  $0.965x$ , not  $0.35x$ . *Choice B* is incorrect. Decreasing the quantity  $x$  by 35% yields  $x - 0.35x$ , or  $0.65x$ , not  $0.35x$ . *Choice C* is incorrect. Decreasing the quantity  $x$  by 6.5% yields  $x - 0.065x$ , or  $0.935x$ , not  $0.35x$ .

## QUESTION 24

**Choice B** is correct. It's given that object R travels a distance of  $4x$  inches in  $y$  seconds. This speed can be written as  $\frac{4x \text{ inches}}{y \text{ seconds}}$ . It's given that the speed of object R is half the speed of object S. It follows that the speed of object S is twice the speed of object R, which is  $2(\frac{4x \text{ inches}}{y \text{ seconds}})$ , or  $\frac{8x \text{ inches}}{y \text{ seconds}}$ . Let  $n$  represent the time,

in seconds, it takes object S to travel a distance of  $24x$  inches. The value of  $n$  can be found by solving the equation  $\frac{8x \text{ inches}}{y \text{ seconds}} = \frac{24x \text{ inches}}{n \text{ seconds}}$ , which can be written as  $\frac{8x}{y} = \frac{24x}{n}$ . Multiplying each side of this equation by  $ny$  yields  $8xn = 24xy$ . Dividing each side of this equation by  $8x$  yields  $n = 3y$ . Therefore, the expression  $3y$  represents the time, in seconds, it takes object S to travel a distance of  $24x$  inches.

*Choice A* is incorrect. This expression represents the time, in seconds, it would take object S to travel a distance of  $24x$  inches if the speed of object R were twice, not half, the speed of object S. *Choice C* is incorrect. This expression represents the time, in seconds, it takes object S to travel a distance of  $128x$  inches, not  $24x$  inches. *Choice D* is incorrect. This expression represents the time, in seconds, it takes object R, not object S, to travel a distance of  $24x$  inches.

## QUESTION 25

**Choice C** is correct. The equation representing the linear relationship shown can be written in slope-intercept form  $y = mx + b$ , where  $m$  is the slope and  $(0, b)$  is the  $y$ -intercept of the line. The line shown passes through the points  $(0, 6)$  and  $(2, 0)$ . Given two points on a line,  $(x_1, y_1)$  and  $(x_2, y_2)$ , the slope of the line can be calculated using the equation  $m = \frac{y_2 - y_1}{x_2 - x_1}$ . Substituting  $(0, 6)$  and  $(2, 0)$  for  $(x_1, y_1)$  and  $(x_2, y_2)$ , respectively, in this equation yields  $m = \frac{0 - 6}{2 - 0}$ , which is equivalent to  $m = -\frac{6}{2}$ , or  $m = -3$ . Since  $(0, 6)$  is the  $y$ -intercept, it follows that  $b = 6$ .

Substituting  $-3$  for  $m$  and  $6$  for  $b$  in the equation  $y = mx + b$  yields  $y = -3x + 6$ . Adding  $3x$  to both sides of this equation yields  $3x + y = 6$ . Multiplying this equation by  $6$  yields  $18x + 6y = 36$ . It follows that the equation  $18x + Ry = 36$ , where  $R$  is a positive constant, represents this relationship.

*Choice A* is incorrect. The graph of this relationship passes through the point  $(0, 2)$ , not  $(0, 6)$ . *Choice B* is incorrect. The graph of this relationship passes through the point  $(0, 2)$ , not  $(0, 6)$ . *Choice D* is incorrect. The graph of this relationship passes through the point  $(-2, 0)$ , not  $(2, 0)$ .

## QUESTION 26

**Choice B** is correct. Let  $x$  represent the total mass, in grams, of the first piece, and let  $y$  represent the total mass, in grams, of the second piece. It's given that the sample has a total mass of  $50.0$  grams. Therefore, the equation  $x + y = 50.0$  represents this situation. It's also given that the sample is  $50.0\%$  silicon by mass. Therefore, the total mass of the silicon in the sample is  $0.500(50.0)$ , or  $25.0$ , grams. It's also given that the first piece was  $30.0\%$  silicon by mass and the second piece was  $80.0\%$  silicon by mass. Therefore, the masses, in grams, of the silicon in the first and second pieces can be represented by the expressions  $0.300x$  and  $0.800y$ , respectively. Since the sample was created by combining the first and second pieces, and the total mass of the silicon in the sample is  $25.0$  grams, the equation  $0.300x + 0.800y = 25.0$  represents this situation.



Subtracting  $y$  from both sides of the equation  $x + y = 50.0$  yields  $x = 50.0 - y$ . Substituting  $50.0 - y$  for  $x$  in the equation  $0.300x + 0.800y = 25.0$  yields  $0.300(50.0 - y) + 0.800y = 25.0$ . Distributing  $0.300$  on the left-hand side of this equation yields  $15.0 - 0.300y + 0.800y = 25.0$ . Combining like terms on the left-hand side of this equation yields  $15.0 + 0.500y = 25.0$ . Subtracting  $15.0$  from both sides of this equation yields  $0.500y = 10.0$ . Dividing both sides of this equation by  $0.500$  yields  $y = 20.0$ . Substituting  $20.0$  for  $y$  in the expression representing the mass, in grams, of the silicon in the second piece,  $0.800y$ , yields  $0.800(20.0)$ , or  $16.0$ . Therefore, the mass, in grams, of the silicon in the second piece is  $16.0$ .

*Choice A* is incorrect. This is the mass, in grams, of the silicon in the first piece, not the second piece. *Choice C* is incorrect. This is the total mass, in grams, of the second piece, not the mass, in grams, of the silicon in the second piece. *Choice D* is incorrect. This is the total mass, in grams, of the first piece, not the mass, in grams, of the silicon in the second piece.

## QUESTION 27

The correct answer is 14. Let  $x$  represent the first integer and  $y$  represent the second integer. If the first integer is 5 greater than twice the second integer, then  $x = 2y + 5$ . It's given that the product of the two integers is 462; therefore  $xy = 462$ . Substituting  $2y + 5$  for  $x$  in this equation yields  $(2y + 5)(y) = 462$ , which can be written as  $2y^2 + 5y = 462$ . Subtracting 462 from each side of this equation yields  $2y^2 + 5y - 462 = 0$ . The left-hand side of this equation can be factored by finding two values whose product is  $2(-462)$ , or  $-924$ , and whose sum is 5. The two values whose product is  $-924$  and whose sum is 5 are 33 and  $-28$ . Thus, the equation  $2y^2 + 5y - 462 = 0$  can be rewritten as  $2y^2 - 28y + 33y - 462 = 0$ , which is equivalent to  $2y(y - 14) + 33(y - 14) = 0$ , or  $(2y + 33)(y - 14) = 0$ . By the zero product property, it follows that  $2y + 33 = 0$  or  $y - 14 = 0$ . Subtracting 33 from both sides of the equation  $2y + 33 = 0$  yields  $2y = -33$ . Dividing both sides of this equation by 2 yields  $y = -\frac{33}{2}$ . Since  $y$  is a positive integer, the value of  $y$  isn't  $-\frac{33}{2}$ . Adding 14 to both sides of the equation  $y - 14 = 0$  yields  $y = 14$ .

Substituting 14 for  $y$  in the equation  $xy = 462$  yields  $x(14) = 462$ . Dividing both sides of this equation by 14 yields  $x = 33$ . Therefore, the two integers are 14 and 33, so the smaller of the two integers is 14.

# Math

## Module 2

(27 questions)

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### QUESTION 1

**Choice B** is correct. The height of each bar in the graph shown represents the number of containers that contain the number of walnuts specified at the bottom of the bar. The bar for 78 walnuts has a height of 7. Therefore, 7 of these containers of walnuts contain exactly 78 walnuts.

*Choice A* is incorrect. This is the number of containers that contain exactly 75 walnuts, not 78 walnuts. *Choice C* is incorrect. This is the total number of containers of walnuts represented in the bar graph, not the number that contain exactly 78 walnuts. *Choice D* is incorrect. This is the number of walnuts in a container that contains exactly 78 walnuts, not the number of containers that contain exactly 78 walnuts.

### QUESTION 2

**Choice C** is correct. For the line graph shown, the probability of snow, as a percent, is represented on the vertical axis. According to the line graph, during this four-day period, the probability of snow is 30% for Thursday.

*Choice A* is incorrect. The probability of snow on Tuesday is 60%. *Choice B* is incorrect. The probability of snow on Wednesday is 90%. *Choice D* is incorrect. The probability of snow on Friday is 70%.

### QUESTION 3

**Choice B** is correct. The solution  $(x, y)$  to the system of two equations corresponds to the point where the graphs of the equations intersect in the  $xy$ -plane. The graphs of the linear equation and the nonlinear equation shown intersect at the point  $(-2, 6)$ . Thus, the solution  $(x, y)$  to this system is  $(-2, 6)$ .

*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 4

**Choice D** is correct. In the figure shown, the angles with measures  $w^\circ$  and  $z^\circ$  are vertical angles. Since vertical angles are congruent,  $w = z$ . Therefore, if  $w = 136$ , the value of  $z$  is 136.

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

*Choice B* is incorrect. This is the measure, in degrees, of an angle that's supplementary, not congruent, to the angle with measure  $w^\circ$ . *Choice C* is incorrect and may result from conceptual or calculation errors.

## QUESTION 5

**Choice A** is correct. The expression  $19(x^2 - 7)$  can be rewritten as  $19(x^2) - 19(7)$ , which is equivalent to  $19x^2 - 133$ .

*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 6

The correct answer is 7. It's given that the parabola intersects the  $y$ -axis at the point  $(x, y)$ . The graph shows that the parabola intersects the  $y$ -axis at the point  $(0, 7)$ . Therefore, the value of  $y$  is 7.

## QUESTION 7

The correct answer is 17. It's given that  $2x + 3 = 9$ . Multiplying each side of this equation by 3 yields  $3(2x + 3) = 3(9)$ , or  $6x + 9 = 27$ . Subtracting 10 from each side of this equation yields  $6x + 9 - 10 = 27 - 10$ , or  $6x - 1 = 17$ . Therefore, the value of  $6x - 1$  is 17.

## QUESTION 8

**Choice D** is correct. A linear model can be written in the form  $y = mx + b$ , where  $m$  is the slope of the graph of the model in the  $xy$ -plane and  $(0, b)$  is the  $y$ -intercept. The graph of an appropriate linear model for this relationship passes near the points  $(1, 3)$  and  $(9, 10)$  in the  $xy$ -plane. Two points on a line,  $(x_1, y_1)$  and  $(x_2, y_2)$ , can be used to find the slope of the line using the slope formula,

$m = \frac{y_2 - y_1}{x_2 - x_1}$ . Substituting the points  $(1, 3)$  and  $(9, 10)$  for  $(x_1, y_1)$  and  $(x_2, y_2)$ ,

respectively, in the slope formula yields  $m = \frac{10 - 3}{9 - 1}$ , or  $m = 0.875$ . Therefore, the

value of  $m$  for an appropriate linear model is approximately 0.875. Substituting

0.875 for  $m$  in  $y = mx + b$  yields  $y = 0.875x + b$ . Since an appropriate linear

model passes near the point  $(1, 3)$ , the approximate value of  $b$  can be found by

substituting 1 for  $x$  and 3 for  $y$  in the equation  $y = 0.875x + b$ , which yields

$3 = (0.875)(1) + b$ , or  $3 = 0.875 + b$ . Subtracting 0.875 from both sides of this

equation yields  $2.125 = b$ . Therefore, the value of  $b$  for an appropriate linear

model is approximately 2.125. Thus, of the given choices,  $y = 0.9x + 2.2$  is the

most appropriate linear model for this relationship.

Alternate approach: A linear model can be written in the form  $y = mx + b$ , where  $m$  is the slope of the graph of the model in the  $xy$ -plane and  $(0, b)$  is the  $y$ -intercept. The scatterplot shows that as the  $x$ -values of the data points increase, the  $y$ -values of the data points increase, which means the graph of an appropriate linear model has a positive slope. Of the given choices,  $y = 0.9x + 2.2$  is the only linear model whose graph has a positive slope.

*Choice A* is incorrect. The graph of this model has a negative slope, not a positive slope. *Choice B* is incorrect. The graph of this model has a negative slope, not a positive slope. *Choice C* is incorrect. The graph of this model has a negative slope, not a positive slope.

## QUESTION 9

**Choice B** is correct. It's given that the equation  $d = 16 - \frac{x}{30}$  gives the estimated amount of diesel  $d$ , in gallons, that remains in the gas tank of the truck after being driven  $x$  miles. Substituting 300 for  $x$  in the given equation yields  $d = 16 - \frac{300}{30}$ , which is equivalent to  $d = 16 - 10$ , or  $d = 6$ . Therefore, the estimated amount of diesel that remains in the gas tank of the truck when  $x = 300$  is 6 gallons.

*Choice A* is incorrect. This is the estimated amount of diesel, in gallons, that will remain in the gas tank of the truck when  $x = 480$ , not when  $x = 300$ . *Choice C* is incorrect. This is the estimated amount of diesel, in gallons, that will remain in the gas tank of the truck when  $x = 60$ , not when  $x = 300$ . *Choice D* is incorrect. This is the estimated amount of diesel, in gallons, that will remain in the gas tank of the truck when  $x = 0$ , not when  $x = 300$ .

## QUESTION 10

**Choice C** is correct. Each of the tables shows the same three values of  $x$ :  $-1$ ,  $0$ , and  $1$ . Substituting  $-1$  for  $x$  in the given function yields  $g(-1) = 11(-1) + 4$ , or  $g(-1) = -7$ . Therefore, when  $x = -1$ , the corresponding value of  $g(x)$  is  $-7$ . Substituting  $0$  for  $x$  in the given function yields  $g(0) = 11(0) + 4$ , or  $g(0) = 4$ . Therefore, when  $x = 0$ , the corresponding value of  $g(x)$  is  $4$ . Substituting  $1$  for  $x$  in the given function yields  $g(1) = 11(1) + 4$ , or  $g(1) = 15$ . Therefore, when  $x = 1$ , the corresponding value of  $g(x)$  is  $15$ . The table in choice C shows  $-7$ ,  $4$ , and  $15$  as the corresponding value of  $g(x)$  for  $x$ -values of  $-1$ ,  $0$ , and  $1$ , respectively. Therefore, the table in choice C shows three values of  $x$  and their corresponding values of  $g(x)$ .

*Choice A* is incorrect. This table shows three values of  $x$  and their corresponding values of  $g(x)$  for the linear function  $g(x) = 4x + 11$ . *Choice B* is incorrect. This table shows three values of  $x$  and their corresponding values of  $g(x)$  for the linear function  $g(x) = 4x$ . *Choice D* is incorrect. This table shows three values of  $x$  and their corresponding values of  $g(x)$  for the linear function  $g(x) = 11x$ .

## QUESTION 11

**Choice A** is correct. It's given that the pressure exerted on a scuba diver at sea level is 14.70 pounds per square inch (psi). It's also given that for each foot the scuba diver descends below sea level, the pressure exerted on the scuba diver increases by 0.44 psi. The total pressure, in psi, exerted on the scuba diver at  $x$  feet below sea level can be represented by the expression  $0.44x + 14.70$ . Substituting 105 for  $x$  in this expression yields  $0.44(105) + 14.70$ , or 60.90. Therefore, the total pressure exerted on the scuba diver at 105 feet below sea level is 60.90 psi.

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

**Choice C** is incorrect. This is the pressure, in psi, exerted on the scuba diver at sea level, not at 105 feet below sea level. **Choice D** is incorrect. This is the rate by which the pressure, in psi, exerted on the scuba diver increases for each foot the scuba diver descends below sea level.

## QUESTION 12

**Choice C** is correct. It's given that function  $f$  is defined by the equation  $f(x) = 4x^{-1}$ . The value of  $f(21)$  is the value of  $f(x)$  when  $x = 21$ . Substituting 21 for  $x$  in the given equation yields  $f(21) = 4(21)^{-1}$ , which is equivalent to  $f(21) = 4\left(\frac{1}{21}\right)$ , or  $f(21) = \frac{4}{21}$ .

**Choice A** is incorrect. This is the value of  $f(21)$  when  $f(x) = -4x$ , rather than  $f(x) = 4x^{-1}$ . **Choice B** is incorrect. This is the value of  $f(21)$  when  $f(x) = (4x)^{-1}$ , rather than  $f(x) = 4x^{-1}$ . **Choice D** is incorrect. This is the value of  $f(21)$  when  $f(x) = (4^{-1})x$ , rather than  $f(x) = 4x^{-1}$ .

## QUESTION 13

The correct answer is 3. The area of a rectangle can be calculated by multiplying the length of its longest side by the length of its shortest side. It's given that the area of the rectangle is 57 square inches and the length of the longest side of the rectangle is 19 inches. Let  $x$  represent the length, in inches, of the shortest side of this rectangle. It follows that  $57 = 19x$ . Dividing both sides of this equation by 19 yields  $3 = x$ . Therefore, the length, in inches, of the shortest side of the rectangle is 3.

## QUESTION 14

The correct answer is 423.5. It's given that 5.5 yards = 1 rod. Therefore, 77 rods is equivalent to  $(77 \text{ rods})\left(\frac{5.5 \text{ yards}}{1 \text{ rod}}\right)$ , or 423.5 yards. Note that 423.5 and  $847/2$  are examples of ways to enter a correct answer.

## QUESTION 15

**Choice A** is correct. The number of solutions of a quadratic equation of the form  $ax^2 + bx + c = 0$ , where  $a$ ,  $b$ , and  $c$  are constants, can be determined by the value of the discriminant,  $b^2 - 4ac$ . If the value of the discriminant is positive, then the

quadratic equation has exactly two distinct real solutions. If the value of the discriminant is equal to zero, then the quadratic equation has exactly one real solution. If the value of the discriminant is negative, then the quadratic equation has zero real solutions. In the given equation,  $x^2 - 12x + 27 = 0$ ,  $a = 1$ ,  $b = -12$ , and  $c = 27$ . Substituting these values for  $a$ ,  $b$ , and  $c$  in  $b^2 - 4ac$  yields  $(-12)^2 - 4(1)(27)$ , or 36. Since the value of its discriminant is positive, the given equation has exactly two distinct real solutions.

*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 16

**Choice C** is correct. An equation defining a linear function can be written in the form  $g(x) = mx + b$ , where  $m$  is the slope and  $(0, b)$  is the  $y$ -intercept of the graph of  $y = g(x)$  in the  $xy$ -plane. It's given that the graph of  $y = g(x)$  has a slope of 2. Therefore,  $m = 2$ . It's also given that the graph of  $y = g(x)$  passes through the point  $(1, 14)$ . It follows that when  $x = 1$ ,  $g(x) = 14$ . Substituting 1 for  $x$ , 14 for  $g(x)$ , and 2 for  $m$  in the equation  $g(x) = mx + b$  yields  $14 = 2(1) + b$ , or  $14 = 2 + b$ . Subtracting 2 from each side of this equation yields  $12 = b$ . Therefore,  $b = 12$ . Substituting 2 for  $m$  and 12 for  $b$  in the equation  $g(x) = mx + b$  yields  $g(x) = 2x + 12$ . Therefore, the equation that defines  $g$  is  $g(x) = 2x + 12$ .

*Choice A* is incorrect. For this function, the graph of  $y = g(x)$  in the  $xy$ -plane passes through the point  $(1, 2)$ , not  $(1, 14)$ . *Choice B* is incorrect. For this function, the graph of  $y = g(x)$  in the  $xy$ -plane passes through the point  $(1, 4)$ , not  $(1, 14)$ .

*Choice D* is incorrect. For this function, the graph of  $y = g(x)$  in the  $xy$ -plane passes through the point  $(1, 16)$ , not  $(1, 14)$ .

## QUESTION 17

**Choice B** is correct. On the graph shown, the  $y$ -axis represents estimated population, in thousands. The graph shows that when  $x = 0$ , the  $y$ -coordinate is 6. Therefore, the estimated population at  $x = 0$  is 6 thousand. The graph also shows that when  $x = 1$ , the  $y$ -coordinate is 9. Therefore, the estimated population at  $x = 1$  is 9 thousand. Dividing 9 thousand by 6 thousand yields 1.5; therefore, 9 thousand is 1.5 times 6 thousand. It follows that the estimated population at  $x = 1$  is 1.5 times the estimated population at  $x = 0$ .

*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 18

**Choice C** is correct. It's given that the price of the collectible card was \$15.50 in March and \$17.36 in April. It's also given that the price of the collectible card in April was  $p\%$  of the price in March. It follows that \$17.36 is  $p\%$  of \$15.50. Therefore, the value of  $p$  can be calculated by solving the equation

$17.36 = \left(\frac{p}{100}\right)(15.50)$ , or  $17.36 = \frac{15.50p}{100}$ . Multiplying each side of this equation by

100 yields  $1,736 = 15.50p$ . Dividing each side of this equation by 15.50 yields  $112 = p$ . Therefore, the value of  $p$  is 112.

*Choice A* is incorrect. 12% is the percent increase in the price of the collectible card from March to April. *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 19

**Choice B** is correct. To express  $a$  in terms of  $b$  and  $x$ , the given equation can be rewritten such that  $a$  is isolated on one side of the equation. Since it's given that  $b$  is a positive number,  $b + 9$  is not equal to zero. Therefore, dividing both sides of the given equation by  $8(b + 9)$  yields the equivalent equation  $\frac{x}{8(b+9)} = a$ , or  $a = \frac{x}{8(b+9)}$ .

*Choice A* is incorrect. This equation is equivalent to  $x = 8(a + (b + 9))$ . *Choice C* is incorrect. This equation is equivalent to  $x = \frac{8(b+9)}{a}$ . *Choice D* is incorrect. This equation is equivalent to  $x = \frac{a}{8(b+9)}$ .

## QUESTION 20

The correct answer is 4. It's given that line  $k$  is parallel to line  $j$ . It follows that the slope of line  $k$  is equal to the slope of line  $j$ . Given two points on a line in the  $xy$ -plane,  $(x_1, y_1)$  and  $(x_2, y_2)$ , the slope of the line can be calculated as  $\frac{y_2 - y_1}{x_2 - x_1}$ . In the  $xy$ -plane shown, the points  $(0, 5)$  and  $(1, 9)$  are on line  $j$ . It follows that the slope of line  $j$  is  $\frac{9-5}{1-0}$ , or 4. Since the slope of line  $j$  is equal to the slope of line  $k$ , the slope of line  $k$  is also 4.

## QUESTION 21

The correct answer is 34. It's given that a line segment has a length of 115 cm and is divided into three parts, where one part is 47 cm long and the other two parts have lengths that are equal. If  $x$  represents the length, in cm, of each of the two parts of equal length, then the equation  $47 + x + x = 115$ , or  $47 + 2x = 115$ , represents this situation. Subtracting 47 from each side of this equation yields  $2x = 68$ . Dividing each side of this equation by 2 yields  $x = 34$ . Therefore, the length, in cm, of one of the two parts of equal length is 34.

## QUESTION 22

**Choice B** is correct. For a quadratic function defined by an equation of the form  $p(x) = a(x - h)^2 + k$ , where  $a$ ,  $h$ , and  $k$  are constants and  $a > 0$ , the minimum value of the function is  $k$ . Subtracting 57 from both sides of the given equation yields  $p(x) = x^2 - 57$ . This function is in the form  $p(x) = a(x - h)^2 + k$ , where  $a = 1$ ,  $h = 0$ , and  $k = -57$ . Therefore, the minimum value of the function  $p$  is  $-57$ .

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 D** is correct. The linear relationship between  $x$  and  $y$  can be represented by the equation  $y = mx + b$ , where  $m$  is the slope of the graph of this equation in the  $xy$ -plane and  $b$  is the  $y$ -coordinate of the  $y$ -intercept. The slope of a line between any two points  $(x_1, y_1)$  and  $(x_2, y_2)$  on the line can be calculated using the

slope formula  $m = \frac{y_2 - y_1}{x_2 - x_1}$ . Based on the table, the graph contains the points

$(-18, -48)$  and  $(7, 52)$ . Substituting  $(-18, -48)$  and  $(7, 52)$  for  $(x_1, y_1)$  and

$(x_2, y_2)$ , respectively, in the slope formula yields  $m = \frac{52 - (-48)}{7 - (-18)}$ , which is equivalent

to  $m = \frac{100}{25}$ , or  $m = 4$ . Substituting 4 for  $m$ ,  $-18$  for  $x$ , and  $-48$  for  $y$  in the

equation  $y = mx + b$  yields  $-48 = 4(-18) + b$ , or  $-48 = -72 + b$ . Adding 72 to both sides of this equation yields  $24 = b$ . Therefore,  $m = 4$  and  $b = 24$ .

Substituting 4 for  $m$  and 24 for  $b$  in the equation  $y = mx + b$  yields  $y = 4x + 24$ .

Thus, the equation  $y = 4x + 24$  represents the linear relationship between  $x$  and  $y$ . It's also given that the graph of the linear equation representing this

relationship in the  $xy$ -plane passes through the point  $(\frac{1}{7}, a)$ . Substituting  $\frac{1}{7}$  for  $x$

and  $a$  for  $y$  in the equation  $y = 4x + 24$  yields  $a = 4(\frac{1}{7}) + 24$ , which is equivalent to

$a = \frac{4}{7} + \frac{168}{7}$ , or  $a = \frac{172}{7}$ .

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 24

**Choice A** is correct. The  $y$ -intercept of a graph in the  $xy$ -plane is the point where  $x = 0$ . Substituting 0 for  $x$  in the given equation,  $y = 576^{(2x+2)}$ , yields

$y = 576^{(2(0)+2)}$ , which is equivalent to  $y = 576^2$ , or  $y = 331,776$ . Therefore, the

graph of the given equation in the  $xy$ -plane has a  $y$ -intercept of  $(0, 331,776)$ . It

follows that  $r = 0$  and  $s = 331,776$ . Thus, the equivalent equation  $y = 331,776^{(x+1)}$  displays the value of  $s$  as the base.

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 25

**Choice D** is correct. If  $k - x$  is a factor of the expression  $-x^2 + (\frac{1}{29})nk^2$ , then the

expression can be written as  $(k - x)(ax + b)$ , where  $a$  and  $b$  are constants. This

expression can be rewritten as  $akx + bk - ax^2 - bx$ , or  $-ax^2 + (ak - b)x + bk$ .

Since this expression is equivalent to  $-x^2 + (\frac{1}{29})nk^2$ , it follows that  $-a = -1$ ,



$ak - b = 0$ , and  $bk = \left(\frac{1}{29}\right)nk^2$ . Dividing each side of the equation  $-a = -1$  by  $-1$  yields  $a = 1$ . Substituting 1 for  $a$  in the equation  $ak - b = 0$  yields  $k - b = 0$ . Adding  $b$  to each side of this equation yields  $k = b$ . Substituting  $k$  for  $b$  in the equation  $bk = \left(\frac{1}{29}\right)nk^2$  yields  $k^2 = \left(\frac{1}{29}\right)nk^2$ . Since  $k$  is positive, dividing each side of this equation by  $k^2$  yields  $1 = \left(\frac{1}{29}\right)n$ . Multiplying each side of this equation by 29 yields  $29 = n$ .

Alternate approach: The expression  $x^2 - y^2$  can be written as  $(x - y)(x + y)$ , which is a difference of two squares. It follows that  $\left(\frac{1}{29}\right)nk^2 - x^2$  is equivalent to  $\left(\left(\sqrt{\frac{1}{29}n}\right)k - x\right)\left(\left(\sqrt{\frac{1}{29}n}\right)k + x\right)$ . It's given that  $k - x$  is a factor of  $-x^2 + \left(\frac{1}{29}\right)nk^2$ , so the factor  $\left(\sqrt{\frac{1}{29}n}\right)k - x$  is equal to  $k - x$ . Adding  $x$  to both sides of the equation  $\left(\sqrt{\frac{1}{29}n}\right)k - x = k - x$  yields  $\left(\sqrt{\frac{1}{29}n}\right)k = k$ . Since  $k$  is positive, dividing both sides of this equation by  $k$  yields  $\sqrt{\frac{1}{29}n} = 1$ . Squaring both sides of this equation yields  $\frac{1}{29}n = 1$ . Multiplying both sides of this equation by 29 yields  $n = 29$ .

*Choice A* is incorrect. This value of  $n$  gives the expression  $-x^2 + \left(\frac{1}{29}\right)(-29)k^2$ , or  $-x^2 - k^2$ . This expression doesn't have  $k - x$  as a factor. *Choice B* is incorrect. This value of  $n$  gives the expression  $-x^2 + \left(\frac{1}{29}\right)\left(-\frac{1}{29}\right)k^2$ , or  $-x^2 + \left(-\frac{1}{841}\right)k^2$ . This expression doesn't have  $k - x$  as a factor. *Choice C* is incorrect. This value of  $n$  gives the expression  $-x^2 + \left(\frac{1}{29}\right)\left(\frac{1}{29}\right)k^2$ , or  $-x^2 + \left(\frac{1}{841}\right)k^2$ . This expression doesn't have  $k - x$  as a factor.

## QUESTION 26

**Choice D** is correct. The figure shows that angle  $MRL$  and angle  $PRQ$  are vertical angles. Since vertical angles are congruent, angle  $MRL$  and angle  $PRQ$  are congruent. It's given that  $\overline{LM}$  is parallel to  $\overline{PQ}$ . The figure also shows that  $\overline{LQ}$  intersects  $\overline{LM}$  and  $\overline{PQ}$ . If two parallel segments are intersected by a third segment, alternate interior angles are congruent. Thus, alternate interior angles  $MLR$  and  $PQR$  are congruent. Since triangles  $LMR$  and  $PQR$  have two pairs of congruent angles, the triangles are similar. Sides  $LR$  and  $MR$  in triangle  $LMR$  correspond to sides  $RQ$  and  $RP$ , respectively, in triangle  $PQR$ . Since the lengths of corresponding sides in similar triangles are proportional, it follows that  $\frac{RQ}{LR} = \frac{RP}{MR}$ . It's given that the lengths of  $\overline{MR}$ ,  $\overline{LR}$ , and  $\overline{RP}$  are 6, 7, and 11, respectively.

Substituting 6 for  $MR$ , 7 for  $LR$ , and 11 for  $RP$  in the equation  $\frac{RQ}{LR} = \frac{RP}{MR}$  yields

$\frac{RQ}{7} = \frac{11}{6}$ . Multiplying each side of this equation by 7 yields  $RQ = \left(\frac{11}{6}\right)(7)$ , or  $RQ = \frac{77}{6}$ . It's given that  $\overline{LQ}$  intersects  $\overline{MP}$  at point  $R$ , so  $LQ = LR + RQ$ .

Substituting 7 for  $LR$  and  $\frac{77}{6}$  for  $RQ$  in this equation yields  $LQ = 7 + \frac{77}{6}$ , or  $LQ = \frac{119}{6}$ . Therefore, the length of  $\overline{LQ}$  is  $\frac{119}{6}$ .

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

*Choice B* is incorrect. This is the length of  $\overline{RQ}$ , not  $\overline{LQ}$ . *Choice C* is incorrect and may result from conceptual or calculation errors.

## QUESTION 27

The correct answer is  $\frac{31}{3}$ . Subtracting  $5(x + 7)$  from each side of the given equation yields  $0 = 15(x - 17)(x + 7) - 5(x + 7)$ . Since  $5(x + 7)$  is a common factor of each of the terms on the right-hand side of this equation, it can be rewritten as  $0 = 5(x + 7)(3(x - 17) - 1)$ . This is equivalent to  $0 = 5(x + 7)(3x - 51 - 1)$ , or  $0 = 5(x + 7)(3x - 52)$ . Dividing both sides of this equation by 5 yields  $0 = (x + 7)(3x - 52)$ . Since a product of two factors is equal to 0 if and only if at least one of the factors is 0, either  $x + 7 = 0$  or  $3x - 52 = 0$ . Subtracting 7 from both sides of the equation  $x + 7 = 0$  yields  $x = -7$ . Adding 52 to both sides of the equation  $3x - 52 = 0$  yields  $3x = 52$ . Dividing both sides of this equation by 3 yields  $x = \frac{52}{3}$ . Therefore, the solutions to the given equation are  $-7$  and  $\frac{52}{3}$ . It follows that the sum of the solutions to the given equation is  $-7 + \frac{52}{3}$ , which is equivalent to  $-\frac{21}{3} + \frac{52}{3}$ , or  $\frac{31}{3}$ . Note that  $31/3$  and  $10.33$  are examples of ways to enter a correct answer.