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Test #5



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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

The following text is from the 1913 story “The King’s Coin” by Emily Pauline Johnson, a Kanienkahagen (Mohawk) writer also known as Tekahionwake. Fox-Foot, a young Ojibwe man, is guiding a group of fur traders who are traveling by canoe and suspects that they are being followed.

At supper time, Fox-Foot would allow no fire to be built, no landing to be made, no trace of their passing to be left. They ate canned meat and marmalade, drank again of the stream and pushed on, until just at dusk they reached the edge of a long, still lake, with shores of granite and dense fir forest.

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

- A) Evidence
- B) Blemish
- C) Amount
- D) Sketch

2

Many ancient sculptures of people’s heads are missing their noses. This is because the nose is the most _____ part of a sculpture of a person’s head. It is delicate and sticks out from the rest of the sculpture, making it especially easy to break.

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

- A) recognizable
- B) fragile
- C) common
- D) sophisticated

3

K.D. Leka and colleagues found that the Sun’s corona provides an advance indication of solar flares—intense eruptions of electromagnetic radiation that emanate from active regions in the Sun’s photosphere and can interfere with telecommunications on Earth. Preceding a flare, the corona temporarily exhibits increased brightness above the region where the flare is _____.

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

- A) antecedent
- B) impending
- C) innocuous
- D) perpetual

4

To demonstrate that the integrity of underground metal pipes can be assessed without unearthing the pipes, engineer Aroba Saleem and colleagues _____ the tendency of some metals’ internal magnetic fields to alter under stress: the team showed that such alterations can be measured from a distance and can reveal concentrations of stress in the pipes.

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

- A) hypothesized
- B) discounted
- C) redefined
- D) exploited

5

Despite the generalizations about human behavior they have produced, many studies of behavioral psychology have used highly unrepresentative subject pools: students at the colleges and universities where the researchers are employed. To _____ this situation, it is necessary to actively recruit subjects from diverse backgrounds and locations.

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

- A) sanction
- B) ameliorate
- C) rationalize
- D) postulate

6

The following text is adapted from Jean Webster’s 1912 novel *Daddy-Long-Legs*. The narrator is a young college student writing letters detailing her weekly experiences.

[The college is] organizing the Freshman basket-ball team and there’s just a chance that I shall make it. I’m little of course, but terribly quick and wiry and tough. While the others are hopping about in the air, I can dodge under their feet and grab the ball.

Which choice best states the main purpose of the text?

- A) To compare basketball with other sports
- B) To provide details of how to play basketball
- C) To state how players will be chosen for the basketball team
- D) To explain why the narrator thinks she might make the basketball team

7

In the late 1800s, Spanish-language newspapers flourished in cities across Texas. San Antonio alone produced eleven newspapers in Spanish between 1890 and 1900. But El Paso surpassed all other cities in the state. This city produced twenty-two newspapers in Spanish during that period. El Paso is located on the border with Mexico and has always had a large population of Spanish speakers. Thus, it is unsurprising that this city became such a rich site for Spanish-language journalism.

Which choice best states the main purpose of the text?

- A) To compare Spanish-language newspapers published in Texas today with ones published there during the late 1800s
- B) To explain that Spanish-language newspapers thrived in Texas and especially in El Paso during the late 1800s
- C) To argue that Spanish-language newspapers published in El Paso influenced the ones published in San Antonio during the late 1800s
- D) To explain why Spanish-language newspapers published in Texas were so popular in Mexico during the late 1800s

8

Chile's Atacama Desert is one of the driest places on Earth. Mary Beth Wilhelm and other astrobiologists search for life, or its remains, in this harsh place because the desert closely mirrors the extreme environment on Mars. The algae and bacteria found in Atacama's driest regions may offer clues about Martian life. By studying how these and other microorganisms survive such extreme conditions on Earth, Wilhelm's team hopes to determine whether similar life might have existed on Mars and to develop the best tools to look for evidence of it.

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

- A) To contrast the conditions in the Atacama Desert with those on Mars
- B) To explain why many life-forms cannot survive in the Atacama Desert
- C) To indicate why astrobiologists choose to conduct research in the Atacama Desert
- D) To describe certain limitations to conducting scientific study in the Atacama Desert

9

More than 60% of journeys in Mexico City occur via public transit, but simply reproducing a feature of the city's transit system—e.g., its low fares—is unlikely to induce a significant increase in another city's transit ridership. As Erick Guerra et al. have shown, transportation mode choice in urban areas of Mexico is the product of a complex mix of factors, including population density, the spatial distribution of jobs, and demographic characteristics of individuals. System features do affect ridership, of course, but there is an irreducibly contextual dimension of transportation mode choice.

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

- A) It presents an objection to the argument of Guerra et al. about transportation mode choice in urban areas of Mexico.
- B) It explains why it is challenging to influence transit ridership solely by altering characteristics of a transit system.
- C) It illustrates the claim that a characteristic associated with high transit ridership in Mexico City is not associated with high transit ridership elsewhere.
- D) It substantiates the assertion that population density, the spatial distribution of jobs, and demographic characteristics are important factors in transportation mode choice.

10

Changes to vegetation cover and other human activities influence carbon and nitrogen levels in soil, though how deep these effects extend is unclear. Hypothesizing that differences in land use lead to differences in carbon and nitrogen levels that are not restricted to the topsoil layer (0–30 cm deep), Chukwuebuka Okolo and colleagues sampled soils across multiple land-use types (e.g., grazing land, cropland, forest) within each of several Ethiopian locations. They found, though, that across land-use types, carbon and nitrogen decreased to comparably low levels beyond depths of 30 cm.

Which choice best describes the overall structure of the text?

- A) It describes a phenomenon that scientists do not fully understand, explains a research team's hypothesis about that phenomenon, and then describes a finding that led the team to refine the hypothesis.
- B) It introduces an unresolved scientific question, presents a research team's hypothesis pertaining to that question, and then describes an observation made by the team that conflicts with that hypothesis.
- C) It discusses a process that scientists are somewhat unclear about, introduces competing hypotheses about that process, and then explains how a research team concluded that one of those hypotheses is likely correct.
- D) It explains a hypothesis that has been the subject of scientific debate, discusses how a research team tested that hypothesis, and then presents data the team collected that validate the hypothesis.

11

Recently, scientists looked at data collected by NASA's InSight lander to learn more about seismic activity on Mars, known as marsquakes. The data show that the marsquakes all started from the same location on the planet. This discovery was surprising to scientists, as they expected that the marsquakes would originate from all over the planet because of the cooling of the planet's surface. Now, scientists believe that there could be areas of active magma flows deep beneath the planet's surface that trigger the marsquakes.

According to the text, what was surprising to scientists studying the seismic activity data from NASA's InSight lander?

- A) The surface temperature of Mars has been rising.
- B) There were different types of seismic waves causing marsquakes.
- C) NASA's InSight lander collected less data than scientists had expected.
- D) All the marsquakes started from the same location on the planet.

12

The ancient writing system used in the Maya kingdoms of southern Mexico and Central America had a symbol for the number zero. The earliest known example of the symbol dates to more than 2,000 years ago. At that time, almost none of the writing systems elsewhere in the world possessed a zero symbol. And the use of zero in Mexico and Central America may be even more ancient. Some historians suggest that Maya mathematicians inherited it from the Olmec civilization, which flourished in the region 2,400–3,600 years ago.

According to the text, what do some historians suggest about Maya civilization?

- A) Maya civilization acquired the use of zero from the Olmec civilization.
- B) Maya civilization respected its historians more than it respected its mathematicians.
- C) Maya civilization was highly secretive about its intellectual achievements.
- D) Maya civilization tried to introduce its writing system to other civilizations.

13

"The Bet" is an 1889 short story by Anton Chekhov. In the story, a banker is described as being very upset about something: _____

Which quotation from "The Bet" most effectively illustrates the claim?

- A) "Then the banker cautiously broke the seals off the door and put the key in the keyhole."
- B) "It struck three o'clock, the banker listened; everyone was asleep in the house and nothing could be heard outside but the rustling of the chilled trees."
- C) "The banker, spoilt and frivolous, with millions beyond his reckoning, was delighted at the bet."
- D) "When [the banker] got home he lay on his bed, but his tears and emotion kept him for hours from sleeping."

14

Partial List of Candidate Species for De-extinction

Common name	Scientific name	Became extinct
Huia	<i>Heteralocha acutirostris</i>	1907
Caribbean monk seal	<i>Monachus tropicalis</i>	1952
Passenger pigeon	<i>Ectopistes migratorius</i>	1914
Saber-toothed cat	<i>Smilodon</i>	11,000 years before present
Woolly mammoth	<i>Mammuthus primigenius</i>	6,400 years before present

The passage of time is among the many obstacles faced by scientists who are pursuing de-extinction efforts—that is, efforts to use breeding or a mixture of cloning and genetic engineering to bring back extinct species. Specifically, researchers are concerned that the longer a species has been extinct, the less likely it is that a suitable habitat still exists for that species. Among candidate species for de-extinction, this problem would be especially concerning for the _____.

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

- A) passenger pigeon (*Ectopistes migratorius*), which became extinct only a few years after the huia (*Heteralocha acutirostris*).
- B) saber-toothed cat (*Smilodon*), which became extinct 11,000 years ago.
- C) woolly mammoth (*Mammuthus primigenius*), which became extinct several thousand years before the saber-toothed cat (*Smilodon*).
- D) Caribbean monk seal (*Monachus tropicalis*), which became extinct in 1952.

15

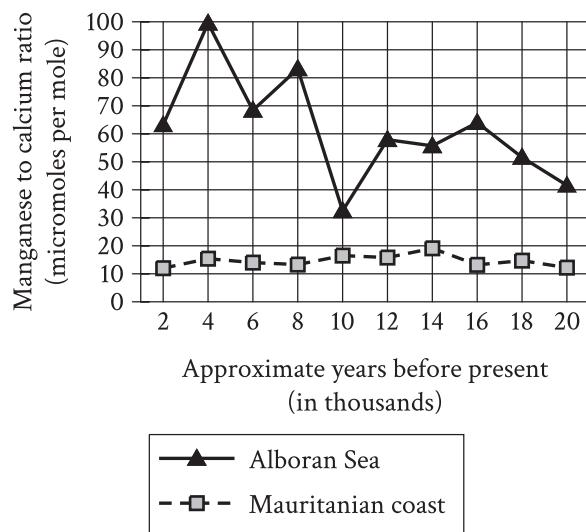
“The Yellow Wallpaper” is an 1892 short story by Charlotte Perkins Gilman. In the story, the narrator expresses mixed feelings about her surroundings:

Which quotation from “The Yellow Wallpaper” most effectively illustrates the claim?

- A) “This wallpaper has a kind of sub-pattern in a different shade, a particularly irritating one, for you can only see it in certain lights, and not clearly then.”
- B) “By moonlight—the moon shines in all night when there is a moon—I wouldn’t know it was the same paper.”
- C) “I’m really getting quite fond of the big room, all but that horrid [wall]paper.”
- D) “The color is repellent, almost revolting; a smouldering, unclean yellow, strangely faded by the slow-turning sunlight.”

16

Ratio of Manganese to Calcium in Samples from Alboran Sea and Mauritanian Coast



The population of the coral *Lophelia pertusa* declined significantly around 9,000 years ago in the Alboran Sea and around 11,000 years ago near the Mauritanian coast. Using the ratio of manganese to calcium, which inversely correlates with ocean oxygenation levels, marine scientist Rodrigo da Costa Portilho-Ramos and colleagues evaluated whether oxygenation played a role in the declines of *L. pertusa*. The researchers concluded that oxygenation may have been important in the Alboran Sea but not near the Mauritanian coast, since _____.

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

- A) a substantial increase in oxygenation in the Alboran Sea corresponded with the local decline in *L. pertusa*, but the opposite relationship between oxygenation and *L. pertusa* was found near the Mauritanian coast.
- B) *L. pertusa* declined in the Alboran Sea during a period of substantial local decline in oxygenation, but *L. pertusa* declined near the Mauritanian coast during a period of little local change in oxygenation.
- C) oxygenation in the Alboran Sea was higher before the decline in *L. pertusa* than after the decline, whereas oxygenation near the Mauritanian coast was relatively low both before and after the decline in *L. pertusa*.
- D) oxygenation in the Alboran Sea tended to be substantially higher than oxygenation near the Mauritanian coast during the period studied.

17

The Younger Dryas was a period of extreme cooling from 11,700 to 12,900 years ago in the Northern Hemisphere. Some scientists argue that a comet fragment hitting Earth brought about the cooling. Others disagree, partly because there is no known crater from such an impact that dates to the beginning of the period. In 2015, a team led by Kurt Kjær detected a 19-mile-wide crater beneath a glacier in Greenland. The scientists who believe an impact caused the Younger Dryas claim that this discovery supports their view. However, Kjær's team hasn't yet been able to determine the age of the crater. Therefore, the team suggests that _____.

Which choice most logically completes the text?

- A) it can't be concluded that the impact that made the crater was connected to the beginning of the Younger Dryas.
- B) it can't be determined whether a comet fragment could make a crater as large as 19 miles wide.
- C) scientists have ignored the possibility that something other than a comet fragment could have made the crater.
- D) the scientists who believe an impact caused the Younger Dryas have made incorrect assumptions about when the period began.

18

In 2016 biological anthropologist Heather F. Smith and her team investigated the evolution of the appendix, an intestinal organ that is present in some mammals, including humans, but is generally thought to have no function. Studying 533 mammal species, the team found that the appendix has emerged independently across multiple lineages in separate instances and, significantly, hasn't disappeared after emerging in specific lineages. Moreover, the team determined that species with the organ tend to have higher concentrations of lymphoid tissue, which supports immune responses, in the cecum, the organ the appendix is attached to. Therefore, the team hypothesized that the appendix likely _____.

Which choice most logically completes the text?

- A) was once present in many nonmammal species but has since disappeared from those lineages.
- B) has been preserved in certain mammal species because it benefits their immune systems.
- C) will emerge in a greater number of mammal species because it may serve a necessary function in the immune system.
- D) produced higher concentrations of lymphoid tissue in mammals in the past than it does currently.

19

Some ethicists hold that the moral goodness of an individual's actions depends solely on whether the actions themselves are good, irrespective of the context in which they are carried out. Philosopher L. Sebastian Purcell has shown that surviving works of Aztec (Nahua) philosophy express a very different view. Purcell reveals that these works posit an ethical system in which an individual's actions are judged in light of how well they accord with the individual's role in society and how well they contribute to the community. To the extent that these works are representative of Aztec thought, Purcell's analysis suggests that _____.

Which choice most logically completes the text?

- A) the Aztecs would have disputed the idea that the morality of an individual's actions can be assessed by appealing to standards of behavior that are independent of the individual's social circumstances.
- B) the Aztecs would not have accepted the notion that the morality of an individual's actions can be fairly evaluated by people who do not live in the same society as that individual.
- C) actions by members of Aztec society who contributed a great deal to their community could be judged as morally good even if those actions were inconsistent with behaviors the Aztecs regarded as good in all contexts.
- D) similar actions performed by people in different social roles in Aztec society would have been regarded as morally equivalent unless those actions led to different outcomes for the community.

20

Lê Lưøng Minh became the thirteenth secretary-general of the Association of Southeast Asian Nations (ASEAN) in January 2013, making _____ the first time the organization would appoint a Vietnamese leader.

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

- A) these
- B) those
- C) this
- D) some

21

In 1929, Edwin Herbert Land invented a polarizing filter that was featured in a number of products, from sunglasses to 3D movies. A decade later, Land _____ his technology to invent the world's first instant camera, the Polaroid Land camera.

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

- A) used
- B) to have used
- C) to use
- D) using

22

An online content creator who uses copyrighted songs without permission risks being demonetized (prohibited from including paid advertisements in content). The best way to avoid demonetization is to choose music from the public domain. Using one of these noncopyrighted songs _____ a creator won't lose advertising revenue.

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

- A) are ensuring
- B) have ensured
- C) ensure
- D) ensures

23

What makes the theremin a unique musical instrument? You play it without touching it. When you place your _____ the pitch will shift as your hands move through the air.

Which choice completes the text with the most logical transition?

- A) hand's between the two antenna's,
- B) hands between the two antennas,
- C) hands' between the two antennas',
- D) hands' between the two antennas,

24

In the music video for the song "We Didn't Start the Fire" by Billy Joel, the singer lists 118 political and cultural references. Such iconic references, cited in rapid and frenetic procession by the musician, who is seated impassively at a dinner table, _____ key moments and personalities of the twentieth century.

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

- A) represents
- B) has represented
- C) was representing
- D) represent

25

Long attributed to Jacques-Louis David, the preeminent Neoclassical painter of his day, the 1801 painting *Marie Joséphine Charlotte du Val d'Ognes* gained fresh attention in the 1990s when art historians discovered that the painting—which depicts a solitary young woman sketching—was actually the work of little-known French portrait _____ Marie-Denise Villers (1774–1821).

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

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

26

In 1986, conceptual artist Sophie Calle asked twenty-three people, all of whom had been born without sight, to describe “their image of beauty” in rich detail. Calle paired excerpts of these conversations with photographs—both of interviewees and the items they _____ to powerful effect in her exhibition *The Blind*.

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

- A) described, from hair to grass to sculptures
- B) described, from hair to grass to sculptures—
- C) described—from hair to grass to sculptures,
- D) described: from hair to grass to sculptures

27

Celebrated Tewa potter Maria Martinez (1887–1980) made her signature all-black ceramic vessels using a heating technique called reduction firing. This technique involves smothering the flame surrounding the clay vessel. _____ the vessel takes on a shiny, black hue.

Which choice completes the text with the most logical transition?

- A) On the contrary,
- B) For example,
- C) Previously,
- D) As a result,

28

Historians agree that the jazz pianist Jelly Roll Morton was exaggerating when he claimed to have invented jazz music. No one can deny, _____ that Morton’s innovative compositions and remarkable improvisational skills helped shape jazz as a genre during its early years.

Which choice completes the text with the most logical transition?

- A) therefore,
- B) in the second place,
- C) in other words,
- D) though,

29

According to Duverger’s law, countries with single-ballot majoritarian elections for single-member districts tend to polarize into two-party systems, wherein dueling political parties consistently dominate the political system. _____ countries with proportional-representation electoral systems tend to support multi-partyism, under which power gets distributed among many political parties.

Which choice completes the text with the most logical transition?

- A) Subsequently,
- B) Conversely,
- C) For instance,
- D) In other words,

30

A turtle shell appears external to the animal, protecting its body like armor. _____ the shell is often incorrectly assumed to be an exoskeleton, a rigid outer casing like that of a crustacean or an insect, when in fact it is an endoskeleton, a part of the turtle's internal bone structure, more akin to a spine or a pair of ribs.

Which choice completes the text with the most logical transition?

- A) That being said,
- B) However,
- C) For instance,
- D) Hence,

31

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

- In 1859, the novel *Adam Bede* was published in England.
- According to the novel's title page, the author's name was George Eliot.
- George Eliot was widely assumed to be a pseudonym.
- A pseudonym is a fake name used to conceal an author's identity.
- A woman named Mary Ann Evans later revealed herself as the novel's real author.

The student wants to identify the real author of *Adam Bede*. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) The real author of *Adam Bede* was Mary Ann Evans, who published the novel using the pseudonym George Eliot.
- B) George Eliot, which *Adam Bede*'s title page indicated was the name of the novel's author, was widely assumed to be a pseudonym.
- C) The title page of the novel *Adam Bede* indicated that the author's name was George Eliot.
- D) A woman who had used a pseudonym to conceal her identity later revealed herself as the real author of *Adam Bede*.

32

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

- Scientists have developed a “freeze-thaw” battery that can retain 92% of its charge after twelve weeks.
- The battery contains molten salt (a type of salt that liquifies when heated and solidifies at room temperature).
- When the salt is in a liquid state, energy flows through the battery.
- When the salt is in a solid state, energy stops flowing and is stored in the battery.
- The stored (frozen) energy can be used by reheating (thawing) the battery.

The student wants to specify how the salt enables energy storage. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) Scientists have developed a freeze-thaw battery that contains molten salt, which liquifies when heated and solidifies at room temperature.
- B) The stored energy in a freeze-thaw battery, which contains molten salt, can be used by reheating the battery.
- C) When the molten salt in a freeze-thaw battery solidifies at room temperature, energy stops flowing and can be stored in the battery.
- D) Molten salt allows a freeze-thaw battery to retain 92% of its charge after twelve weeks.

33

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

- The US Fish and Wildlife Service (FWS) keeps a list of all at-risk species.
- Species on the list are classified as either endangered or threatened.
- A species that is in danger of extinction throughout most or all of its range is classified as endangered.
- A species that is likely to soon become endangered is classified as threatened.
- The California red-legged frog (*Rana draytonii*) is likely to soon become endangered, according to the FWS.

The student wants to indicate the California red-legged frog’s FWS classification category. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) Species on the FWS list, which includes the California red-legged frog (*Rana draytonii*), are classified as either endangered or threatened.
- B) The California red-legged frog (*Rana draytonii*) appears on the FWS list of at-risk species.
- C) According to the FWS, the California red-legged frog is in the endangered category, in danger of extinction throughout most or all of its range.
- D) Likely to soon become endangered, the California red-legged frog is classified as threatened by the FWS.

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

The following text is adapted from Elizabeth von Arnim's 1922 novel *The Enchanted April*. Mrs. Wilkins and her friend Rose are traveling in Italy.

"I'm going to have one of these gorgeous oranges," said Mrs. Wilkins, staying where she was and reaching across to a black bowl piled with them. "Rose, how can you resist them. Look—have this one. Do have this beauty—" And she held out a big one.

As used in the text, what does the phrase "reaching across to" most nearly mean?

- A) Joining with
- B) Gaining on
- C) Stretching toward
- D) Arriving at

2

A team of paleontologists has found a rich fossil deposit near Gulgong, Australia. The fossils are so well preserved that the team has been able to _____ detailed information about the life forms that left them behind, such as color patterns and how they interacted with other species.

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

- A) occupy
- B) hoard
- C) reserve
- D) obtain

3

According to a team of neuroeconomists from the University of Zurich, ease of decision making may be linked to communication between two brain regions, the prefrontal cortex and the parietal cortex. Individuals tend to be more decisive if the information flow between the regions is intensified, whereas they make choices more slowly when information flow is _____.

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

- A) reduced
- B) evaluated
- C) determined
- D) acquired

4

The War of 1812 has _____ place in historical memory in Britain, partly because it is overshadowed by the much larger concurrent conflict against Napoleonic France and partly because it essentially maintained the geopolitical status quo for Britain: the country neither gained nor lost significant territory or position as a result of its participation in the war.

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

- A) a tenuous
- B) an enduring
- C) a contentious
- D) a conspicuous

5

Claims about the original significance of Minoan bull-leaping rituals—depicted in paintings and sculptures from the second millennium BCE—are difficult to successfully _____. We know so little about the people archaeologists call the Minoans that assertions about what bull-leaping meant to them will almost inevitably rely on significant speculation and guesswork.

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

- A) imagine
- B) summarize
- C) defend
- D) adjust

6

The following text is adapted from Jerome K. Jerome's 1889 novel *Three Men in a Boat (To Say Nothing of the Dog)*. The narrator is traveling by boat with Harris and another friend.

[Harris] told us anecdotes of how he had gone across the [English] Channel when it was so rough that the passengers had to be tied into their [beds], and he and the captain were the only two living souls on board who were not ill. Sometimes it was he and the second mate who were not ill; but it was generally he and one other man. If not he and another man, then it was he by himself.

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

- A) It indicates the reason for Harris's eagerness to resume traveling.
- B) It hints at Harris's feeling that during an earlier boat trip, others didn't include him in activities.
- C) It emphasizes that Harris always boasts about his own constitution when speaking of a previous boat trip.
- D) It reveals that although Harris claims to prefer solitary activities when traveling, he actually enjoys having company.

7

Several studies have found negligible electoral consequences for governments that impose fiscal austerity measures, yet some European governments recently suffered electorally due to their austerity programs. Evelyne Huebscher and colleagues attribute this incongruity to governments' tendency—not followed in the recent European cases—to implement austerity programs strategically to avoid electoral costs (e.g., setting spending cuts to take effect only after the next election), which has obscured the inherent political risks of austerity measures in the election data scholars have examined.

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

- A) It explains a discrepancy between what has been observed in study settings and what has been observed in real-world settings that the text goes on to assert is attributable to the studies not using real-world data.
- B) It identifies a conflict between research findings and recent events that the text goes on to suggest is a consequence of a complicating factor in the data used to generate those findings.
- C) It presents a long-standing divergence in research findings that the text goes on to say is due to different groups of researchers using data that derive from different electoral circumstances.
- D) It describes a recent exception to a general pattern in research findings that the text goes on to explain is a result of researchers underestimating the significance of inconsistencies in the data they've analyzed.

8

Text 1

Graphic novels are increasingly popular in bookstores and libraries, but they shouldn't be classified as literature. By definition, literature tells a story or conveys meaning through language only; graphic novels tell stories through illustrations and use language only sparingly, in captions and dialogue. Graphic novels are experienced as series of images and not as language, making them more similar to film than to literature.

Text 2

Graphic novels present their stories through both language and images. Without captions and dialogue, readers would be unable to understand what is depicted in the illustrations: the story results from the interaction of text and image. Moreover, Alison Bechdel's *Fun Home* and many other graphic novels feature text that is as beautifully written as the prose found in many standard novels. Therefore, graphic novels qualify as literary texts.

Based on the texts, how would the author of Text 2 most likely respond to the overall argument presented in Text 1?

- A) By asserting that language plays a more important role in graphic novels than the author of Text 1 recognizes
- B) By acknowledging that the author of Text 1 has identified a flaw that is common to all graphic novels
- C) By suggesting that the story lines of certain graphic novels are more difficult to understand than the author of Text 1 claims
- D) By agreeing with the author of Text 1 that most graphic novels aren't as well crafted as most literary works are

9

The following text is adapted from Ann Petry's 1946 novel *The Street*. Lutie lives in an apartment in Harlem, New York.

The glow from the sunset was making the street radiant. The street is nice in this light, [Lutie] thought. It was swarming with children who were playing ball and darting back and forth across the sidewalk in complicated games of tag. Girls were skipping double dutch rope, going tirelessly through the exact center of a pair of ropes, jumping first on one foot and then the other.

©1946 by Ann Petry

Which choice best describes what is happening in the text?

- A) Lutie is observing the appearance of the street at a particular time of day and the events occurring on it.
- B) Lutie is annoyed by the noise of children playing games on her street.
- C) Lutie is puzzled by the rules of certain children's games.
- D) Lutie is spending time alone in her apartment because she doesn't want to interact with her neighbors.

10

Since its completion in 2014, Bosco Verticale (Vertical Forest)—a pair of residential towers in Milan, Italy, covered by vegetation—has become a striking symbol of environmental sustainability in architecture. Stefano Boeri intended his design, which features balconies that are home to hundreds of trees, to serve as a model for promoting urban biodiversity. However, the concept has faced skepticism: critics note that although the trees used in Bosco Verticale were specifically cultivated for the project, it's too early to tell if they can thrive in this unusual setting.

According to the text, why are some critics skeptical of the concept behind Bosco Verticale?

- A) Some essential aspects of Bosco Verticale's design are difficult to adapt to locations other than Milan.
- B) The plant life on Bosco Verticale ended up being less varied than Boeri had envisioned it would be.
- C) The construction of Bosco Verticale was no less environmentally damaging than the construction of more conventional buildings is.
- D) It is unclear whether Bosco Verticale can support the plant life included in its design.

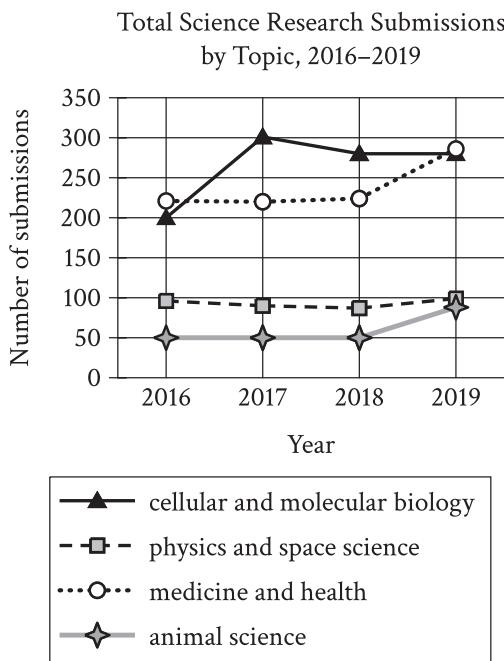
11

Many literary theorists distinguish between *fabula*, a narrative's content, and *syuzhet*, a narrative's arrangement and presentation of events. In the film *The Godfather Part II*, the *fabula* is the story of the Corleone family, and the *syuzhet* is the presentation of the story as it alternates between two timelines in 1901 and 1958. But literary theorist Mikhail Bakhtin maintained that *fabula* and *syuzhet* are insufficient to completely describe a narrative—he held that systematic categorizations of artistic phenomena discount the subtle way in which meaning is created by interactions between the artist, the work, and the audience.

Which choice best states the main idea of the text?

- A) Literary theorist Mikhail Bakhtin argued that there are important characteristics of narratives that are not fully encompassed by two concepts that other theorists have used to analyze narratives.
- B) Literary theorist Mikhail Bakhtin claimed that meaning is not inherent in a narrative but is created when an audience encounters a narrative so that narratives are interpreted differently by different people.
- C) The storytelling methods used in *The Godfather Part II* may seem unusually complicated, but they can be easily understood when two concepts from literary theory are utilized.
- D) Narratives that are told out of chronological order are more difficult for audiences to understand than are narratives presented chronologically.

12



A student is researching the trends in the topics submitted to a national science fair for high school students. The graph shows the number of submissions by topic that were made each year. Based on the data in the graph, the student claims that there were more medicine and health research topics submitted in 2019 than in any other year.

Which choice most effectively uses data from the graph to support the underlined claim?

- A) In 2016, the number of cellular and molecular biology topic submissions was the same as the number of animal science topic submissions.
- B) In 2019, there were more physics and space science topic submissions than there were medicine and health topic submissions.
- C) The lowest number of animal science topic submissions in a year was approximately 95 in 2016.
- D) The highest number of medicine and health topic submissions during the period shown is approximately 285 in 2019.

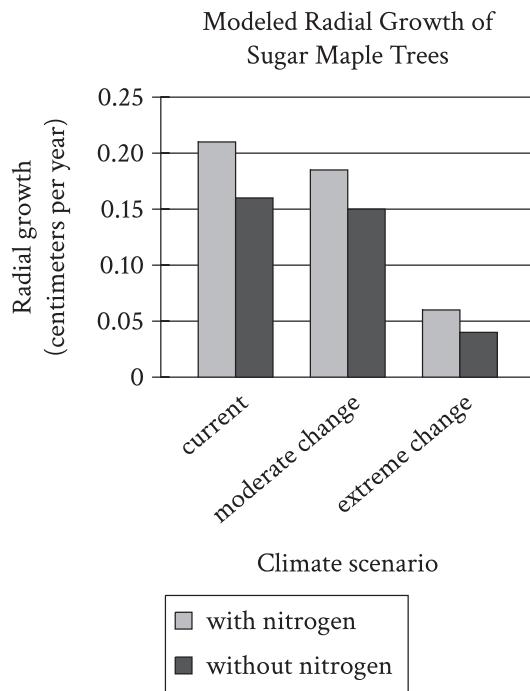
13

Fish whose DNA has been modified to include genetic material from other species are known as transgenic. Some transgenic fish have genes from jellyfish that result in fluorescence (that is, they glow in the dark). Although these fish were initially engineered for research purposes in the 1990s, they were sold as pets in the 2000s and can now be found in the wild in creeks in Brazil. A student in a biology seminar who is writing a paper on these fish asserts that their escape from Brazilian fish farms into the wild may have significant negative long-term ecological effects.

Which quotation from a researcher would best support the student's assertion?

- A) "In one site in the wild where transgenic fish were observed, females outnumbered males, while in another the numbers of females and males were equivalent."
- B) "Though some presence of transgenic fish in the wild has been recorded, there are insufficient studies of the impact of those fish on the ecosystems into which they are introduced."
- C) "The ecosystems into which transgenic fish are known to have been introduced may represent a subset of the ecosystems into which the fish have actually been introduced."
- D) "Through interbreeding, transgenic fish might introduce the trait of fluorescence into wild fish populations, making those populations more vulnerable to predators."

14



Inés Ibáñez and colleagues studied a forest site in which some sugar maple trees receive periodic fertilization with nitrogen to mimic the broader trend of increasing anthropogenic nitrogen deposition in soil. Ibáñez and colleagues modeled the radial growth of the trees with and without nitrogen fertilization under three different climate scenarios (the current climate, moderate change, and extreme change). Although they found that climate change would negatively affect growth, they concluded that anthropogenic nitrogen deposition could more than offset that effect provided that change is moderate rather than extreme.

Which choice best describes data from the graph that support Ibáñez and colleagues' conclusion?

- A) Growth with nitrogen under the current climate exceeded growth with nitrogen under moderate change, but the latter exceeded growth without nitrogen under extreme change.
- B) Growth without nitrogen under the current climate exceeded growth without nitrogen under moderate change, but the latter exceeded growth with nitrogen under extreme change.
- C) Growth with nitrogen under moderate change exceeded growth without nitrogen under moderate change, but the latter exceeded growth without nitrogen under extreme change.
- D) Growth with nitrogen under moderate change exceeded growth without nitrogen under the current climate, but the latter exceeded growth with nitrogen under extreme change.

15

“Poetry” is a 1919 poem by Marianne Moore. The poem highlights an ambivalence toward poetry as the speaker acknowledges its merits while also expressing a sense of displeasure, writing _____.

Which quotation from “Poetry” most effectively illustrates the claim?

- A) “nor is it valid / to discriminate against ‘business documents and / school-books’; all these phenomena are important.”
- B) “One must make a distinction / however: when dragged into prominence by half poets, the result is not / poetry”
- C) “when [poems] become so derivative as to become unintelligible, the / same thing may be said for all of us—that we / do not admire what / we cannot understand.”
- D) “Reading [poetry], however, with a perfect contempt for it, one discovers that there is in / it after all, a place for the genuine.”

16

Simulated Change in Annual Aquifer Input and Irrigation Output if Precipitation Concentration Increases as Climate Models Predict

Baseline concentration of annual precipitation	% change in water entering aquifers	% change in surface water used for irrigation	% change in groundwater used for irrigation
Precipitation is currently somewhat concentrated	4.9	0.4	0.9
Precipitation is currently evenly distributed	11.0	9.0	7.9

Some climate models for the western United States predict that while total annual precipitation may remain unchanged from the present level, precipitation will become concentrated into fewer but more intense rain and snow events. University of Texas climate scientist Geeta Persad and her colleagues simulated how the amount of water entering aquifers and the amount being used for irrigation purposes would change if this were to occur. Persad and her colleagues concluded that concentration of precipitation into fewer events would result in a higher number of dry days, triggering more irrigation, but that this change in irrigation output is highly sensitive to the baseline concentration of precipitation that currently exists in an area.

Which choice best describes data from the table that support Persad and her colleagues' conclusion?

- A) If baseline precipitation is somewhat concentrated, the amount of water being used for irrigation will increase 0.4% for surface water and 0.9% for groundwater, whereas the amount of water entering aquifers will increase 11.0% if baseline precipitation is evenly distributed.
- B) If baseline precipitation is somewhat concentrated, water use for irrigation will increase only slightly, whereas it will increase 9.0% for surface water and 7.9% for groundwater if baseline precipitation is evenly distributed.
- C) If baseline precipitation is somewhat concentrated, the amount of water entering aquifers will increase 4.9%, while the amount being used for irrigation will increase 0.4% for surface water and 0.9% for groundwater.
- D) If baseline precipitation is somewhat concentrated, water use for irrigation will decline by a small amount, whereas it will increase 11.0% for surface water and 9.0% for groundwater if baseline precipitation is evenly distributed.

17

In dialects of English spoken in Scotland, the “r” sound is strongly emphasized when it appears at the end of syllables (as in “car”) or before other consonant sounds (as in “bird”). English dialects of the Upland South, a region stretching from Oklahoma to western Virginia, place similar emphasis on “r” at the ends of syllables and before other consonant sounds. Historical records show that the Upland South was colonized largely by people whose ancestors came from Scotland. Thus, linguists have concluded that _____.

Which choice most logically completes the text?

- A) the English dialects spoken in the Upland South acquired their emphasis on the “r” sound from dialects spoken in Scotland.
- B) emphasis on the “r” sound will eventually spread from English dialects spoken in the Upland South to dialects spoken elsewhere.
- C) the English dialects spoken in Scotland were influenced by dialects spoken in the Upland South.
- D) people from Scotland abandoned their emphasis on the “r” sound after relocating to the Upland South.

18

How did whales, once no bigger than seals, evolve to become the largest animals on Earth? Brazilian biologist Mariana Nery believes the answer might be found in whales’ DNA. In January 2023, Nery and her colleagues _____ a study showing changes over time in four whale genes associated with body size.

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

- A) published
- B) publishing
- C) having published
- D) to publish

19

A harpsichord may look just like a piano, but the difference between the two instruments is easy to hear. When a harpsichord’s keys are pressed, the strings inside the _____ are plucked, not struck.

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

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

20

When they were first introduced to western Europe from Byzantium in the eleventh century, table forks were met with much resistance. The Bishop of Ostia, St. Peter Damian, condemned the eating utensils because he considered _____ dangerous and unnecessary luxury items.

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

- A) them
- B) this
- C) that
- D) it

21

Julia Alvarez’s 1994 novel *In the Time of the Butterflies*, a fictionalized account of the lives of the Mirabal _____ can serve as a starting point for those wanting to explore how the rule of dictator Rafael Trujillo has been represented in Dominican American literature.

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

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

22

On March 23, 2021, a gust of wind wreaked havoc on global trade. *Ever Given*, an international shipping container vessel, became lodged in Egypt's Suez Canal, a major shipping route between Europe and Asia. The vessel took six days to _____ it's as heavy as two thousand blue whales when fully loaded.

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

- A) dislodge in part due to its sheer size,
- B) dislodge, in part due to its sheer size:
- C) dislodge, in part due to its sheer size,
- D) dislodge, in part, due to its sheer size

23

Fans of the film *Moana* (2016) may not know that the deep and humorous voice behind the _____ belongs to comedian, actor, and musician Jemaine Clement. The versatile performer has appeared in everything from television commercials to action movies, but voice acting, specifically, has become a notable part of his career.

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

- A) character Tamatoa the crab
- B) character Tamatoa the crab,
- C) character: Tamatoa the crab,
- D) character, Tamatoa the crab

24

In her 1983 book *The Managed Heart: Commercialization of Human Feeling*, sociologist Arlie Russell Hochschild first explored at length her conception of a “sociology of emotions”—the idea that the various cultural and ideological frameworks a person has internalized (class, gender, political affiliation, etc.) _____ each emotional reaction that person has within a situation.

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

- A) underlies
- B) is underlying
- C) underlie
- D) has been underlying

25

American abstract artist Richard _____ his installations to make passersby keenly aware of how one’s movements are affected by the physical features of one’s environment, assembles large-scale steel plates into sculptures that dominate the outdoor spaces they occupy.

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

- A) Serra is intending
- B) Serra, intends
- C) Serra, intending
- D) Serra intends

26

In 1949, Frank Zamboni developed an ice rink resurfacing machine. As Zamboni's machine moved along the rink's surface, it first scraped off the top layer of ice. _____ it sprayed water into the deep grooves left behind by customers' skates. Lastly, it smoothed over the newly formed ice.

Which choice completes the text with the most logical transition?

- A) For example,
- B) Next,
- C) Similarly,
- D) In contrast,

27

In 2014, Nestor Gomez won his first-ever storytelling competition, relating a tale about his life as a Guatemalan immigrant living in Chicago. _____ in 2017, Gomez created the show *80 Minutes Around the World* as a platform for others to share stories about their immigration experiences.

Which choice completes the text with the most logical transition?

- A) Instead,
- B) For example,
- C) Later,
- D) In other words,

28

To guarantee the validity of experimental results, scientists rely on precise, unchanging standards of measurement. _____ metrologists (scientists who study measurement) developed the SI, or International System of Units. The SI's units of measurement are based on unchanging values in nature, such as the mass of an electron or the speed of light.

Which choice completes the text with the most logical transition?

- A) In contrast,
- B) Regardless,
- C) In addition,
- D) For this reason,

29

In retrospect, one of the lessons of the 2003 Human Genome Project is that a gene is affected by many factors, not the least of which is its interactions with the protein products of other genes. _____ rather than just focusing on the human genome, efforts to better understand gene mutations related to disease have begun to consider the human proteome, the complete set of proteins expressed by human genes.

Which choice completes the text with the most logical transition?

- A) In other words,
- B) That said,
- C) For example,
- D) Accordingly,

30

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

- Iranian scholar Abu Rayhan al-Biruni studied Earth's physical features.
- He theorized that a large landmass existed west of Europe and east of Asia.
- Al-Biruni published his landmass theory in 1037 CE.

The student wants to specify when al-Biruni published his landmass theory. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) In 1037 CE, al-Biruni published his theory that a large landmass existed west of Europe and east of Asia.
- B) Al-Biruni, who studied Earth's physical features, published a theory about a large landmass.
- C) Al-Biruni was an Iranian scholar who studied Earth's physical features.
- D) An Iranian scholar who studied Earth's physical features, al-Biruni theorized that a large landmass existed west of Europe and east of Asia.

31

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

- In astronomy, the mass of stars can be described in units called solar masses.
- One solar mass is roughly equal to the mass of the Sun.
- The mass of the star Proxima Centauri is 0.122 solar masses.
- The mass of the star Sirius A is 2.063 solar masses.

The student wants to emphasize the mass of Sirius A. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) The mass of stars, like Proxima Centauri, can be described in units called solar masses.
- B) In astronomy, the mass of stars can be described in units called solar masses, and one solar mass is roughly equal to the mass of the Sun.
- C) The Sun is more massive than Proxima Centauri, which has a mass of 0.122 solar masses.
- D) With a mass of 2.063 solar masses, Sirius A is more massive than the Sun.

32

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

- A lever is a simple machine consisting of a rigid beam and a fulcrum.
- The fulcrum is the point about which the beam pivots.
- The input force (effort) is the force applied to the lever.
- The output force (load) is the force that the lever exerts on another object.
- In first-class levers, the fulcrum is located between the effort and the load.
- In second-class levers, the load is located between the effort and the fulcrum.

The student wants to contrast first-class levers and second-class levers. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) In levers, the effort is the force applied to the lever; the load, in contrast, is the force that the lever exerts on another object.
- B) In first-class and second-class levers, the fulcrum and the load are in different locations.
- C) First-class levers are simple machines consisting of a rigid beam and a fulcrum, but then again, the same is true of second-class levers.
- D) In first-class levers, the fulcrum is located between the effort and the load, but in second-class levers, the load is located between the effort and the fulcrum.

33

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

- Earthquakes start at a point called a “focus” and spread out from there as seismic waves.
- The two types of seismic waves that travel beneath Earth’s surface are primary waves (P waves) and secondary waves (S waves).
- P waves travel more quickly beneath Earth’s surface than do S waves.
- P waves compress and expand the ground, causing it to move backward and forward.
- S waves cause the ground to move from side to side.

The student wants to emphasize a similarity between P waves and S waves. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) P waves and S waves both travel beneath Earth’s surface, causing the ground to move.
- B) P waves travel away from an earthquake’s starting point at a higher rate of speed than do S waves.
- C) Spreading out from the focus of an earthquake, P waves move the ground backward and forward.
- D) Although P waves and S waves start at the same point, they behave very differently.

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

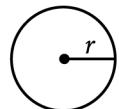
DIRECTIONS

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:

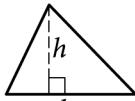
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE


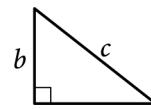
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



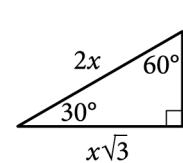
$$A = \ell w$$



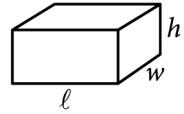
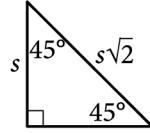
$$A = \frac{1}{2} bh$$



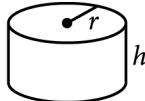
$$c^2 = a^2 + b^2$$



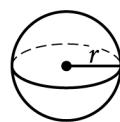
Special Right Triangles



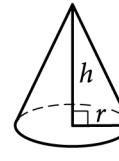
$$V = \ell wh$$



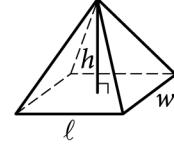
$$V = \pi r^2 h$$



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



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



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

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

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

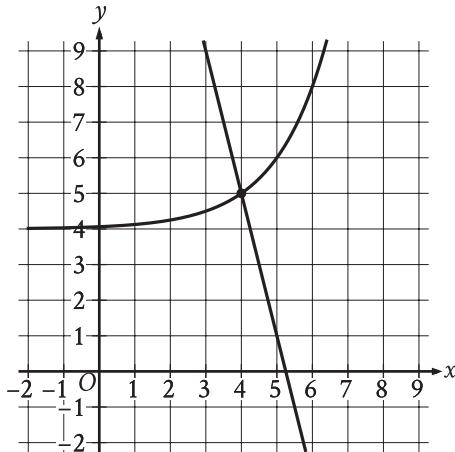
The sum of the measures in degrees of the angles of a triangle is 180.

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.

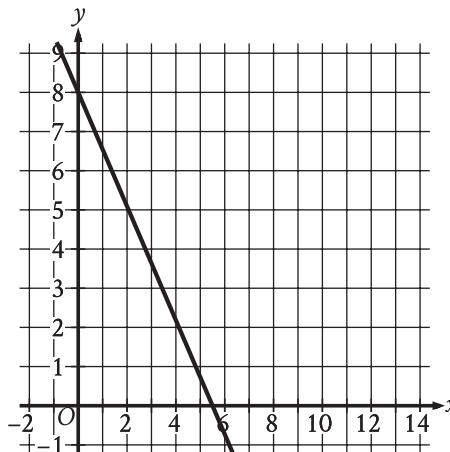
1



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

- A) $(0, 0)$
- B) $(0, 4)$
- C) $(4, 5)$
- D) $(5, 0)$

3



The graph of the linear function f is shown, where $y = f(x)$. What is the y -intercept of the graph of f ?

- A) $(0, 0)$
- B) $\left(0, -\frac{16}{11}\right)$
- C) $(0, -8)$
- D) $(0, 8)$

2

On the first day of a semester, a film club has 90 members. Each day after the first day of the semester, 10 new members join the film club. If no members leave the film club, how many total members will the film club have 4 days after the first day of the semester?

- A) 400
- B) 130
- C) 94
- D) 90

4

$$\begin{aligned}s + 7r &= 27 \\ r &= 3\end{aligned}$$

What is the solution (r, s) to the given system of equations?

- A) $(6, 3)$
- B) $(3, 6)$
- C) $(3, 27)$
- D) $(27, 3)$

5

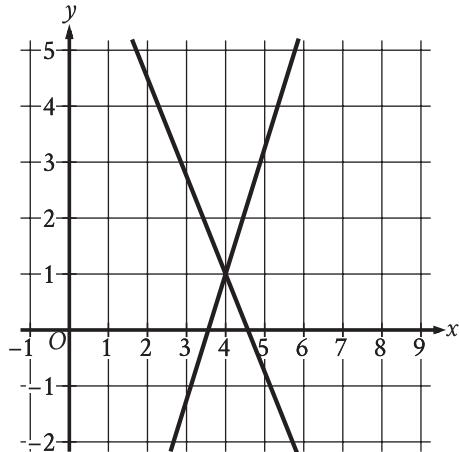
The table shows selected values from function f .

x	$f(x)$
-1	16
0	17
1	18
2	19

Which of the following is the best description of function f ?

- A) Decreasing linear
- B) Increasing linear
- C) Decreasing exponential
- D) Increasing exponential

6



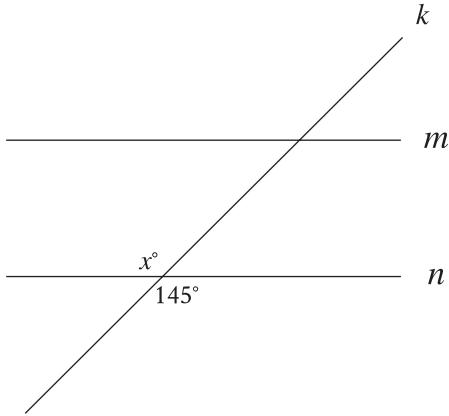
The graph of a system of linear equations is shown. The solution to the system is (x, y) . What is the value of x ?

7

23, 27, 27, 32, 35, 36, 52

What is the range of the 7 scores shown?

8



Note: Figure not drawn to scale.

In the figure, line m is parallel to line n , and line k intersects both lines. Which of the following statements is true?

- A) The value of x is less than 145.
- B) The value of x is greater than 145.
- C) The value of x is equal to 145.
- D) The value of x cannot be determined.

9

The equation $x + y = 1,440$ represents the number of minutes of daylight (between sunrise and sunset), x , and the number of minutes of non-daylight, y , on a particular day in Oak Park, Illinois. If this day has 670 minutes of daylight, how many minutes of non-daylight does it have?

- A) 670
- B) 770
- C) 1,373
- D) 1,440

10

Scott selected 20 employees at random from all 400 employees at a company. He found that 16 of the employees in this sample are enrolled in exactly three professional development courses this year. Based on Scott's findings, which of the following is the best estimate of the number of employees at the company who are enrolled in exactly three professional development courses this year?

- A) 4
- B) 320
- C) 380
- D) 384

11

If $4x - 28 = -24$, what is the value of $x - 7$?

- A) -24
- B) -22
- C) -6
- D) -1

12

For a snowstorm in a certain town, the minimum rate of snowfall recorded was 0.6 inches per hour, and the maximum rate of snowfall recorded was 1.8 inches per hour. Which inequality is true for all values of s , where s represents a rate of snowfall, in inches per hour, recorded for this snowstorm?

- A) $s \geq 2.4$
- B) $s \geq 1.8$
- C) $0 \leq s \leq 0.6$
- D) $0.6 \leq s \leq 1.8$

13

$$\begin{aligned}y &= 4x \\y &= x^2 - 12\end{aligned}$$

A solution to the given system of equations is (x, y) , where $x > 0$. What is the value of x ?

14

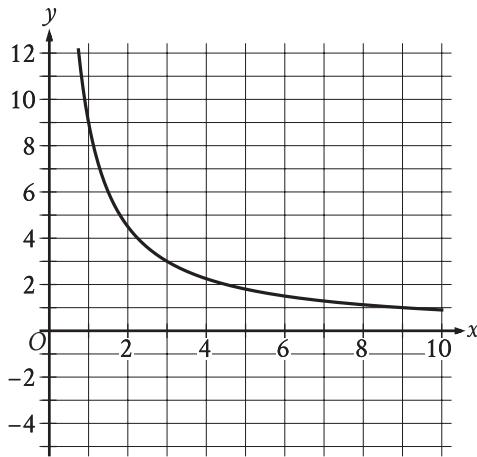
A store sells two different-sized containers of blueberries. The store's sales of these blueberries totaled 896.86 dollars last month. The equation $4.51x + 6.07y = 896.86$ represents this situation, where x is the number of smaller containers sold and y is the number of larger containers sold. According to the equation, what is the price, in dollars, of each smaller container?

15

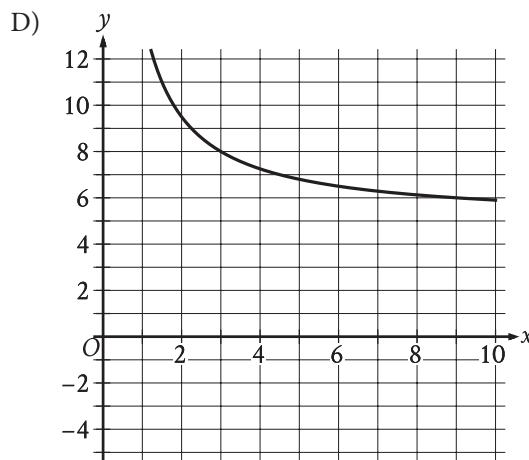
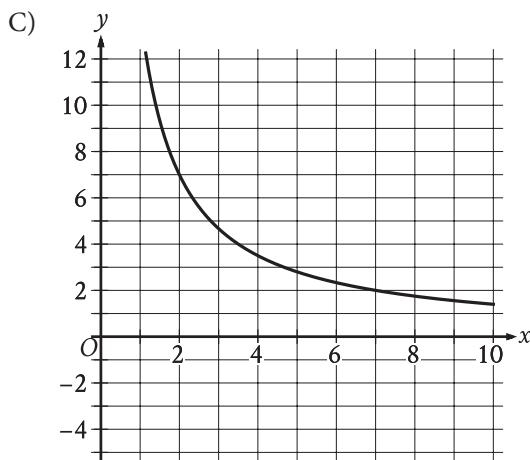
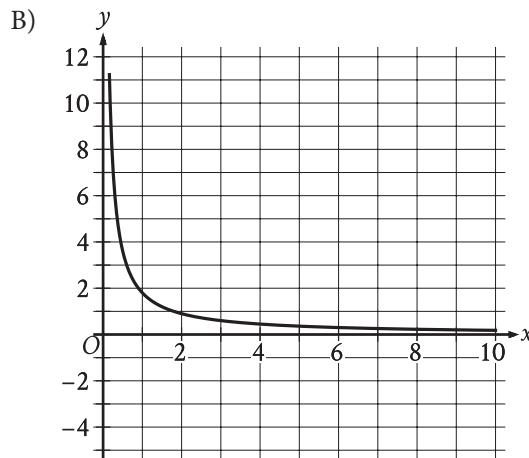
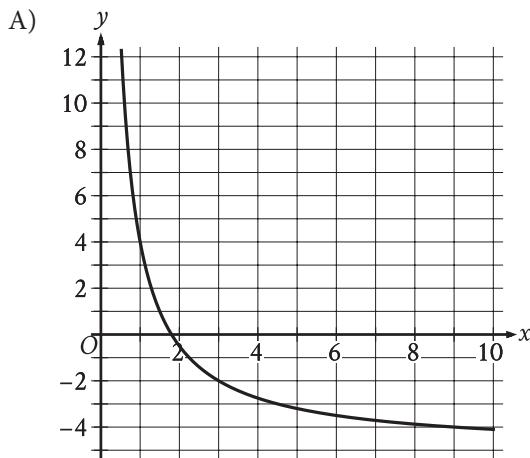
A right circular cylinder has a base diameter of 22 centimeters and a height of 6 centimeters. What is the volume, in cubic centimeters, of the cylinder?

- A) 132π
- B) 264π
- C) 726π
- D) $2,904\pi$

16



The graph of the rational function f is shown, where $y = f(x)$ and $x \geq 0$. Which of the following is the graph of $y = f(x) + 5$, where $x \geq 0$?



17

At a particular track meet, the ratio of coaches to athletes is 1 to 26. If there are x coaches at the track meet, which of the following expressions represents the number of athletes at the track meet?

- A) $\frac{x}{26}$
- B) $26x$
- C) $x + 26$
- D) $\frac{26}{x}$

18

Kaylani used fabric measuring 5 yards in length to make each suit for a men's choir. The relationship between the number of suits that Kaylani made, x , and the total length of fabric that she purchased y , in yards, is represented by the equation $y - 5x = 6$. What is the best interpretation of 6 in this context?

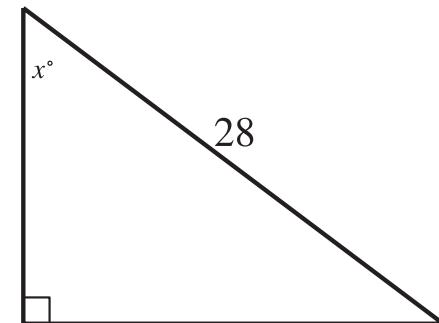
- A) Kaylani made 6 suits.
- B) Kaylani purchased a total of 6 yards of fabric.
- C) Kaylani used a total of 6 yards of fabric to make the suits.
- D) Kaylani purchased 6 yards more fabric than she used to make the suits.

19

What is the value of $\tan \frac{92\pi}{3}$?

- A) $-\sqrt{3}$
- B) $-\frac{\sqrt{3}}{3}$
- C) $\frac{\sqrt{3}}{3}$
- D) $\sqrt{3}$

20



Note: Figure not drawn to scale.

In the triangle shown, what is the value of $\cos x^\circ$?

21

The function g is defined by $g(x) = (x + 14)(t - x)$, where t is a constant. In the xy -plane, the graph of $y = g(x)$ passes through the point $(24, 0)$. What is the value of $g(0)$?

22

$$(x + 4)^2 + (y - 19)^2 = 121$$

The graph of the given equation is a circle in the xy -plane. The point (a, b) lies on the circle. Which of the following is a possible value for a ?

- A) -16
- B) -14
- C) 11
- D) 19

23

A right rectangular prism has a height of 9 inches. The length of the prism's base is x inches, which is 7 inches more than the width of the prism's base. Which function V gives the volume of the prism, in cubic inches, in terms of the length of the prism's base?

- A) $V(x) = x(x + 9)(x + 7)$
- B) $V(x) = x(x + 9)(x - 7)$
- C) $V(x) = 9x(x + 7)$
- D) $V(x) = 9x(x - 7)$

24

Which of the following functions has(have) a minimum value at -3 ?

- I. $f(x) = -6(3)^x - 3$
- II. $g(x) = -3(6)^x$

- A) I only
- B) II only
- C) I and II
- D) Neither I nor II

25

The result of increasing the quantity x by 400% is 60. What is the value of x ?

- A) 12
- B) 15
- C) 240
- D) 340

26

The function f is defined by $f(x) = ax^2 + bx + c$, where a , b , and c are constants. The graph of $y = f(x)$ in the xy -plane passes through the points $(7, 0)$ and $(-3, 0)$. If a is an integer greater than 1, which of the following could be the value of $a + b$?

- A) -6
- B) -3
- C) 4
- D) 5

27

The function g is defined by $g(x) = x(x - 2)(x + 6)^2$.

The value of $g(7 - w)$ is 0, where w is a constant.

What is the sum of all possible values of w ?

STOP

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

Math

27 QUESTIONS

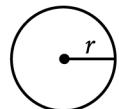
DIRECTIONS

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

NOTES

Unless otherwise indicated:

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

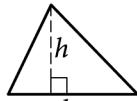
REFERENCE


$$A = \pi r^2$$

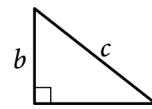
$$C = 2\pi r$$



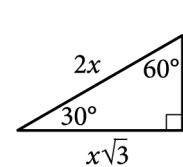
$$A = lw$$



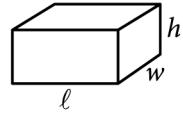
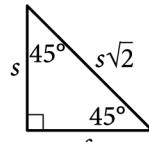
$$A = \frac{1}{2}bh$$



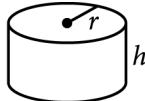
$$c^2 = a^2 + b^2$$



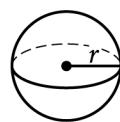
Special Right Triangles



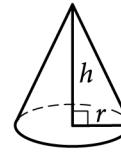
$$V = lwh$$



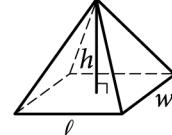
$$V = \pi r^2 h$$



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



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



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

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

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

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

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

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

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

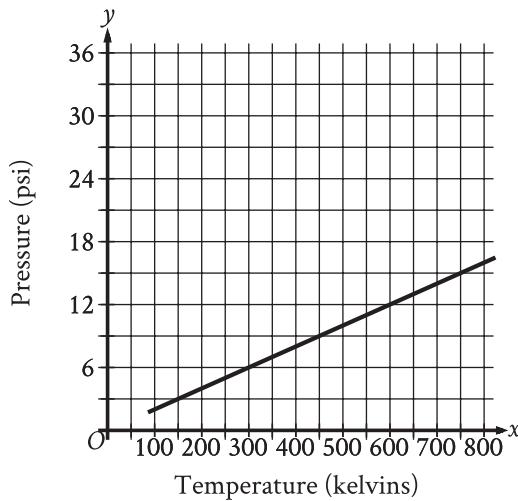
1

What is 20% of 440?

- A) 44
- B) 88
- C) 880
- D) 1,760

2

Argon is placed inside a container with a constant volume. The graph shows the estimated pressure y , in pounds per square inch (psi), of the argon when its temperature is x kelvins.



What is the estimated pressure of the argon, in psi, when the temperature is 600 kelvins?

- A) 6
- B) 12
- C) 300
- D) 600

3

The function f is defined by $f(x) = 4x - 3$. What is the value of $f(10)$?

- A) -30
- B) 37
- C) 40
- D) 43

4

Which expression is equivalent to $16x^3y^2 + 14xy$?

- A) $2xy(8xy + 7)$
- B) $2xy(8x^2y + 7)$
- C) $14xy(2x^2y + 1)$
- D) $14xy(8x^2y + 1)$

5

A veterinarian recommends that each day a certain rabbit should eat 25 calories per pound of the rabbit's weight, plus an additional 11 calories. Which equation represents this situation, where c is the total number of calories the veterinarian recommends the rabbit should eat each day if the rabbit's weight is x pounds?

- A) $c = 25x$
- B) $c = 36x$
- C) $c = 11x + 25$
- D) $c = 25x + 11$

6

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

7

$$(d - 30)(d + 30) - 7 = -7$$

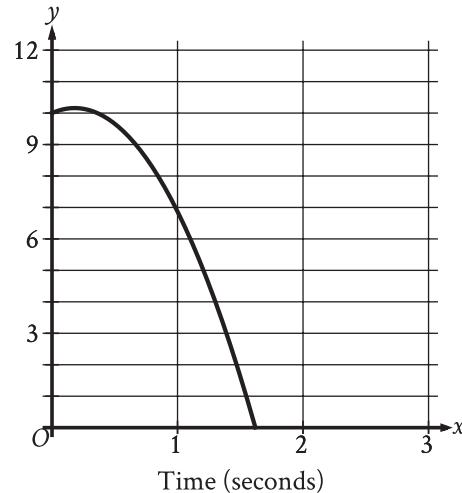
What is a solution to the given equation?

8

Line r in the xy -plane has a slope of 4 and passes through the point $(0, 6)$. Which equation defines line r ?

- A) $y = -6x + 4$
- B) $y = 6x + 4$
- C) $y = 4x - 6$
- D) $y = 4x + 6$

9



A competitive diver dives from a platform into the water. The graph shown gives the height above the water y , in meters, of the diver x seconds after diving from the platform. What is the best interpretation of the x -intercept of the graph?

- A) The diver reaches a maximum height above the water at 1.6 seconds.
- B) The diver hits the water at 1.6 seconds.
- C) The diver reaches a maximum height above the water at 0.2 seconds.
- D) The diver hits the water at 0.2 seconds.

10

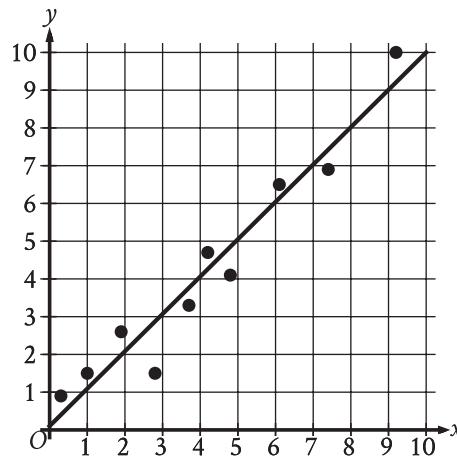
The kinetic energy, in joules, of an object with mass 9 kilograms traveling at a speed of v meters per second is given by the function K , where

$$K(v) = \frac{9}{2}v^2.$$
 Which of the following is the best interpretation of $K(34) = 5,202$ in this context?

- A) The object traveling at 34 meters per second has a kinetic energy of 5,202 joules.
- B) The object traveling at 340 meters per second has a kinetic energy of 5,202 joules.
- C) The object traveling at 5,202 meters per second has a kinetic energy of 34 joules.
- D) The object traveling at 23,409 meters per second has a kinetic energy of 34 joules.

11

The scatterplot shows the relationship between two variables x and y . A line of best fit for the data is also shown.



For how many of the 10 data points is the actual y -value greater than the y -value predicted by the line of best fit?

- A) 3
- B) 4
- C) 6
- D) 7

12

At a movie theater, there are a total of 350 customers. Each customer is located in either theater A, theater B, or theater C. If one of these customers is selected at random, the probability of selecting a customer who is located in theater A is 0.48, and the probability of selecting a customer who is located in theater B is 0.24. How many customers are located in theater C?

- A) 28
- B) 40
- C) 84
- D) 98

13

What is the slope of the graph of

$$y = \frac{1}{3}(29x + 10) + 5x \text{ in the } xy\text{-plane?}$$

14

The length of each edge of a box is 29 inches. Each side of the box is in the shape of a square. The box does not have a lid. What is the exterior surface area, in square inches, of this box without a lid?

15

Five *Eretmochelys imbricata*, a type of sea turtle, each have a nest. The table shows an original data set of the number of eggs that each turtle laid in its nest.

Nest	Number of eggs
A	149
B	144
C	148
D	136
E	139

A sixth nest with 121 eggs is added to create a new data set. Which of the following correctly compares the means of the two data sets?

- A) The mean of the original data set is greater than the mean of the new data set.
- B) The mean of the original data set is less than the mean of the new data set.
- C) The means of both data sets are equal.
- D) There is not enough information to compare the means.

16

In $\triangle RST$, the measure of $\angle R$ is 63° . Which of the following could be the measure, in degrees, of $\angle S$?

- A) 116
- B) 118
- C) 126
- D) 180

17

Which expression is equivalent to

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

- A) $8x^3 + 6$
- B) $7x^3 + 10$
- C) $8x^3 + 10$
- D) $7x^3 + 6$

18

If $4\sqrt{2x} = 16$, what is the value of $6x$?

- A) 24
- B) 48
- C) 72
- D) 96

19

$$2x - y > 883$$

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

A)

x	y
440	0
441	-2
442	-4

B)

x	y
440	0
442	-2
441	-4

C)

x	y
442	0
440	-2
441	-4

D)

x	y
442	0
441	-2
440	-4

20

$$5y = 10x + 11$$

$$-5y = 5x - 21$$

The solution to the given system of equations is (x, y) . What is the value of $30x$?

21

A rectangle is inscribed in a circle, such that each vertex of the rectangle lies on the circumference of the circle. The diagonal of the rectangle is twice the length of the shortest side of the rectangle. The area of the rectangle is $1,089\sqrt{3}$ square units. What is the length, in units, of the diameter of the circle?

22

Rectangles $ABCD$ and $EFGH$ are similar. The length of each side of $EFGH$ is 6 times the length of the corresponding side of $ABCD$. The area of $ABCD$ is 54 square units. What is the area, in square units, of $EFGH$?

- A) 9
- B) 36
- C) 324
- D) 1,944

23

Which expression is equivalent to $\frac{42a}{k} + 42ak$, where $k > 0$?

- A) $\frac{84a}{k}$
- B) $\frac{84ak^2}{k}$
- C) $\frac{42a(k+1)}{k}$
- D) $\frac{42a(k^2+1)}{k}$

24

Which quadratic equation has no real solutions?

- A) $x^2 + 14x - 49 = 0$
- B) $x^2 - 14x + 49 = 0$
- C) $5x^2 - 14x - 49 = 0$
- D) $5x^2 - 14x + 49 = 0$

25

$$P(t) = 260(1.04)^{\left(\frac{6}{4}\right)t}$$

The function P models the population, in thousands, of a certain city t years after 2003. According to the model, the population is predicted to increase by 4% every n months. What is the value of n ?

- A) 8
- B) 12
- C) 18
- D) 72

27

For an electric field passing through a flat surface perpendicular to it, the electric flux of the electric field through the surface is the product of the electric field's strength and the area of the surface. A certain flat surface consists of two adjacent squares, where the side length, in meters, of the larger square is 3 times the side length, in meters, of the smaller square. An electric field with strength 29.00 volts per meter passes uniformly through this surface, which is perpendicular to the electric field. If the total electric flux of the electric field through this surface is 4,640 volts · meters, what is the electric flux, in volts · meters, of the electric field through the larger square?

26

A circle in the xy -plane has its center at $(-1, 1)$. Line t is tangent to this circle at the point $(5, -4)$. Which of the following points also lies on line t ?

- A) $\left(0, \frac{6}{5}\right)$
- B) $(4, 7)$
- C) $(10, 2)$
- D) $(11, 1)$

STOP

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

The SAT®

Practice

Test #5



ANSWER EXPLANATIONS

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



Reading and Writing

Module 1

(33 questions)

QUESTION 1

Choice A is the best answer because the text indicates that Fox-Foot doesn't let the group build a fire or create a canoe landing when it's time for supper. This context suggests that he doesn't want anyone who might be following the group to see any sign of them or their activities. In other words, Fox-Foot doesn't want there to be any trace, or evidence, of the group's movements ("their passing") through the area.

Choice B is incorrect because the text conveys that Fox-Foot doesn't want the group to be detected, not that he doesn't want their presence to create a blemish, or a spoiling flaw, in the area; human activity could disturb a natural environment, but the context emphasizes that Fox-Foot is instead focused on avoiding giving any sign of the group's movements through a place ("their passing") to anyone who might be following them. *Choice C* is incorrect because the text focuses on Fox-Foot's desire to avoid detection by those who might be following the group. This context conveys that Fox-Foot doesn't want to create any signs or evidence of the group moving through a place ("their passing"), not that he doesn't want to leave behind some quantity of their presence; indeed, it isn't clear what an amount of a group's movement would be. *Choice D* is incorrect because nothing in the text suggests that the group has a sketch, or rough drawing, of their movements through that area ("their passing") that might be left behind. Rather, the context emphasizes that Fox-Foot is focused on ensuring that the group doesn't give any kind of indication of their presence, as he wants to avoid detection by anyone who might be following the group.

QUESTION 2

Choice B is the best answer because it most logically completes the text's discussion of noses on ancient sculptures. In this context, "fragile" means weak or delicate. This matches the text's description of noses on ancient sculptures, which are often missing from sculptures' heads because they are "especially easy to break." Therefore, this context indicates that noses on ancient sculptures are the most fragile part of the sculptures' heads.

Choice A is incorrect. In this context, “recognizable” would mean identifiable, and since the text indicates that noses are often missing from ancient statues, they therefore cannot be the most recognizable part of the statue. *Choice C* is incorrect because the text indicates that many ancient statues are missing noses, so noses wouldn’t be “common,” or frequent, aspects of ancient statues; they would conversely be uncommon. *Choice D* is incorrect because the text only indicates that noses on ancient statues often stick out and end up missing from the heads, which doesn’t relate to the noses being “sophisticated,” or knowledgeable or refined.

QUESTION 3

Choice B is the best answer because it most logically completes the text’s discussion of advance indications of solar flares. In this context the word “impending” means imminent or approaching. The text mentions a study by Leka and colleagues that found that the Sun’s corona provides an advance indication of solar flares. The text then points out why such an advance indication would be useful—solar flares can interfere with communications on Earth—and concludes by describing the characteristic of the corona that gives warning of a solar flare. The text indicates that this characteristic—increased brightness in a particular region of the corona—comes before the appearance of the flare. Therefore, in context, the best answer would indicate that the flare is approaching, or impending.

Choice A is incorrect. The best answer would be one that indicates that the increased brightness of the Sun’s corona precedes the appearance of the flare. But if the flare were “antecedent,” or previous, then the flare would instead precede the appearance of the increased brightness of the corona, a statement that is logically inconsistent. *Choice C* is incorrect. The word “innocuous,” or harmless, does not logically complete the text; since solar flares can interfere with communications on Earth, they cannot reasonably be described as innocuous. *Choice D* is incorrect. If the solar flares have an advance indication of their appearance, then there must therefore be a time before the appearance of the flares when they do not exist. But the word “perpetual,” or never-ending, would in context indicate that the flare exists at the same time as the advance indication provided by the Sun’s corona, which would not make logical sense.

QUESTION 4

Choice D is the best answer because it most logically completes the text’s discussion of using magnetism to detect stress in buried metal pipes. In this context, “exploited” means made productive use of. The text indicates that the magnetic fields of some metals change under stress and that Saleem and colleagues showed that it is possible to measure those changes from a distance, thereby demonstrating that the integrity of underground metal pipes can be evaluated without having to unearth them. This context thus indicates that Saleem and colleagues made productive use of, or exploited, this tendency of the metals’ magnetic fields.

Choice A is incorrect because in this context, “hypothesized” would mean made a tentative assumption to be evaluated in a study or experiment. Although Saleem and colleagues may have had one or more hypotheses for these experiments, the text presents the information about the tendency of some metals’ magnetic fields to change under stress as a known fact that the researchers made productive use of, not as a hypothesis to be evaluated. The text after the colon indicates that the researchers were not evaluating whether such changes occur but whether those changes can be measured at a distance. *Choice B* is incorrect because in this context, “discounted” would mean downplayed or ignored, but the text does not suggest that Saleem and colleagues minimized or ignored the tendency of the magnetic fields of some metals to change under stress. Rather, the text indicates that this tendency is the basis for Saleem and colleagues’ method of assessing the pipes’ integrity. *Choice C* is incorrect because nothing in the text indicates that Saleem and colleagues “redefined,” or reevaluated or reformulated, the tendency of some metals’ magnetic fields to change under stress. Instead, the text indicates that the researchers made use of that tendency to demonstrate that it is possible to evaluate the integrity of underground pipes without unearthing them.

QUESTION 5

Choice B is the best answer because it most logically completes the text’s discussion of behavioral psychology studies. In this context, “ameliorate” means to help remedy or improve. The text states that many behavioral psychology studies are flawed because the subjects used are “highly unrepresentative.” It is then suggested that researchers should recruit subjects from “diverse backgrounds and locations” in order to help address the issue of unrepresentative subject pools. Thus, this context conveys that recruitment efforts focused on diversity would help ameliorate the problems outlined in the text.

Choice A is incorrect. In this context, “sanction” could have two meanings: to give official approval for something or to enact a penalty, neither of which makes sense in this context. The text describes a situation known to be problematic in behavioral psychology studies and then presents a potential remedy to that situation; the text does not suggest that the situation is officially approved or results in any type of penalty. *Choice C* is incorrect because rather than “rationalize,” or explain or justify, a situation, the text presents a situation and its potential remedy. *Choice D* is incorrect because the text is not attempting to “postulate,” or suggest a claim or theory, related to the situation described in the text but is rather presenting a potential remedy for the situation.

QUESTION 6

Choice D is the best answer because it most accurately describes the main purpose of the text. In the first sentence of the text, the narrator states that she thinks there’s a chance she will become part of the basketball team at her college. She goes on to explain that she is “quick” and “tough.” Based on these characteristics, she thinks she has a chance to join the team. Thus, the main purpose of the text is to explain why the narrator thinks she might make the basketball team.

Choice A is incorrect because the text focuses solely on basketball and doesn't mention any other kinds of sports. *Choice B* is incorrect because the text doesn't describe aspects of the game of basketball. Instead, it provides the narrator's reasoning for thinking that she might make her school basketball team. *Choice C* is incorrect. Although the narrator explains why she thinks she will be chosen for the basketball team at her school, the text doesn't go into the general decision-making process or the requirements for being picked for the team.

QUESTION 7

Choice B is the best answer because it most accurately describes the main purpose of the text. The text begins by stating that there were many Spanish-language newspapers in cities across Texas in the late 1800s, citing San Antonio as a city that produced eleven such newspapers. The text then goes on to note that in El Paso, there were twenty-two newspapers published in Spanish in the late 1800s, more than any other Texas city. The text then concludes by explaining that the reason for this large number of Spanish-language newspapers was likely El Paso's location near Mexico and its large population of Spanish speakers.

Therefore, the main purpose of the text is to explain that Spanish-language newspapers thrived in Texas cities, especially in El Paso, in the late 1800s.

Choice A is incorrect because the text doesn't discuss Spanish-language newspapers published in Texas today, let alone compare them with newspapers that were published in the 1800s. *Choice C* is incorrect. Although the text characterizes El Paso as a particularly rich site for Spanish-language journalism in the late 1800s, the text doesn't discuss whether newspapers published in El Paso influenced the newspapers published in other cities across Texas, including San Antonio. *Choice D* is incorrect because the text doesn't mention whether Spanish-language newspapers published in Texas were also widely read in Mexico. The text only focuses on the popularity of Spanish-language newspapers within Texas, and especially in El Paso.

QUESTION 8

Choice C is the best answer because it most accurately describes how the underlined sentence functions in the text as a whole. The first sentence describes a unique location on Earth, the Atacama Desert. The next sentence, which is the underlined sentence, states that the reason why astrobiologists study life, or its remains, in this unique location is that Atacama is a harsh environment that closely resembles the extreme environment of Mars. The remainder of the text explains that the researchers hope their work in Atacama will support inquiry into life on Mars. Thus, the underlined portion functions mainly to indicate why astrobiologists choose to conduct research in the Atacama Desert.

Choice A is incorrect because to contrast two things means to show the differences between them, and the phrase "closely mirrors" in the underlined sentence indicates that the extreme environment in the Atacama Desert is similar to, not different from, that on Mars. This similarity is why, according to the underlined sentence, astrobiologists conduct research in Atacama. *Choice B* is incorrect because the underlined sentence doesn't address forms of life that are unable to survive the harsh environment of the Atacama Desert. Instead, the

underlined sentence explains why astrobiologists study life, or its remains, in this environment. *Choice D* is incorrect because the underlined sentence doesn't suggest that the scientific research in the Atacama Desert is limited in any way; instead, the sentence explains that the similarity between the environments of Atacama and Mars is the reason why astrobiologists search for life, or its remains, in Atacama.

QUESTION 9

Choice B is the best answer because it most accurately describes how the underlined portion functions in the text as a whole. The first sentence explains that reproducing the high ridership of Mexico City's public transit system in other cities by implementing some of its features, such as its low fares, is unlikely to guarantee significant ridership increases in those cities. The following sentence introduces a study by Guerra et al., whose findings—namely that choice of transportation mode in urban centers in Mexico is influenced by a variety of local contextual factors—support this claim. The first part of the last sentence concedes that features of transportation systems likely do have some effect on ridership numbers, but the underlined portion reiterates the study's conclusion by stating that there is an "irreducibly contextual dimension" to peoples' choice to use public transportation: that is, there is a complex mix of local contextual factors—including population density, spatial distribution of jobs, and demographics—whose influence over an urban center's transit ridership is unique to each location, and it is unlikely that simple changes to transit system characteristics could negate the influence of those contextual factors. Thus, the underlined portion explains why it is challenging to influence transit ridership solely by changing some of a transit system's characteristics.

Choice A is incorrect. Rather than objecting to the argument of Guerra et al., the underlined portion reiterates their argument by stating that there is an "irreducibly contextual dimension" involved in transportation mode choice; in other words, transportation mode choice in urban areas of Mexico is strongly dependent on contextual factors that are unique to each urban area. *Choice C* is incorrect because it mischaracterizes the text's central claim, which is that transit ridership is the product of a complex mix of contextual factors and transit system features, not that a characteristic associated with Mexico City's high transit ridership was found to have no association with high transit ridership elsewhere. Additionally, the underlined portion does not illustrate a claim, but instead restates the findings of Guerra et al. *Choice D* is incorrect. Although Guerra et al. demonstrate that population density, the spatial distribution of jobs, and demographic characteristics—factors that comprise the "contextual dimension of transportation mode choice"—influence transit ridership, the underlined portion does not substantiate—that is, provide evidence in support of—this assertion. Rather, the underlined portion merely restates a study finding that explains why simply altering a transit system's features would be unlikely to induce significant increases in transit ridership.

QUESTION 10

Choice B is the best answer because it most accurately describes the overall structure of the text. The text begins by explaining that human activities influence carbon and nitrogen levels in soil, but how deeply these effects are seen in the soil remains an unresolved question. Next, the text summarizes Okolo and colleagues' hypothesis regarding this question—which is that the different effects on carbon and nitrogen levels associated with different types of land use would also be observed below the topsoil layer—and then briefly explains the methods they used to test this hypothesis. Finally, the text states that the researchers found that at depths below the topsoil layer, carbon and nitrogen decreased to similarly low levels across all land-use types, a finding that conflicts with the team's hypothesis presented earlier in the text. Thus, the text introduces an unresolved scientific question, presents a research team's hypothesis pertaining to that question, and then describes an observation that the team made that conflicted with their hypothesis.

Choice A is incorrect. Although the text introduces a phenomenon (the fact that human activities influence carbon and nitrogen levels in the soil) that isn't fully understood by scientists and explains a research team's hypothesis about the phenomenon, the text doesn't describe how the team refined their hypothesis when a research finding contradicted it. *Choice C* is incorrect because the text doesn't discuss a process at all; rather, it poses an unsolved scientific question and presents a hypothesis that Okolo and colleagues tested to answer that question. Moreover, the text only describes one hypothesis; it doesn't mention any competing hypotheses, nor does it suggest that Okolo's team was able to determine which hypothesis was correct. *Choice D* is incorrect because the text doesn't begin by presenting a hypothesis that is under scientific debate; rather, it presents a question that scientists have been unable to answer and then introduces a hypothesis formulated by Okolo and colleagues. While the text does explain how Okolo's team tested their hypothesis, the text goes on to say that their data conflicted with their hypothesis, not that the data validated, or supported, their hypothesis.

QUESTION 11

Choice D is the best answer because it presents a statement about what surprised the scientists that is supported by the text. The text states that the marsquakes described in the data from NASA's InSight lander originated from the same location on Mars. The text goes on to say that because they had expected the opposite (that marsquakes would originate from all over the planet) this discovery surprised the scientists.

Choice A is incorrect because the text doesn't say that the data from NASA's InSight lander revealed any surprising information about the planet's surface temperature. Instead, the text mentions the cooling of Mars's surface as a reason the scientists expected that marsquakes had multiple origins. In addition, cooling would indicate that the temperature has been falling rather than rising. *Choice B* is incorrect. Although the text indicates that by studying seismic activity scientists found a possible explanation for what causes marsquakes, the text doesn't say

that they discovered that marsquakes are caused by different types of seismic waves. Rather, the text states that based on the data from NASA's InSight lander, scientists now believe that this seismic activity happens because of areas of active magma that flow below the planet's surface. *Choice C* is incorrect because the text doesn't discuss the amount of data NASA's InSight lander collected or whether scientists who studied the data found the amount to be as expected. Instead, the text focuses on what the data revealed about where on Mars the marsquakes originated.

QUESTION 12

Choice A is the best answer because it presents information about Maya civilization that is supported by the text. The text states that the writing system used in the Maya kingdoms had a symbol for the number zero. It goes on to say that at the time of the zero symbol's earliest example, more than 2,000 years ago, almost no other writing systems in the world featured such a symbol. The text also points out that some historians suggest that Maya mathematicians inherited the use of zero from the Olmec civilization, which existed in the same area as the Maya civilization at an earlier date. Thus, according to the text, some historians suggest that the Maya civilization acquired the use of zero from the Olmec civilization.

Choice B is incorrect because although the text mentions present-day historians and Maya mathematicians, it does not say anything about how much the Maya civilization respected its historians and mathematicians. *Choice C* is incorrect because the text does not indicate that the Maya civilization treated its use of the zero symbol, or any other intellectual achievements, as secrets to be kept from other civilizations. *Choice D* is incorrect because although the text mentions historians who suggest that the writing system of the Maya civilization inherited some features from the earlier Olmec civilization, the text does not describe any attempts of Maya civilization to introduce its writing system to other civilizations.

QUESTION 13

Choice D is the best answer because it most effectively uses a quotation from "The Bet" to illustrate the claim that the banker was very upset about something. The quotation indicates that the banker shed tears, which suggests that he was likely unhappy about something, and that his emotions were so strong that they kept him from sleeping for hours. These details suggest that the banker was very upset.

Choice A is incorrect because this quotation mainly describes the banker cautiously unlocking a door; it doesn't suggest that he was particularly upset about anything. *Choice B* is incorrect because this quotation doesn't mention whether the banker was experiencing any particularly strong negative feelings; instead, the quotation focuses on the quietness of the setting. *Choice C* is incorrect because this quotation states that the banker was feeling "delighted," not that he was upset.

QUESTION 14

Choice B is the best answer because it uses data from the table to complete the statement regarding a species for which the problem of finding a suitable habitat would be especially concerning. For each candidate species, the table lists its common name, scientific name, and when the species became extinct. The text explains that scientists pursuing de-extinction for the candidate species also consider the length of time that has passed since the species' extinction, noting that the longer the animal has been extinct, the less likely it is that a suitable habitat would exist for the species today. The possibility of not having a suitable habitat would be especially concerning for the candidate species for which the most time has passed since its extinction. According to the table this species would be the saber-toothed cat, which became extinct 11,000 years before present.

Choice A is incorrect because it compares the time since the extinction of the passenger pigeon to the time since the extinction of the huia instead of citing the species listed in the table that has been extinct the longest (the saber-toothed cat). The text indicates that the longer a species has been extinct, the lower the chances are that a suitable habitat exists for it today. Neither the table nor the text supports the claim that the passenger pigeon is especially vulnerable to this problem. *Choice C* is incorrect because the text states that the longer a species has been extinct, the less likely it is that there would be a suitable habitat available for the species today. So, the problem would be especially concerning for the saber-toothed cat, which became extinct several thousand years before the woolly mammoth did—not the other way around. *Choice D* is incorrect because the text states that the longer a species has been extinct, the lower the chances are that a suitable habitat would be available for that species today. According to the table, the Caribbean monk seal became extinct in 1952, which is the most recent extinction listed for a candidate species in the table.

QUESTION 15

Choice C is the best answer because it most effectively illustrates the claim that the narrator of "The Yellow Wallpaper" has mixed feelings about her surroundings. She says she is "really getting quite fond of the big room," a positive sentiment, but also describes the room's wallpaper as "horrid," a negative sentiment. Since some of her feelings about her surroundings are positive and others are negative, they are best described as mixed.

Choice A is incorrect because though the narrator describes the room's wallpaper as "irritating," a negative sentiment, she does not mention a positive sentiment. Thus, the quotation does not effectively illustrate the claim that the narrator has mixed feelings about her surroundings. *Choice B* is incorrect because it describes how the appearance of the room's wallpaper changes at night but does not mention the narrator's feelings about her surroundings. *Choice D* is incorrect because though the narrator describes the room's wallpaper as "repellant," a negative sentiment, she does not mention a positive sentiment. Thus, the quotation does not effectively illustrate the claim that the narrator has mixed feelings about her surroundings.

QUESTION 16

Choice B is the best answer because it effectively uses data from the graph to complete the statement about Rodrigo da Costa Portilho-Ramos and colleagues' conclusion. The graph shows the ratio of manganese to calcium in *L. pertusa* coral samples from the Alboran Sea and the Mauritanian coast. The graph reflects time in approximate years before present: in other words, the greater the number in years noted on the graph's horizontal axis, the farther that moment is in the past. The text indicates that the researchers tested the samples to determine whether oxygenation played a role in the decline of *L. pertusa*. The text goes on to note that a change in the ratio of manganese to calcium would signal an inverse, or opposite, change in oxygenation. According to the graph, the ratio of manganese to calcium in samples from the Alboran Sea increased from about 30 micromoles per mole 10,000 years ago to about 80 micromoles per mole 8,000 years ago, which means that oxygenation decreased between 10,000 and 8,000 years ago. Meanwhile, there was almost no discernible change in the ratio of manganese to calcium in samples from the Mauritanian coast between 12,000 and 10,000 years ago. According to the text, the population of *L. pertusa* declined significantly around 9,000 years ago in the Alboran Sea and around 11,000 years ago near the Mauritanian coast. Thus, the increase in the ratio of manganese to calcium around 9,000 years ago in the Alboran Sea coincides with the decline in the *L. pertusa* population, suggesting an association between the decrease in oxygenation and the decline in population of the coral. No such relationship is suggested around 11,000 years ago near the Mauritanian coast. So, oxygenation likely played a role in the *L. pertusa* decline in the Alboran Sea but not in the coral's decline near the Mauritanian coast.

Choice A is incorrect because it asserts the opposite of what the graph indicates regarding oxygenation in the Alboran Sea, and it misrepresents what the graph indicates about oxygenation near the Mauritanian coast. The graph indicates that at the time of the decline in *L. pertusa* (approximately 9,000 years ago), the samples from the Alboran Sea contained a ratio of manganese to calcium that was increasing. According to the text, this ratio inversely correlates with ocean oxygenation levels, so if the ratio was increasing, oxygenation was decreasing, not substantially increasing. Furthermore, the graph shows that the ratio of manganese to calcium remained relatively stable in coral samples from the Mauritanian coast during the period studied, which suggests that there was no discernible relationship between oxygenation and the coral's population decline in that location, not that there was a substantial decrease in oxygenation corresponding to the coral's decline. **Choice C** is incorrect. Although the graph suggests that the level of oxygenation in the Alboran Sea was higher before the decline in *L. pertusa* than after—because the ratio of manganese to calcium inversely correlates with ocean oxygenation levels and this ratio was lower before the decline than after—the graph doesn't support the claim that oxygenation near the Mauritanian coast was consistently low before and after the coral's decline there. Rather, the graph indicates that relative to coral samples from the Alboran Sea, the ratio of manganese to calcium in samples from near the Mauritanian coast was consistently low, which suggests that oxygenation levels were relatively high both before and after the decline of *L. pertusa*. **Choice D** is incorrect because it states the opposite of what the graph indicates: the graph

shows that throughout the period studied, the ratio of manganese to calcium was higher in coral samples from the Alboran Sea than it was in samples from near the Mauritanian coast. Since the text indicates that the ratio of manganese to calcium inversely correlates with ocean oxygenation levels, oxygenation in the Alboran Sea was therefore lower than, not higher than, oxygenation near the Mauritanian coast during the period studied. Moreover, even if choice D did accurately represent the graph, it wouldn't effectively complete the statement since a comparison of the ocean oxygenation levels at the two locations is not relevant to the claim that a decline in oxygenation levels was associated with the decline of *L. pertusa* in the Alboran Sea but not near the Mauritanian coast.

QUESTION 17

Choice A is the best answer because it most logically completes the text's discussion of a crater's connection to the start of the Younger Dryas. According to the text, some scientists believe that a comet fragment hitting Earth caused the cooling of the Younger Dryas period to come about. The text then indicates that a team of scientists found a crater in Greenland, which some believe supports the theory of a comet fragment hitting Earth to initiate the Younger Dryas. However, the text also notes that the team was unable to determine the age of the crater. If the age of the crater can't be determined, then its connection to the Younger Dryas period of time can't be confirmed either. Thus, it can't be concluded that the impact that made the crater was connected to the beginning of the Younger Dryas.

Choice B is incorrect because though the text suggests that the age of the comet crater found by a team of scientists is uncertain, it doesn't address whether a comet fragment can make a crater as large as 19 miles wide. The text doesn't consider the size of comet fragments and how they relate to the size of craters they might make. **Choice C** is incorrect because the debate in the text centers on the age of the crater found, not the cause of the crater. The text doesn't indicate uncertainty about what caused the discovered crater. **Choice D** is incorrect because the text suggests that the age of the crater found by the team of scientists is uncertain, not that the dates of the Younger Dryas are uncertain or incorrect. The text states that "the Younger Dryas was a period of extreme cooling from 11,700 to 12,900 years ago" but doesn't indicate any debate about the timing of the period.

QUESTION 18

Choice B is the best answer because it most logically completes the text's discussion of Smith and colleagues' investigation of the evolution and biological role of the appendix. The text indicates that the team found several instances of the appendix emerging and not disappearing in the lineages of various mammal species the team examined. Furthermore, the text states that species that possess an appendix also tend to have relatively high amounts of lymphoid tissue—a type of tissue that supports immune system function. Taken together, these details strongly support the hypothesis that the appendix has persisted in some species because it has a function that contributes to effective immune responses in those species.

Choice A is incorrect because the text doesn't address any nonmammalian species. *Choice C* is incorrect because the text doesn't make predictions about the evolutionary future of the species Smith and colleagues examined, and although the implication of the text is that the appendix likely does serve a function for the immune system, nothing in the text indicates that the appendix will become more widespread in the future. *Choice D* is incorrect. Although the text does suggest an association between having an appendix and relatively high concentrations of lymphoid tissue, it doesn't claim that the appendix causes the tissue to grow, nor does it address the relative production of the tissue at different periods of time.

QUESTION 19

Choice A is the best answer because it most logically completes the text's discussion about Aztec (Nahua) ethics. The text indicates that, according to Purcell's interpretation of available Aztec philosophical works, the Aztec ethical system views an individual's actions in relation to that individual's societal role and how the actions affect the community. The text contrasts this view with another held by some ethicists, namely that actions are morally good or bad regardless of the context in which they occur. Thus, Purcell's analysis suggests that the Aztecs would have asserted that the morality of an individual's actions are rooted in that person's position in the community and the actions' effects and therefore cannot be determined in the absence of that context.

Choice B is incorrect. Although the text indicates that morally judging an action according to Aztec ethics requires an understanding of the action's effects and the individual's social circumstances, it does not specify that only members of that society can acquire this information. *Choice C* is incorrect because it implies that the Aztecs considered some actions good or bad regardless of the surrounding context, which contradicts the text's claim that the Aztecs believed that the morality of an individual's action is dependent on the action's effects on the community and the person's specific circumstances. *Choice D* is incorrect. Although the text indicates that in Aztec ethics the morality of an action depends in part on how it affects the community, this is only one of the two factors—the other being the person's societal role—that need to be considered. Therefore, it is possible that two actions with the same effect on the community could be considered morally distinct if they are performed by individuals in different social roles.

QUESTION 20

Choice C is the best answer. The convention being tested is pronoun-antecedent agreement. The singular pronoun "this" agrees in number with the singular antecedent "Lê Lương Minh became the thirteenth secretary-general of the Association of Southeast Asian Nations (ASEAN) in January 2013." The pronoun "this" is referring back to the singular event described earlier in the sentence in which Minh became secretary-general of ASEAN.

Choice A is incorrect because the plural pronoun "these" doesn't agree in number with the singular antecedent "Lê Lương Minh became the thirteenth secretary-

general of the Association of Southeast Asian Nations (ASEAN) in January 2013.” *Choice B* is incorrect because the plural pronoun “those” doesn’t agree in number with the singular antecedent “Lê Lương Minh became the thirteenth secretary-general of the Association of Southeast Asian Nations (ASEAN) in January 2013.” *Choice D* is incorrect because the indefinite pronoun “some” is ambiguous in this context; the resulting sentence leaves unclear what marks the first time the organization appointed a Vietnamese leader.

QUESTION 21

Choice A is the best answer. The convention being tested is the use of verb forms within a sentence. A main clause requires a finite (tensed) verb to perform the action of the subject (in this case, Land), and this choice supplies the finite past tense verb “used” to indicate what Land did with the technology he had invented.

Choice B is incorrect because it results in an ungrammatical sentence. The nonfinite perfect infinitive “to have used” doesn’t supply the main clause with a finite verb. *Choice C* is incorrect because it results in an ungrammatical sentence. The nonfinite to-infinitive “to use” doesn’t supply the main clause with a finite verb. *Choice D* is incorrect because it results in an ungrammatical sentence. The nonfinite participle “using” doesn’t supply the main clause with a finite verb.

QUESTION 22

Choice D is the best answer. The convention being tested is subject-verb agreement. The singular verb “ensures” agrees in number with the singular subject “using.”

Choice A is incorrect because the plural verb “are ensuring” doesn’t agree in number with the singular subject “using.” *Choice B* is incorrect because the plural verb “have ensured” doesn’t agree in number with the singular subject “using.” *Choice C* is incorrect because the plural verb “ensure” doesn’t agree in number with the singular subject “using.”

QUESTION 23

Choice B is the best answer. The convention being tested is the use of plural nouns in a sentence. The plural noun “hands” and the plural noun “antennas” correctly indicate that two hands are placed between two antennas when playing the theremin.

Choice A is incorrect because the context requires the plural nouns “hands” and “antennas,” not the singular possessive nouns “hand’s” and “antenna’s.” *Choice C* is incorrect because the context requires the plural nouns “hands” and “antennas,” not the plural possessive nouns “hands’” and “antennas’.” *Choice D* is incorrect because the context requires the plural noun “hands,” not the plural possessive noun “hands’.”

QUESTION 24

Choice D is the best answer. The convention being tested is subject-verb agreement. The plural verb “represent” agrees in number with the plural subject “references.”

Choice A is incorrect because the singular verb “represents” doesn’t agree in number with the plural subject “references.” *Choice B* is incorrect because the singular verb “has represented” doesn’t agree in number with the plural subject “references.” *Choice C* is incorrect because the singular verb “was representing” doesn’t agree in number with the plural subject “references.”

QUESTION 25

Choice B is the best answer. The convention being tested is the use of punctuation between titles and proper nouns. No punctuation is needed to set off the proper noun “Marie-Denise Villers” from the title that describes Villers, “little-known French portrait artist.”

Choice A is incorrect because no punctuation is needed. *Choice C* is incorrect because no punctuation is needed. *Choice D* is incorrect because no punctuation is needed.

QUESTION 26

Choice B is the best answer. The convention being tested is the punctuation of supplementary elements within a sentence. The comma after “described” separates the first supplementary element (“both of interviewees and the items they described”) from the second supplementary element (“from hair to grass to sculptures”). Furthermore, the dash after “sculptures” pairs with the dash after “photographs” to separate these two supplementary elements from the rest of the sentence. The pair of dashes, which operate at a higher organizing level than the comma, indicates that the elements between the dashes function together—in this case, the second supplement (“from...sculptures”) describes the range of items mentioned in the first supplement—and could be removed without affecting the grammatical coherence of the sentence.

Choice A is incorrect because it fails to appropriately punctuate the supplementary elements in the sentence. A dash is needed after “sculptures” to separate the supplementary elements (“both...sculptures”) from the rest of the sentence. *Choice C* is incorrect because it fails to appropriately punctuate the supplementary elements in the sentence. The two supplementary elements “both...described” and “from...sculptures” function together to describe the photographs, and placing a dash between them would make this relationship less clear, suggesting that the supplement “both...described” is a standalone element that could be removed without affecting the grammatical coherence of the sentence, which isn’t the case. *Choice D* is incorrect because it fails to appropriately punctuate the supplementary elements in the sentence. A colon isn’t conventionally used in this way to separate a supplementary element (“from hair to grass to sculptures”) from the noun phrase it is modifying (“items they described”). Additionally, a dash is needed after “sculptures” to separate the supplementary elements (“both...sculptures”) from the rest of the sentence.

QUESTION 27

Choice D is the best answer. “As a result” logically signals that the information in this sentence—the vessel turning black—is a result of the heating technique discussed in the previous sentence.

Choice A is incorrect because “on the contrary” illogically signals that the information in this sentence directly opposes the heating technique in the previous sentence. Instead, the vessel turns black as a result of that technique. *Choice B* is incorrect because “for example” illogically signals that the information in this sentence is an example of the heating technique in the previous sentence. Instead, the vessel turns black as a result of that technique. *Choice C* is incorrect because “previously” illogically signals that the information in this sentence occurs earlier in a chronological series of events than does the heating technique discussed in the first two sentences. Instead, the vessel turns black as a result of that technique.

QUESTION 28

Choice D is the best answer. “Though” logically signals that the claim in the sentence—that Morton’s improvisational skills helped shape jazz as a genre during its early years (“No one can deny” it)—is true despite the previous information about Morton’s exaggerated claim to have invented jazz.

Choice A is incorrect because “therefore” illogically signals that the claim in the sentence is a result of the previous information about Morton’s claim to have invented jazz. Instead, the sentence states that Morton helped to shape jazz—even if his claim was an exaggeration. *Choice B* is incorrect because “in the second place” illogically signals that the claim in the sentence is a second, separate point in addition to Morton’s claim to have invented jazz. Instead, the sentence states that Morton helped to shape jazz—even if his claim was an exaggeration. *Choice C* is incorrect because “in other words” illogically signals that the claim in the sentence is merely a paraphrase or restatement of the previous information about Morton’s claim to have invented jazz. Instead, the sentence states that Morton helped to shape jazz—even if his claim was an exaggeration.

QUESTION 29

Choice B is the best answer. “Conversely” logically signals that the information in this sentence—that countries with proportional-representation electoral systems tend toward multi-partyism—contrasts with the previous information about countries with single-ballot majoritarian elections, which tend to have two-party systems.

Choice A is incorrect because “subsequently” illogically signals that the information in this sentence about countries with proportional-representation electoral systems occurs later in a chronological sequence of events than the information in the previous sentence. Instead, it contrasts with the previous information. *Choice C* is incorrect because “for instance” illogically signals that the information in this sentence about countries with proportional-representation electoral systems is an example supporting the previous statement about

countries with single-ballot majoritarian elections. Instead, it contrasts with the previous statement. *Choice D* is incorrect because “in other words” illogically signals that the information in this sentence about countries with proportional-representation electoral systems is a paraphrase or restatement of the previous information about countries with single-ballot majoritarian elections. Instead, it contrasts with the previous information.

QUESTION 30

Choice D is the best answer. “Hence” logically signals that the information in this sentence about turtle shells—that people incorrectly assume they are exoskeletons—is a consequence of the shells appearing external to the animal.

Choice A is incorrect because “that being said” illogically signals that this sentence qualifies or contrasts with the previous information about turtle shells appearing external to the animal. Instead, it presents a consequence of that information. *Choice B* is incorrect because “however” illogically signals that this sentence contrasts with the previous information about turtle shells appearing external to the animal. Instead, it presents a consequence of that information. *Choice C* is incorrect because “for instance” illogically signals that this sentence provides an example supporting the previous information about turtle shells appearing external to the animal. Instead, it presents a consequence of that information.

QUESTION 31

Choice A is the best answer. The sentence identifies the novel’s real author, explaining that Mary Ann Evans published the novel under the pseudonym of George Eliot.

Choice B is incorrect. The sentence explains that George Eliot was assumed to be a pseudonym; it doesn’t identify the novel’s real author. *Choice C* is incorrect. The sentence specifies the pseudonym used on the novel’s title page; it doesn’t identify the novel’s real author. *Choice D* is incorrect. While the sentence indicates that the novel’s real author used a pseudonym, it doesn’t identify that author as Mary Ann Evans.

QUESTION 32

Choice C is the best answer. The sentence specifies how the salt in a freeze-thaw battery enables energy storage, explaining that energy stops flowing and can be stored when the salt solidifies at room temperature.

Choice A is incorrect. The sentence explains some properties of molten salt; it doesn’t specify how that salt enables energy storage. *Choice B* is incorrect. The sentence indicates how the energy in a freeze-thaw battery can be released; it doesn’t specify how the salt in the battery enables energy storage. *Choice D* is incorrect. The sentence specifies how much charge the freeze-thaw battery retains when storing energy; it doesn’t specify how the salt in the battery enables energy storage.

QUESTION 33

Choice D is the best answer. The sentence effectively indicates the California red-legged frog's FWS classification category, noting that the FWS classifies the frog as threatened, a classification given to species that are likely to soon become endangered.

Choice A is incorrect. The sentence specifies the classification categories of the FWS list; it doesn't indicate the classification category of the California red-legged frog. *Choice B* is incorrect. While the sentence does note that the California red-legged frog is among the species classified by the FWS, it doesn't indicate what classification category the California red-legged frog occupies.

Choice C is incorrect. While the sentence does appear to indicate the California red-legged frog's FWS classification category, the sentence is factually incorrect and therefore ineffective; the frog's classification category is threatened, not endangered.

Reading and Writing

Module 2

(33 questions)

QUESTION 1

Choice C is the best answer because as used in the text “reaching across to” most nearly means stretching toward. The text begins with Mrs. Wilkins stating that she wants to have one of the oranges that she’s admiring. The text then indicates that Mrs. Wilkins, staying where she is, holds out a big orange to her friend. This context suggests that when the text describes Mrs. Wilkins as reaching across to the bowl of oranges, it means that she is stretching toward the bowl.

Choice A is incorrect because the text never suggests that Mrs. Wilkins is joining with, or becoming attached to, the bowl of oranges. Rather, the text indicates that she is stretching toward the bowl so she can pick out oranges for herself and her friend Rose to eat. *Choice B* is incorrect because the text never suggests that Mrs. Wilkins is gaining on, or overtaking in a competition or race, the bowl of oranges. The text suggests instead that the bowl is sitting still on a surface and that Mrs. Wilkins is extending her arm toward the bowl so she can pick out oranges for herself and her friend Rose to eat. *Choice D* is incorrect because the text doesn’t indicate that Mrs. Wilkins is arriving at the bowl of oranges. In fact, the text states that Mrs. Wilkins stays where she is when reaching across to the bowl, meaning that she remains at a distance from it.

QUESTION 2

Choice D is the best answer because it most logically completes the text’s discussion of the fossil deposit. In this context, “obtain” means gain or acquire. According to the text, a team of paleontologists has found fossils that are very well preserved. For this reason, the text suggests, the paleontologists have been able to gain detailed information from the fossils, such as the color patterns of the life forms that left them behind.

Choice A is incorrect because “occupy” means engage or inhabit, neither of which would make sense in context. It’s unclear what it would mean for detailed

information revealed by fossils to be engaged or inhabited. *Choice B* is incorrect because the text gives no indication that the paleontologists wanted to “hoard,” or collect and hide, the detailed information revealed by the well-preserved fossils. *Choice C* is incorrect because the text gives no indication that the paleontologists wanted to “reserve,” or withhold, the detailed information revealed by the well-preserved fossils.

QUESTION 3

Choice A is the best answer because it most logically completes the text’s discussion of how the flow of information between two regions of the brain may affect the ease of people’s decision making. In this context, “reduced” means decreased. The text presents the finding from a team of neuroeconomists that decision making may be connected to communication between the prefrontal cortex and the parietal cortex. In presenting this finding, the text suggests a contrast between people who tend to be more decisive and people who make decisions more slowly. According to the text, people tend to be more decisive when the flow of information between the two brain regions is intensified, or strengthened. On the other hand, this context suggests that people make choices more slowly when the flow of information between the two brain regions is decreased.

Choice B is incorrect because “evaluated” means assessed, which wouldn’t make sense in context. According to the text, people tend to be more decisive when the flow of information between two brain regions is intensified, or strengthened. This suggests that people’s ease of decision making varies based on the rate of information traveling between the regions, not based on an effort to assess the information. *Choice C* is incorrect because “determined” means judged or influenced, neither of which would make sense in context. According to the text, people tend to be more decisive when the flow of information between two brain regions is intensified, or strengthened. This suggests that people’s ease of decision making varies based on the rate of information traveling between the regions, not based on an effort to judge or influence the information. *Choice D* is incorrect because “acquired” means developed or attained, neither of which would make sense in context. According to the text, people tend to be more decisive when the flow of information between two brain regions is intensified, or strengthened. This suggests that people’s ease of decision making varies based on the rate of information traveling between the regions, not based on the development or attainment of the information.

QUESTION 4

Choice A is the best answer because it most logically completes the text’s discussion of the significance of the War of 1812 in British historical memory. In this context, “tenuous” means vulnerable or uncertain. The text indicates that the War of 1812 was both smaller, and less prominent, than the conflict with France, and resulted in no significant geopolitical changes. These details imply that the War of 1812 is less likely than other British historical events to be remembered, giving the War of 1812 a tenuous place in British historical memory.

Choice B is incorrect because in this context “enduring” would mean lasting or durable, but the text describes the War of 1812 as being overshadowed by, and smaller than, the simultaneous conflict with France. This seems to conflict with the notion that the War of 1812 has an enduring place in British historical memory.

Choice C is incorrect because in this context “contentious” would mean likely to cause disagreement, and while there likely are contentious issues related to the War of 1812, nothing in the text discusses or implies any such disagreement.

Choice D is incorrect because in this context “conspicuous” would mean obvious, but the text describes the War of 1812 as being overshadowed by, and smaller than, the simultaneous conflict with France. Rather than suggesting that the War of 1812 has a conspicuous place in British historical memory, these descriptions suggest that its place is not particularly obvious.

QUESTION 5

Choice C is the best answer because it most logically completes the text’s discussion of Minoan bull-leaping rituals. In this context, “defend” means support in the face of argument. The overall focus of the text is on the difficulty of determining what bull-leaping rituals meant to the Minoans, about whom, the text indicates, we know very little. The text states that because of this scarcity of information, assertions about the meaning of the rituals, which took place a very long time ago (in the second millennium BCE), are highly likely to be based on speculation and guesswork. This context suggests that claims about the meaning of the rituals are difficult to successfully support, or defend.

Choice A is incorrect because “imagine” in this context would mean form a mental image of something. Although it’s possible to imagine what Minoan bull-leaping rituals might have looked like, the focus of the text isn’t on how the rituals looked but rather on claims about them, which the text suggests are difficult to support because very little is known about the Minoans. *Choice B* is incorrect because “summarize” in this context would mean recap or outline, neither of which makes sense. The text indicates that claims about the significance of Minoan bull-leaping rituals will inevitably rely on speculation and guesswork because very little is known about the Minoans. This suggests that claims about the Minoan rituals are difficult to support in the face of argument, not that they’re difficult to recap or outline. *Choice D* is incorrect because “adjust” in this context would mean modify or correct. Although a claim about a ritual’s meaning could be modified or corrected based on newly discovered evidence, the text doesn’t focus on any specific claims made about the significance of Minoan bull-leaping rituals. Rather, the text focuses on the feasibility of making valid claims about the rituals in general, suggesting that the scarcity of information about the Minoans makes it difficult to support any claims about the rituals.

QUESTION 6

Choice C is the best answer because it most accurately describes how the underlined sentence functions in the text as a whole. In the text, Harris tells stories about his previous boat trip across the English Channel, when conditions were so rough that others onboard became seasick. According to the text, Harris’s accounts vary somewhat but generally involve him and only one other

man not growing ill. The underlined sentence then adds that if it was “not [Harris] and another man” who didn’t develop seasickness, “then it was [Harris] by himself.” That is, some versions of the story even involve Harris being the only person onboard who resisted seasickness. Therefore, the underlined sentence emphasizes that Harris always boasts about his own constitution, or physical well-being, when speaking of a previous boat trip.

Choice A is incorrect because the text doesn’t portray Harris as being eager to resume traveling; instead, it shows Harris boasting of how he didn’t become seasick on a previous boat trip when most or all of the other people onboard did. *Choice B* is incorrect because there’s nothing in the text to suggest that Harris felt excluded from activities during an earlier boat trip. The text suggests that Harris experienced isolation during that trip because others onboard had grown ill, not because Harris had wanted to join certain activities but felt left out. *Choice D* is incorrect because the text doesn’t portray Harris as either enjoying company or claiming to prefer solitude. The text suggests that Harris experienced some degree of isolation during a previous boat trip, but the reason provided by the text has nothing to do with a preference for either solitude or the opposite; rather, the reason, according to Harris, is that most or all of the other people onboard were sick.

QUESTION 7

Choice B is the best answer because it best describes how the underlined sentence functions in the text as a whole. The underlined sentence explains that contrary to what several studies would suggest, recent European governments suffered electorally after the launch of fiscal austerity programs. The text goes on to indicate that the researchers generated their findings from data that didn’t reveal the true political risk of austerity measures because the data were based on cases in which governments had set austerity programs to take effect after the next election, a practice the European governments that recently suffered electorally didn’t adhere to, thus introducing a complicating factor resulting in a conflict between the research findings and recent events.

Choice A is incorrect because the underlined sentence doesn’t indicate that the discrepancy described in the text is between observations made in study settings and observations made in real-world settings. Rather, the underlined sentence indicates that the outcome of recent events is contrary to what would be expected based on the findings of several studies. Additionally, there is nothing in the text to suggest that the studies mentioned did not use real-world data; instead, the text indicates that the data used was generated under potentially different circumstances than the recent events. *Choice C* is incorrect because the underlined sentence doesn’t present a long-standing divergence in research findings but rather a discrepancy between past research findings and recent events that the text goes on to attribute to researchers’ use of data that didn’t reveal the true political risk of austerity measures. *Choice D* is incorrect because while the underlined sentence notes that there have been some recent exceptions to a general pattern observed in several research studies, it does not go on to attribute this exception to the researchers underestimating inconsistencies in the data. Rather, the text goes on to attribute this to a

circumstance (fiscal austerity measures being implemented before an election rather than after) which adds a complicating factor into the data not accounted for in past studies.

QUESTION 8

Choice A is the best answer because it most accurately states how the author of Text 2 would most likely respond to the argument presented in Text 1. In arguing that graphic novels shouldn't be classified as literature and are more comparable to film, Text 1 claims that language plays a relatively limited role in graphic novels: images, not language, are the primary means by which graphic novels tell their stories, and language is used "only sparingly"—that is, comparatively very little—in the form of captions and dialogue. However, the author of Text 2 asserts that language in graphic novels is as equally vital for conveying meaning as images are, since without captions and dialogue, readers wouldn't be able to make sense of the narrative. Moreover, the author of Text 2 argues that there are many graphic novels that are "beautifully written" and whose use of language is as accomplished as any standard novel. Because Text 1 argues that language is subordinate to images in graphic novels, whereas Text 2 highlights how language is an essential component of a graphic novel's storytelling, it can reasonably be inferred that the author of Text 2 would say that language plays a more important role in graphic novels than the author of Text 1 recognizes.

Choice B is incorrect. Although Text 1 indicates that graphic novels shouldn't be classified as literature based on their limited use of language, there's no indication that the author of Text 1 considers this limited use of language as a flaw, just that it doesn't fit the particular definition of "literature" proposed in the text. Even if Text 1 had suggested that their use of language was a common flaw of graphic novels, the author of Text 2 emphasizes how many graphic novels are "beautifully written," and would therefore say that their use of language is exemplary, not that it is flawed. **Choice C** is incorrect because Text 1 doesn't claim that the story lines of graphic novels are generally relatively easy to understand; in addition, Text 2 argues that given their dependence on the interaction of image and text, the stories of graphic novels would be incomprehensible if their captions and dialogue were removed, not that the story lines of some graphic novels are more difficult to understand than Text 1 acknowledges. **Choice D** is incorrect because the author of Text 1 doesn't imply that graphic novels aren't well crafted, only that they use language too sparingly to fit the definition of "literature," and that their use of images to convey stories makes them more comparable to film than to literature. Even if the author of Text 1 had implied that most graphic novels aren't well crafted, Text 2 refers to the fact that many graphic novels are as beautifully written—that is, well crafted—as many standard novels; thus, it wouldn't be accurate to say that the author of Text 2 would agree with the author of Text 1 that most graphic novels aren't well crafted.

QUESTION 9

Choice A is the best answer because it most accurately states what is happening in the text. The narrator notes that Lutie thinks the street looks nice in the light of the sunset. The narrator goes on to describe what Lutie can see in the street: children playing ball or tag and girls skipping rope. Thus, what is happening in the text is that Lutie is observing the appearance of the street at a particular time of day and the events occurring on it.

Choice B is incorrect. Although Lutie is observing children playing games on her street, the text doesn't suggest that she is annoyed by the noise of the games. Instead, the text says that Lutie thinks the street looks nice in the light of the sunset. *Choice C* is incorrect. Although Lutie is observing children playing games on her street, the text doesn't suggest that she is puzzled by the rules of the games. *Choice D* is incorrect because there is no evidence in the text that Lutie doesn't want to interact with her neighbors or that she is in her apartment alone. All the text indicates about Lutie is that she is watching the events on the street and thinks the street looks nice in the light of the sunset.

QUESTION 10

Choice D is the best answer because it presents a statement about critics' skepticism of Bosco Verticale that is supported by the text. The text states that Boeri's design for Bosco Verticale features hundreds of trees on balconies and is intended to serve as a model for promoting urban biodiversity. But the text goes on to state that some critics believe that it is too early to determine if the trees planted on Bosco Verticale can thrive there. Therefore, according to the text, critics are skeptical of the concept behind Bosco Verticale because it is unclear whether Bosco Verticale can support the plant life included in its design.

Choice A is incorrect. Although the text states that one of Boeri's goals was for Bosco Verticale to serve as a model for promoting biodiversity in architecture, which suggests that Boeri would likely support the idea of reproducing the same concept in other locations, the text does not discuss whether it is feasible to adapt the design to locations other than Milan. Instead, the text describes critics' concerns that the plant life that currently exists on Bosco Verticale might not thrive in its current setting. *Choice B* is incorrect. Although the text states that one of Boeri's goals in creating Bosco Verticale was to promote biodiversity, which implies a goal of including varied plant life in the design, it does not mention whether the hundreds of trees that were planted on its balconies failed to meet this goal. Rather, the text states that some critics are concerned that the trees on Bosco Verticale's balconies may not thrive in this setting. *Choice C* is incorrect because the text does not mention how Bosco Verticale was constructed, let alone how environmentally destructive its construction may have been relative to the construction of more conventional buildings.

QUESTION 11

Choice A is the best answer because it most accurately states the main idea of the text. The text begins by explaining that many literary theorists rely on the concepts of *fabula* (a narrative's content) and *syuzhet* (a narrative's arrangement and presentation of events) and illustrates these concepts by explaining how they can be applied to the film *The Godfather Part II*. The text then discusses how Mikhail Bakhtin, a literary theorist, argued that *fabula* and *syuzhet* can't fully describe a narrative, since systematic categorizations such as these fail to account for all the ways in which interactions between the artist, the work, and the audience produce meaning. Thus, the main idea is that Bakhtin argued that there are important characteristics of narratives that are not fully encompassed by two concepts that other theorists have used to analyze narratives.

Choice B is incorrect because according to the text, Mikhail Bakhtin believed that meaning was created through the interactions of the artist, narrative, and audience, not simply through the interaction between the audience and narrative; moreover, the text doesn't address whether Bakhtin focused on the ways in which different people interpret narratives differently. **Choice C** is incorrect. Although the text implies that the storytelling methods used in *The Godfather Part II* are complicated, it discusses the film only to illustrate how the concepts of *fabula* and *syuzhet* may be applied to a narrative. The film's storytelling methods aren't the primary focus of the text. **Choice D** is incorrect. The text discusses *The Godfather Part II*, whose narrative doesn't adhere to a single chronological order, only to illustrate the concepts of *fabula* (a narrative's content) and *syuzhet* (narrative's arrangement and presentation of events). The primary focus of this text isn't the structure of this film or of other narratives that are told out of chronological order; moreover, the text doesn't consider whether such structures make it harder for audiences to understand narratives.

QUESTION 12

Choice D is the best answer because it effectively uses data from the graph to support the underlined claim that more medicine and health topics were submitted to a national science fair in 2019 than in any of the other years shown. This choice indicates that the approximately 285 medicine and health topics submitted in 2019 are more than the number of medicine and health submissions in any other year shown—a description that is supported by information in the graph, which shows that medicine and health topic submissions were below 250 in 2016, 2017, and 2018, but above 250 (approximately 285 submissions) in 2019.

Choice A is incorrect because it doesn't support the underlined claim or accurately reflect the information in the graph. This choice refers to 2016 and discusses cellular and molecular biology and animal science, whereas the underlined claim refers to 2019 and discusses medicine and health. Moreover, the claim that in 2016 there were equal numbers of submissions in the cellular and molecular biology category and in the animal science category is contradicted by the graph, which shows approximately 200 submissions and 50 submissions, respectively, for those categories in 2016. **Choice B** is incorrect because it doesn't accurately reflect the information in the graph. This choice claims that in

2019 there were more physics and space submissions than there were medicine and health submissions, but the graph shows that there were approximately 100 space and science submissions that year and approximately 285 medicine and health submissions. *Choice C* is incorrect because it doesn't accurately reflect the information in the graph or support the underlined claim about medicine and health research topics. This choice claims that there were approximately 95 submissions for the animal science category in 2016, but the graph shows that the number was closer to 50 in 2016.

QUESTION 13

Choice D is the best answer because this quotation would best support the student's assertion that the escape of transgenic fish from Brazilian fish farms into the wild may have significant negative long-term ecological effects. The text explains that transgenic fish have DNA that includes genetic material from other species, that some transgenic fish have genes from jellyfish that make them glow in the dark, and that glow-in-the-dark transgenic fish can now be found in the wild in Brazilian creeks. The quotation indicates why the escape of these fish may have negative long-term ecological effects: glow-in-the-dark transgenic fish might introduce fluorescence into wild fish populations by breeding with wild fish, causing wild fish to glow in the dark and thereby allowing predators to prey on them much more easily.

Choice A is incorrect because this quotation doesn't mention any negative effects of the introduction of fluorescent transgenic fish into the wild. The quotation merely compares the ratio of females to males at two sites in the wild where transgenic fish have been observed. *Choice B* is incorrect because this quotation doesn't support the idea that the escape of fluorescent transgenic fish from Brazilian fish farms may have significant negative long-term ecological effects. Rather, the quotation suggests that more research is needed to understand the effects. *Choice C* is incorrect because this quotation supports the idea that transgenic fish may be present in more ecosystems than has been observed; it doesn't address whether the presence of fluorescent transgenic fish affects these ecosystems.

QUESTION 14

Choice D is the best answer because it describes data from the graph that support Ibáñez and colleagues' conclusion that increasing anthropogenic nitrogen deposition can compensate for the negative effect of climate change on tree growth if that change is moderate but not if it's extreme. The bar graph shows the growth of sugar maple trees with and without nitrogen fertilization under three different climate-change scenarios: current conditions, a moderate change, and an extreme change. According to the graph, radial growth without nitrogen fertilization is projected to be about 0.16 centimeters (cm) under current conditions, 0.15 cm under a moderate change, and 0.04 cm under an extreme change. The graph also shows that with nitrogen fertilization, growth is projected to be about 0.18 centimeters under a moderate change but only about 0.06 centimeters under an extreme change. Thus, the data in the graph support the researchers' conclusion by showing greater growth for a moderate change using nitrogen fertilization than they do either under current conditions without nitrogen fertilization or under an extreme change with nitrogen fertilization.

Choice A is incorrect. Although it accurately represents the data in the graph, this fact pattern doesn't support Ibáñez and colleagues' conclusion that the decline in radial growth due to climate change will be partly offset by higher levels of anthropogenic nitrogen, but only if change to the climate is moderate and not if it's extreme. To support this would require comparing radial growth without nitrogen fertilization under current climate conditions to the growth with nitrogen fertilization under both moderate and extreme changes. This choice mentions only growth with nitrogen fertilization under current climate conditions and moderate change and growth without nitrogen fertilization under an extreme change, which don't provide a basis to determine whether higher nitrogen in the future will be able to offset reduced growth due to climate change. *Choice B* is incorrect. Although it accurately represents the data in the graph, this fact pattern doesn't support Ibáñez and colleagues' conclusion that the decline in radial growth due to climate change will be partly offset by higher levels of atmospheric nitrogen, but only if change to the climate is moderate and not if it's extreme. The support needed would compare radial growth under current climate conditions without nitrogen fertilization to the growth with nitrogen fertilization under moderate and extreme changes. This choice mentions only growth without nitrogen fertilization under current conditions and moderate change and growth with nitrogen fertilization under extreme change, which don't provide a basis to determine whether higher nitrogen in the future will be able to offset reduced growth due to climate change. *Choice C* is incorrect. Although it accurately represents the data in the graph, this fact pattern doesn't support Ibáñez and colleagues' conclusion that the decline in radial growth due to climate change will be partly offset by higher levels of atmospheric nitrogen, but only if change to the climate is moderate and not if it's extreme. The support needed would compare radial growth without adding nitrogen under current climate conditions to the growth with nitrogen fertilization under moderate and extreme changes. This choice mentions only the growth with and without nitrogen fertilization under moderate climate change and growth without nitrogen fertilization under extreme change, which don't provide a basis to determine whether higher nitrogen in the future will be able to offset reduced growth due to climate change.

QUESTION 15

Choice D is the best answer because it most effectively uses a quotation from "Poetry" to illustrate the claim that the poem highlights an ambivalence, or a conflicted attitude, toward poetry. In the quotation, the speaker suggests that one might read poetry with "contempt," or disdain, for it, but even with this negative attitude one will find "a place for the genuine." Because the quotation expresses conflicting attitudes toward poetry, it effectively illustrates the speaker's ambivalence in discussing the merits and displeasure of reading poetry.

Choice A is incorrect because it doesn't mention poetry or show ambivalence. *Choice B* is incorrect. Although the idea of "half poets" may seem to relate to ambivalence, the speaker mentions only negative attitudes toward certain works and the quotation therefore lacks a contrasting positive or neutral attitude that would be needed to indicate ambivalence. *Choice C* is incorrect because the speaker mentions only negative attitudes toward certain works and the quotation therefore lacks a contrasting positive or neutral attitude that would be needed to indicate ambivalence.

QUESTION 16

Choice B is the best answer because it describes data from the table that support Persad and her colleagues' conclusion. The text explains that, according to some climate models, precipitation in the western United States will become concentrated into fewer, more intense rain and snow events. According to the text, Persad and her colleagues concluded that more irrigation will consequently be needed but that the change in irrigation output will be highly sensitive to, or greatly affected by, the baseline concentration of precipitation in an area. This conclusion is supported by data from the researchers' simulations of changes in annual irrigation output in two different scenarios—one in which an area's annual precipitation is already somewhat concentrated and one in which its annual precipitation is evenly distributed. The table shows that if baseline precipitation is somewhat concentrated, water use for irrigation will increase only slightly, whereas if baseline precipitation is evenly distributed, water use for irrigation will increase much more—9.0% for surface water and 7.9% for groundwater. This difference illustrates the researchers' conclusion that the amount of additional water needed for irrigation will vary greatly depending on how concentrated or spread out the annual precipitation in an area already is.

Choice A is incorrect because it compares changes in the amount of water being used for irrigation to changes in the amount of water entering aquifers. Persad and her colleagues' conclusion doesn't focus on changes to the amount of water entering aquifers; rather, the researchers' conclusion focuses on changes to irrigation output relative to how concentrated or spread out the annual precipitation in an area is. *Choice C* is incorrect because it supports only part of Persad and her colleagues' conclusion. According to the text, the researchers concluded that the concentration of precipitation into fewer events will trigger more irrigation but that this change in irrigation output will be highly sensitive to an area's baseline concentration of annual precipitation. The data in this choice support the idea that more irrigation will be needed, but to support the rest of the researchers' conclusion, additional data from the table are required to show that the increases in water use for irrigation will vary depending on how concentrated or spread out the annual precipitation in an area already is. *Choice D* is incorrect because data in the table indicate no declines in water use for irrigation, showing only increases in the form of positive values.

QUESTION 17

Choice A is the best answer because it most logically completes the text's discussion of English dialects spoken in Scotland and the Upland South. The text indicates that these dialects share a feature: putting emphasis on the "r" sound when it appears in certain positions in words. The text goes on to state that records indicate the Upland South was colonized largely by people of Scottish ancestry. It is reasonable to assume that the English dialects spoken by these colonizers were influenced by the English dialects spoken by their ancestors in Scotland. It follows, then, that the emphasis on the "r" sound in the dialects in Scotland carried over into the Upland South dialects as they developed—that is, that the Upland South dialects likely acquired it from dialects spoken in Scotland.

Choice B is incorrect because the text suggests that Scottish ancestry explains the origin of the emphasis on the “r” sound in English dialects spoken in the Upland South, since that linguistic feature is also found in dialects spoken in Scotland; the text doesn’t address any other dialects or suggest that the feature will spread elsewhere. *Choice C* is incorrect because the text indicates that many Upland South colonizers were the descendants of Scottish people, suggesting that the English dialects spoken by these colonizers had been influenced by the English dialects spoken by the colonizers’ ancestors in Scotland and had acquired their emphasis on the “r” sound from those ancestors’ dialects—not the other way around. *Choice D* is incorrect because the text indicates that the emphasis on the “r” sound is part of English dialects spoken in the Upland South today, which almost certainly wouldn’t be the case if people from Scotland, who were the main colonizers of the Upland South, had eliminated that linguistic feature from their dialects.

QUESTION 18

Choice A is the best answer. The convention being tested is the use of verb forms within a sentence. A main clause requires a finite (tensed) verb to perform the action of the subject (in this case, Nery and her colleagues), and this choice supplies the finite past tense verb “published” to indicate that these biologists shared their findings about changes in whale genes associated with body size.

Choice B is incorrect because it results in an ungrammatical sentence. The nonfinite participle “publishing” doesn’t supply the main clause with a finite verb. *Choice C* is incorrect because it results in an ungrammatical sentence. The nonfinite participle “having published” doesn’t supply the main clause with a finite verb. *Choice D* is incorrect because it results in an ungrammatical sentence. The nonfinite to-infinitive “to publish” doesn’t supply the main clause with a finite verb.

QUESTION 19

Choice B is the best answer. The convention being tested is punctuation use between a subject and a verb. When, as in this case, a subject (“the strings inside the instrument”) is immediately followed by a main verb (“are plucked”), no punctuation is needed.

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

QUESTION 20

Choice A is the best answer. The convention being tested is pronoun-antecedent agreement. The plural pronoun “them” agrees in number with the plural antecedent “utensils.”

Choice B is incorrect because the singular pronoun “this” doesn’t agree in number with the plural antecedent “utensils.” *Choice C* is incorrect because the singular pronoun “that” doesn’t agree in number with the plural antecedent “utensils.”

Choice D is incorrect because the singular pronoun “it” doesn’t agree in number with the plural antecedent “utensils.”

QUESTION 21

Choice C is the best answer. The convention being tested is the punctuation of a supplementary element within a sentence. The comma after “sisters” pairs with the comma after “*Butterflies*” to separate the supplementary element “a fictionalized account of the lives of the Mirabal sisters” from the rest of the sentence. This supplementary element functions to describe the novel *In the Time of the Butterflies*, and the pair of commas indicates that this element could be removed without affecting the grammatical coherence of the sentence.

Choice A is incorrect because a comma and conjunction can’t be used in this way to separate the supplementary element from the rest of the sentence.

Choice B is incorrect because it fails to use appropriate punctuation to separate the supplementary element from the rest of the sentence. *Choice D* is incorrect because it fails to use appropriate punctuation to separate the supplementary element from the rest of the sentence.

QUESTION 22

Choice B is the best answer. The convention being tested is punctuation between main clauses and a supplementary element. This choice correctly uses a comma to mark the boundary between the main clause (“The vessel took six days to dislodge”) and the supplementary element (“in part due to its sheer size”) that provides additional information on why the vessel was difficult to dislodge. Additionally, this choice correctly uses a colon to introduce another main clause that describes the vessel’s size (“it’s as heavy as two thousand blue whales when fully loaded”).

Choice A is incorrect because it results in a comma splice. A comma can’t be used in this way to mark the boundary between two main clauses (“The vessel...size” and “it’s...loaded”). Additionally, it fails to mark the boundary between the main clause (“The vessel took six days to dislodge”) and the supplementary element (“in part due to its sheer size”). *Choice C* is incorrect because it results in a comma splice. A comma can’t be used in this way to mark the boundary between two main clauses (“The vessel...size” and “it’s...loaded”). *Choice D* is incorrect because it results in a run-on sentence. The two main clauses (“The vessel...size” and “it’s...loaded”) are fused without punctuation and/or a conjunction.

QUESTION 23

Choice A is the best answer. The convention being tested is the use of punctuation around noun phrases. No punctuation is needed because the noun phrase “Tamatoa the crab” is a restrictive appositive, meaning that it provides essential identifying information about the noun phrase before it, “the character.” Additionally, no punctuation is needed between the noun phrase “the deep and humorous voice..crab” and the verb “belongs” that indicates whom the voice belongs to.

Choice B is incorrect because no punctuation is needed. *Choice C* is incorrect because no punctuation is needed. *Choice D* is incorrect because no punctuation is needed.

QUESTION 24

Choice C is the best answer. The convention being tested is subject-verb agreement. The plural verb “underlie” agrees in number with the plural subject “frameworks.”

Choice A is incorrect because the singular verb “underlies” doesn’t agree in number with the plural subject “frameworks.” *Choice B* is incorrect because the singular verb “is underlying” doesn’t agree in number with the plural subject “frameworks.” *Choice D* is incorrect because the singular verb “has been underlying” doesn’t agree in number with the plural subject “frameworks.”

QUESTION 25

Choice C is the best answer. The convention being tested is the use of verb forms within a sentence. This choice pairs the comma after “Serra” with the comma after “environment” and uses the nonfinite present participle “intending” to correctly form a supplementary phrase describing the reaction Serra intends his sculptures to provoke. This supplementary phrase appears between the noun phrase that it modifies (“American abstract artist Richard Serra”) and the finite present tense verb (“assembles”), which functions as the sentence’s main verb and describes what Serra does.

Choice A is incorrect because it results in an ungrammatical sentence. The finite present continuous tense verb “is intending” can’t be used in this way in conjunction with the finite present tense verb “assembles,” which already functions as the main verb in the sentence. *Choice B* is incorrect because it results in an ungrammatical sentence. The finite present tense verb “intends” can’t be used in this way to supplement the noun phrase “American abstract artist Richard Serra.” *Choice D* is incorrect because it results in an ungrammatical sentence. The finite present tense verb “intends” can’t be used in this way in conjunction with the finite present tense verb “assembles,” which already functions as the main verb in the sentence.

QUESTION 26

Choice B is the best answer. “Next” logically signals that the action in this sentence—the water spraying—is the next step in the resurfacing process, following the ice scraping mentioned in the previous sentence.

Choice A is incorrect because “for example” illogically signals that the action in this sentence is an example of the action in the previous sentence. Instead, the water spraying is the next step in a process that begins with the ice scraping. *Choice C* is incorrect because “similarly” illogically signals that the action in this sentence is similar to the action in the previous sentence. Instead, the water spraying is the next step in a process that begins with the ice scraping. *Choice D* is incorrect because “in contrast” illogically signals that the action in this sentence contrasts with the action in the previous sentence. Instead, the water spraying is the next step in a process that begins with the ice scraping.

QUESTION 27

Choice C is the best answer. “Later” logically signals that the information in the sentence—that in 2017 Gomez created a platform for others to share stories about their immigration experiences—occurs later in a chronological series of events than the previous information about Gomez winning his first storytelling competition in 2014.

Choice A is incorrect because “instead” illogically signals that Gomez created a platform for others to share stories about their immigration experiences as an alternative to winning his first storytelling competition. Rather, Gomez created the platform later—in a chronological series of events—than when he won the competition. *Choice B* is incorrect because “for example” illogically signals that the information about Gomez creating a platform for others to share stories exemplifies his winning his first storytelling competition. Rather, Gomez created the platform later—in a chronological series of events—than when he won the competition. *Choice D* is incorrect because “in other words” illogically signals that the information about Gomez creating a platform for others to share stories is merely a paraphrase or restatement of the previous information about Gomez winning his first storytelling competition. Rather, Gomez created the platform later—in a chronological series of events—than when he won the competition.

QUESTION 28

Choice D is the best answer. “For this reason” logically signals that the information that follows—that metrologists developed the SI based on unchanging values in nature—is a result of the previous claim that scientists rely on precise, unchanging standards of measurement to guarantee the validity of experimental results.

Choice A is incorrect because “in contrast” illogically signals that the information that follows contrasts with the previous claim that scientists rely on precise, unchanging standards of measurement. Instead, the information that metrologists developed the SI based on unchanging values in nature is a result of that claim. *Choice B* is incorrect because “regardless” illogically signals that the information that follows is true despite the previous claim that scientists rely on precise, unchanging standards of measure. Instead, the information that metrologists developed the SI based on unchanging values in nature is a result of that claim. *Choice C* is incorrect because “in addition” illogically signals that the information that follows is merely an additional fact related to the previous claim that scientists rely on precise, unchanging standards of measurement. Instead, the information that metrologists developed the SI based on unchanging values in nature is a result of that claim.

QUESTION 29

Choice D is the best answer. “Accordingly” logically signals that this sentence states a result or consequence of the previous information about the 2003 Human Genome Project. Taking into account an important lesson of the 2003 project (that a gene is affected by interactions with the protein products of other genes), research has begun to consider the human proteome instead of just the genome.

Choice A is incorrect because “in other words” illogically signals that the information in this sentence is a paraphrase or restatement of the previous information about the 2003 Human Genome Project. Instead, this sentence states a result or consequence of that information. *Choice B* is incorrect because “that said” illogically signals that the information in this sentence qualifies or contrasts with the previous information about the 2003 Human Genome Project. Instead, this sentence states a result or consequence of that information. *Choice C* is incorrect because “for example” illogically signals that this sentence provides an example supporting the previous information about the 2003 Human Genome Project. Instead, this sentence states a result or consequence of that information.

QUESTION 30

Choice A is the best answer. The sentence specifies when al-Biruni published his landmass theory, indicating that it was published in the year 1037 CE.

Choice B is incorrect. While the sentence notes that al-Biruni published a landmass theory, it doesn’t specify when the theory was published. *Choice C* is incorrect. The sentence identifies al-Biruni as a scholar of Earth’s physical features; it doesn’t specify when he published his landmass theory. *Choice D* is incorrect. The sentence describes al-Biruni’s landmass theory; it doesn’t specify when the theory was published.

QUESTION 31

Choice D is the best answer. The sentence emphasizes the mass of Sirius A, noting that it has a mass of 2.063 solar masses and that it is larger than the Sun.

Choice A is incorrect. The sentence makes a generalization about how the mass of stars can be measured; it doesn’t emphasize the mass of Sirius A. *Choice B* is incorrect. The sentence introduces solar masses as a unit of measurement; it doesn’t emphasize the mass of Sirius A. *Choice C* is incorrect. The sentence emphasizes the mass of Proxima Centauri, not the mass of Sirius A.

QUESTION 32

Choice D is the best answer. The sentence contrasts first-class levers and second-class levers, explaining that the fulcrum in a first-class lever is between the effort and the load, whereas in a second-class lever the load is between the effort and the fulcrum.

Choice A is incorrect. The sentence defines two terms associated with levers; it doesn’t contrast first-class levers and second-class levers. *Choice B* is incorrect. While the sentence seems to acknowledge a general difference in fulcrum and load locations between first-class and second-class levers, it does not specify what this difference is. Moreover, the sentence could be read as emphasizing a similarity—that in both types of levers, the fulcrum and load are in different locations. The sentence thus fails to effectively contrast the two types of levers. *Choice C* is incorrect. The sentence describes a similarity between first-class and second-class levers; it doesn’t contrast them.

QUESTION 33

Choice A is the best answer. The sentence emphasizes a similarity between P waves and S waves, noting that they both travel beneath Earth's surface, thereby causing the ground to move.

Choice B is incorrect. The sentence emphasizes a difference between P waves and S waves, noting that P waves travel faster than S waves; it doesn't emphasize a similarity between the two types of waves. **Choice C** is incorrect. The sentence emphasizes how P waves move; it doesn't emphasize a similarity between P waves and S waves. **Choice D** is incorrect. While the sentence acknowledges that P waves and S waves start at the same point, it doesn't emphasize a similarity; instead, the sentence emphasizes a difference between the two types of waves, noting that they behave very differently.

Math

Module 1 (27 questions)

QUESTION 1

Choice C is correct. The solution to the system of two equations corresponds to the point where the graphs of the equations intersect. The graphs of the linear equation and the nonlinear equation shown intersect at the point $(4, 5)$. Thus, the solution to the system is $(4, 5)$.

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 2

Choice B is correct. It's given that the film club has 90 members on the first day of a semester, and 10 new members join the film club each day after the first day of the semester. This means that after 4 days, 4×10 , or 40, new members will have joined the club. Adding 40 members to the original 90 club members yields 130 members. Thus, the film club will have 130 total members 4 days after the first day of the semester.

Choice A is incorrect. This is the number of members that will have joined the film club 4 days after the first day of the semester if 100 new members, not 10, join the film club each day. *Choice C* is incorrect. This is the number of members the film club will have 4 days after the first day of the semester if 1 new member, not 10, joins the film club each day. *Choice D* is incorrect. This is the number of members the film club has on the first day of the semester.

QUESTION 3

Choice D is correct. The y -intercept of a graph is the point where the graph intersects the y -axis. The graph of function f shown intersects the y -axis at the point $(0, 8)$. Therefore, the y -intercept of the graph of f is $(0, 8)$.

Choice A is incorrect. This is the point where the x -axis, not the graph of f , intersects the y -axis. *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 4

Choice B is correct. The second equation in the given system is $r = 3$.

Substituting 3 for r in the first equation in the given system yields $s + 7(3) = 27$, or $s + 21 = 27$. Subtracting 21 from both sides of this equation yields $s = 6$.

Therefore, the solution (r, s) to the given system of equations is $(3, 6)$.

Choice A is incorrect. This is the solution (s, r) , not (r, s) , to the given system of equations. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 5

Choice B is correct. The given values show that as x increases, $f(x)$ also increases, which means that f is an increasing function. Furthermore, $f(x)$ increases at a constant rate of 1 for each increase of x by 1. A function with a constant rate of change is linear. Thus, the function f can be described as an increasing linear function.

Choice A is incorrect. For a decreasing linear function, as x increases, $f(x)$ decreases rather than increases. *Choice C* is incorrect. For a decreasing exponential function, for each increase of x by 1, $f(x)$ decreases by a fixed percentage rather than increases at a constant rate. *Choice D* is incorrect. For an increasing exponential function, for each increase of x by 1, $f(x)$ increases by a fixed percentage rather than at a constant rate.

QUESTION 6

The correct answer is 4. A solution to a system of equations must satisfy each equation in the system. It follows that if (x, y) is a solution to the system, the point (x, y) lies on the graph in the xy -plane of each equation in the system. According to the graph, the point (x, y) that lies on the graph of each equation in the system is $(4, 1)$. Therefore, the solution to the system is $(4, 1)$. It follows that the value of x is 4.

QUESTION 7

The correct answer is 29. The range of a data set is the difference between its maximum value and its minimum value. For the data set shown, the maximum score is 52 and the minimum score is 23. The difference between those scores is $52 - 23$, or 29. Therefore, the range of the 7 scores shown is 29.

QUESTION 8

Choice C is correct. Vertical angles, or angles that are opposite each other when two lines intersect, are congruent. It's given that line k intersects line n . Based on the figure, the angle with measure x° and the angle with measure 145° are vertical angles. Therefore, the value of x is equal to 145.

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 9

Choice B is correct. It's given that the equation $x + y = 1,440$ represents the number of minutes of daylight, x , and the number of minutes of non-daylight, y , on a particular day in Oak Park, Illinois. It's also given that this day has 670 minutes of daylight. Substituting 670 for x in the equation $x + y = 1,440$ yields $670 + y = 1,440$. Subtracting 670 from both sides of this equation yields $y = 770$. Therefore, this day has 770 minutes of non-daylight.

Choice A is incorrect. This is the number of minutes of daylight, not non-daylight, on this day. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the total number of minutes of daylight and non-daylight.

QUESTION 10

Choice B is correct. It's given that from the sample of 20 employees at the company, 16 of the employees are enrolled in exactly three professional development courses this year. Since $\left(\frac{16}{20}\right)$ is equal to 0.80, or $\frac{80}{100}$, it follows that 80% of the employees in the sample are enrolled in exactly three professional development courses this year. Therefore, the best estimate for the percentage of employees at the company who are enrolled in exactly three professional development courses this year is 80%. It's given that there are a total of 400 employees at the company. Therefore, the best estimate of the number of employees at the company who are enrolled in exactly three professional development courses this year is $\left(\frac{80}{100}\right)(400)$, or 320.

Choice A is incorrect. This is the number of employees from the sample who aren't enrolled in exactly three professional development courses this year.

Choice C is incorrect. This is the number of employees who weren't selected for the sample. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 11

Choice C is correct. Dividing all terms in the given equation by 4 yields

$$\frac{4x}{4} - \frac{28}{4} = -\frac{24}{4}, \text{ or } x - 7 = -6. \text{ Therefore, the value of } x - 7 \text{ is } -6.$$

Choice A is incorrect. This is the value of $4x - 28$, not $x - 7$. *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 12

Choice D is correct. It's given that for a snowstorm in a certain town, the minimum rate of snowfall recorded was 0.6 inches per hour, the maximum rate of snowfall recorded was 1.8 inches per hour, and s represents a rate of snowfall, in inches per hour, recorded for this snowstorm. It follows that the inequality $0.6 \leq s \leq 1.8$ is true for all values of s .

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

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

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

QUESTION 13

The correct answer is 6. It's given that $y=4x$ and $y=x^2 - 12$. Since $y=4x$, substituting $4x$ for y in the second equation of the given system yields $4x=x^2 - 12$. Subtracting $4x$ from both sides of this equation yields $0=x^2 - 4x - 12$. This equation can be rewritten as $0=(x-6)(x+2)$. By the zero product property, $x-6=0$ or $x+2=0$. Adding 6 to both sides of the equation $x-6=0$ yields $x=6$. Subtracting 2 from both sides of the equation $x+2=0$ yields $x=-2$. Therefore, solutions to the given system of equations occur when $x=6$ and when $x=-2$. It's given that a solution to the given system of equations is (x, y) , where $x > 0$. Since 6 is greater than 0, it follows that the value of x is 6.

QUESTION 14

The correct answer is 4.51. It's given that the equation $4.51x + 6.07y = 896.86$ represents this situation, where x is the number of smaller containers sold, y is the number of larger containers sold, and 896.86 is the store's total sales, in dollars, of blueberries last month. Therefore, $4.51x$ represents the store's sales, in dollars, of smaller containers, and $6.07y$ represents the store's sales, in dollars, of larger containers. Since x is the number of smaller containers sold, the price, in dollars, of each smaller container is 4.51.

QUESTION 15

Choice C is correct. 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. It's given that a right circular cylinder has a height of 6 centimeters. Therefore, $h=6$. It's also given that the cylinder has a base diameter of 22 centimeters. The radius of a circle is half the diameter of the circle. Since the base of a right circular cylinder is a circle, it follows that the radius of the base of the right circular cylinder is $\frac{22}{2}$, or 11, centimeters. Therefore, $r=11$.

Substituting 11 for r and 6 for h in the formula $V=\pi r^2 h$ yields $V=\pi(11)^2(6)$, which is equivalent to $V=\pi(121)(6)$, or $V=726\pi$. Therefore, the volume, in cubic centimeters, of the cylinder is 726π .

Choice A is incorrect. This is the volume of a right circular cylinder that has a base diameter of $2\sqrt{22}$, not 22, centimeters and a height of 6 centimeters. *Choice B* is incorrect. This is the volume of a right circular cylinder that has a base diameter of $4\sqrt{11}$, not 22, centimeters and a height of 6 centimeters. *Choice D* is incorrect. This is the volume of a right circular cylinder that has a base diameter of 44, not 22, centimeters and a height of 6 centimeters.

QUESTION 16

Choice D is correct. It's given that the graph of the rational function f is shown, where $y = f(x)$ and $x \geq 0$. The graph shown passes through the point $(3, 3)$. It follows that when the value of x is 3, the value of $f(x)$ is 3. When the value of $f(x)$ is 3, the value of $f(x) + 5$ is $3 + 5$, or 8. Therefore, the graph of $y = f(x) + 5$ passes through the point $(3, 8)$. Of the given choices, choice D is the only graph that passes through the point $(3, 8)$ and is therefore the graph of $y = f(x) + 5$.

Choice A is incorrect. This is the graph of $y = f(x) - 5$, rather than $y = f(x) + 5$.

Choice B is incorrect. This is the graph of $y = \frac{f(x)}{5}$, rather than $y = f(x) + 5$.

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

QUESTION 17

Choice B is correct. It's given that at a particular track meet, the ratio of coaches to athletes is 1 to 26. If one number in a ratio is multiplied by a value, the other number must be multiplied by the same value in order to maintain the same ratio. If there are x coaches at the track meet, multiplying both numbers in the ratio by x yields 1(x) to 26(x), or x to 26 x . Therefore, the expression 26 x represents the number of athletes at the track meet.

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 D is correct. It's given that the equation $y - 5x = 6$ represents the relationship between the number of suits that Kaylani made, x , and the total length of fabric she purchased, y , in yards. Adding $5x$ to both sides of the given equation yields $y = 5x + 6$. Since Kaylani made x suits and used 5 yards of fabric to make each suit, the expression $5x$ represents the total amount of fabric she used to make the suits. Since y represents the total length of fabric Kaylani purchased, in yards, it follows from the equation $y = 5x + 6$ that Kaylani purchased $5x$ yards of fabric to make the suits, plus an additional 6 yards of fabric. Therefore, the best interpretation of 6 in this context is that Kaylani purchased 6 yards more fabric than she used to make the suits.

Choice A is incorrect. Kaylani made a total of x suits, not 6 suits. *Choice B* is incorrect. Kaylani purchased a total of y yards of fabric, not a total of 6 yards of fabric. *Choice C* is incorrect. Kaylani used a total of $5x$ yards of fabric to make the suits, not a total of 6 yards of fabric.

QUESTION 19

Choice A is correct. A trigonometric ratio can be found using the unit circle, that is, a circle with radius 1 unit. If a central angle of a unit circle in the xy -plane centered at the origin has its starting side on the positive x -axis and its terminal side intersects the circle at a point (x, y) , then the value of the tangent of the

central angle is equal to the y -coordinate divided by the x -coordinate. There are 2π radians in a circle. Dividing $\frac{92\pi}{3}$ by 2π yields $\frac{92}{6}$, which is equivalent to $15 + \frac{2}{3}$. It follows that on the unit circle centered at the origin in the xy -plane, the angle $\frac{92\pi}{3}$ is the result of 15 revolutions from its starting side on the positive x -axis followed by a rotation through $\frac{2\pi}{3}$ radians. Therefore, the angles $\frac{92\pi}{3}$ and $\frac{2\pi}{3}$ are coterminal angles and $\tan\left(\frac{92\pi}{3}\right)$ is equal to $\tan\left(\frac{2\pi}{3}\right)$. Since $\frac{2\pi}{3}$ is greater than $\frac{\pi}{2}$ and less than π , it follows that the terminal side of the angle is in quadrant II and forms an angle of $\frac{\pi}{3}$, or 60° , with the negative x -axis. Therefore, the terminal side of the angle intersects the unit circle at the point $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$. It follows that the value of $\tan\left(\frac{2\pi}{3}\right)$ is $\frac{\sqrt{3}}{-\frac{1}{2}}$, which is equivalent to $-\sqrt{3}$. Therefore, the value of $\tan\left(\frac{92\pi}{3}\right)$ is $-\sqrt{3}$.

Choice B is incorrect. This is the value of $\frac{1}{\tan\left(\frac{92\pi}{3}\right)}$, not $\tan\left(\frac{92\pi}{3}\right)$. **Choice C** is incorrect. This is the value of $\frac{1}{\tan\left(\frac{\pi}{3}\right)}$, not $\tan\left(\frac{92\pi}{3}\right)$. **Choice D** is incorrect. This is the value of $\tan\left(\frac{\pi}{3}\right)$, not $\tan\left(\frac{92\pi}{3}\right)$.

QUESTION 20

The correct answer is $\frac{11}{28}$. 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 the angle with measure x° is 11 units and the length of the hypotenuse is 28 units. Therefore, the value of $\cos x^\circ$ is $\frac{11}{28}$. Note that 11/28, .3928, .3929, 0.392, and 0.393 are examples of ways to enter a correct answer.

QUESTION 21

The correct answer is 336. By the zero product property, if $(x+14)(t-x)=0$, then $x+14=0$, which gives $x=-14$, or $(t-x)=0$, which gives $x=t$. Therefore, $g(x)=0$ when $x=-14$ and when $x=t$. Since the graph of $y=g(x)$ passes through the point $(24, 0)$, it follows that $g(24)=0$, so $t=24$. Substituting 24 for t in the equation $g(x)=(x+14)(t-x)$ yields $g(x)=(x+14)(24-x)$. The value of $g(0)$ can be calculated by substituting 0 for x in this equation, which yields $g(0)=(0+14)(24-0)$, or $g(0)=336$.

QUESTION 22

Choice B is correct. An equation of the form $(x-h)^2+(y-k)^2=r^2$, where h , k , and r are constants, represents a circle in the xy -plane with center (h, k) and radius r . Therefore, the circle represented by the given equation has center $(-4, 19)$ and radius 11. Since the center of the circle has an x -coordinate of -4 and the radius of the circle is 11, the least possible x -coordinate for any point on the circle is $-4 - 11$, or -15 . Similarly, the greatest possible x -coordinate for any point on the circle is $-4 + 11$, or 7 . Therefore, if the point (a, b) lies on the circle, it must be true that $-15 \leq a \leq 7$. Of the given choices, only -14 satisfies this inequality.

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 volume of a right rectangular prism can be represented by a function V that gives the volume of the prism, in cubic inches, in terms of the length of the prism's base. The volume of a right rectangular prism is equal to the area of its base times its height. It's given that the length of the prism's base is x inches, which is 7 inches more than the width of the prism's base. This means that the width of the prism's base is $x - 7$ inches. It follows that the area of the prism's base, in square inches, is $x(x - 7)$ and the volume, in cubic inches, of the prism is $x(x - 7)(9)$. Thus, the function V that gives the volume of this right rectangular prism, in cubic inches, in terms of the length of the prism's base, x , is $V(x) = 9x(x - 7)$.

Choice A is incorrect. This function would give the volume of the prism if the height were 9 inches more than the length of its base and the width of the base were 7 inches more than its length. *Choice B* is incorrect. This function would give the volume of the prism if the height were 9 inches more than the length of its base. *Choice C* is incorrect. This function would give the volume of the prism if the width of the base were 7 inches more than its length, rather than the length of the base being 7 inches more than its width.

QUESTION 24

Choice D is correct. A function of the form $f(x) = a(b)^x + c$, where $a < 0$ and $b > 1$, is a decreasing function. Both of the given functions are of this form; therefore, both are decreasing functions. If a function f is decreasing, as the value of x increases, the corresponding value of $f(x)$ decreases; therefore, the function doesn't have a minimum value. Thus, neither of the given functions has a minimum value.

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 25

Choice A is correct. It's given that the result of increasing the quantity x by 400% is 60. This can be written as $x + \left(\frac{400}{100}\right)x = 60$, which is equivalent to $x + 4x = 60$, or $5x = 60$. Dividing each side of this equation by 5 yields $x = 12$. Therefore, the value of x is 12.

Choice B is incorrect. The result of increasing the quantity 15 by 400% is 75, not 60. *Choice C* is incorrect. The result of increasing the quantity 240 by 400% is 1,200, not 60. *Choice D* is incorrect. The result of increasing the quantity 340 by 400% is 1,700, not 60.

QUESTION 26

Choice A is correct. It's given that the graph of $y=f(x)$ in the xy -plane passes through the points $(7, 0)$ and $(-3, 0)$. It follows that when the value of x is either 7 or -3 , the value of $f(x)$ is 0 . It's also given that the function f is defined by $f(x)=ax^2+bx+c$, where a , b , and c are constants. It follows that the function f is a quadratic function and, therefore, may be written in factored form as $f(x)=a(x-u)(x-v)$, where the value of $f(x)$ is 0 when x is either u or v . Since the value of $f(x)$ is 0 when the value of x is either 7 or -3 , and the value of $f(x)$ is 0 when the value of x is either u or v , it follows that u and v are equal to 7 and -3 . Substituting 7 for u and -3 for v in the equation $f(x)=a(x-u)(x-v)$ yields $f(x)=a(x-7)(x-(-3))$, or $f(x)=a(x-7)(x+3)$. Distributing the right-hand side of this equation yields $f(x)=a(x^2-7x+3x-21)$, or $f(x)=ax^2-4ax-21a$. Since it's given that $f(x)=ax^2+bx+c$, it follows that $b=-4a$. Adding a to each side of this equation yields $a+b=-3a$. Since $a+b=-3a$, if a is an integer, the value of $a+b$ must be a multiple of 3 . If a is an integer greater than 1 , it follows that $a \geq 2$. Therefore, $-3a \leq -3(2)$. It follows that the value of $a+b$ is less than or equal to $-3(2)$, or -6 . Of the given choices, only -6 is a multiple of 3 that's less than or equal to -6 .

Choice B is incorrect. This is the value of $a+b$ if a is equal to, not greater than, 1 .

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

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

QUESTION 27

The correct answer is 25 . The value of $g(7-w)$ is the value of $g(x)$ when $x=7-w$, where w is a constant. Substituting $7-w$ for x in the given equation yields $g(7-w)=(7-w)(7-w-2)(7-w+6)^2$, which is equivalent to $g(7-w)=(7-w)(5-w)(13-w)^2$. It's given that the value of $g(7-w)$ is 0 . Substituting 0 for $g(7-w)$ in the equation $g(7-w)=(7-w)(5-w)(13-w)^2$ yields $0=(7-w)(5-w)(13-w)^2$. Since the product of the three factors on the right-hand side of this equation is equal to 0 , at least one of these three factors must be equal to 0 . Therefore, the possible values of w can be found by setting each factor equal to 0 . Setting the first factor equal to 0 yields $7-w=0$. Adding w to both sides of this equation yields $7=w$. Therefore, 7 is one possible value of w . Setting the second factor equal to 0 yields $5-w=0$. Adding w to both sides of this equation yields $5=w$. Therefore, 5 is a second possible value of w . Setting the third factor equal to 0 yields $(13-w)^2=0$. Taking the square root of both sides of this equation yields $13-w=0$. Adding w to both sides of this equation yields $13=w$. Therefore, 13 is a third possible value of w . Adding the three possible values of w yields $7+5+13$, or 25 . Therefore, the sum of all possible values of w is 25 .

Math

Module 2 (27 questions)

QUESTION 1

Choice B is correct. 20% of 440 can be calculated as $\left(\frac{20}{100}\right)(440)$, which is equivalent to $\frac{8800}{100}$, or 88.

Choice A is incorrect. This is 10%, not 20%, of 440. *Choice C* is incorrect. This is 200%, not 20%, of 440. *Choice D* is incorrect. This is 400%, not 20%, of 440.

QUESTION 2

Choice B is correct. For the graph shown, the x -axis represents temperature, in kelvins, and the y -axis represents the estimated pressure, in pounds per square inch (psi). The estimated pressure of the argon when the temperature is 600 kelvins can be found by locating the point on the graph where the value of x is equal to 600. The graph passes through the point (600, 12). This means that when the temperature is 600 kelvins, the estimated pressure is 12 psi.

Choice A is incorrect. This is the estimated pressure, in psi, of the argon when the temperature is 300 kelvins, not 600 kelvins. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the temperature, in kelvins, of the argon.

QUESTION 3

Choice B is correct. It's given that the function f is defined by $f(x) = 4x - 3$. Substituting 10 for x in the given function yields $f(10) = 4(10) - 3$, which is equivalent to $f(10) = 40 - 3$, or $f(10) = 37$. Therefore, the value of $f(10)$ is 37.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the value of $f(10)$ for the function $f(x) = 4x$, not $f(x) = 4x - 3$. *Choice D* is incorrect. This is the value of $f(10)$ for the function $f(x) = 4x + 3$, not $f(x) = 4x - 3$.

QUESTION 4

Choice B is correct. Since $2xy$ is a common factor of each term in the given expression, the expression can be rewritten as $2xy(8x^2y + 7)$.

Choice A is incorrect. This expression is equivalent to $16x^2y^2 + 14xy$. **Choice C** is incorrect. This expression is equivalent to $28x^3y^2 + 14xy$. **Choice D** is incorrect. This expression is equivalent to $112x^3y^2 + 14xy$.

QUESTION 5

Choice D is correct. It's given that a veterinarian recommends that each day the rabbit should eat 25 calories per pound of the rabbit's weight, plus an additional 11 calories. If the rabbit's weight is x pounds, then multiplying 25 calories per pound by the rabbit's weight, x pounds, yields $25x$ calories. Adding the additional 11 calories that the rabbit should eat each day yields $25x + 11$ calories. It's given that c is the total number of calories the veterinarian recommends the rabbit should eat each day if the rabbit's weight is x pounds. Therefore, this situation can be represented by the equation $c = 25x + 11$.

Choice A is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat 25 calories per pound of the rabbit's weight. **Choice B** is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat $25 + 11$, or 36, calories per pound of the rabbit's weight. **Choice C** is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat 11 calories per pound of the rabbit's weight, plus an additional 25 calories.

QUESTION 6

The correct answer is 6. Dividing both sides of the equation $6n = 12$ by 6 yields $n = 2$. Substituting 2 for n in the expression $n + 4$ yields $2 + 4$, or 6.

QUESTION 7

The correct answer is either -30 or 30 . Adding 7 to each side of the given equation yields $(d - 30)(d + 30) = 0$. Since a product of two factors is equal to 0 if and only if at least one of the factors is 0, either $d - 30 = 0$ or $d + 30 = 0$. Adding 30 to each side of the equation $d - 30 = 0$ yields $d = 30$. Subtracting 30 from each side of the equation $d + 30 = 0$ yields $d = -30$. Therefore, the solutions to the given equation are -30 and 30 . Note that -30 and 30 are examples of ways to enter a correct answer.

QUESTION 8

Choice D is correct. A line in the xy -plane with a slope of m and a y -intercept of $(0, b)$ can be defined by an equation in the form $y = mx + b$. It's given that line r has a slope of 4 and passes through the point $(0, 6)$. It follows that $m = 4$ and $b = 6$. Substituting 4 for m and 6 for b in the equation $y = mx + b$ yields $y = 4x + 6$. Therefore, the equation $y = 4x + 6$ defines line r .

Choice A is incorrect. This equation defines a line that has a slope of -6 , not 4 , and passes through the point $(0, 4)$, not $(0, 6)$. *Choice B* is incorrect. This equation defines a line that has a slope of 6 , not 4 , and passes through the point $(0, 4)$, not $(0, 6)$. *Choice C* is incorrect. This equation defines a line that passes through the point $(0, -6)$, not $(0, 6)$.

QUESTION 9

Choice B is correct. It's given that the graph shows the height above the water y , in meters, of a diver x seconds after diving from a platform. The x -intercept of a graph is the point at which the graph intersects the x -axis, or when the value of y is 0 . The graph shown intersects the x -axis between $x = 1$ and $x = 2$. In other words, the diver is 0 meters above the water, or hits the water, between 1 and 2 seconds after diving from the platform. Of the given choices, only choice B includes an interpretation where the diver hits the water between 1 and 2 seconds. Therefore, the best interpretation of the x -intercept of the graph is the diver hits the water at 1.6 seconds.

Choice A is incorrect and may result from conceptual errors. *Choice C* is incorrect. This is the best interpretation of the maximum value, not the x -intercept, of the graph. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 10

Choice A is correct. It's given that the kinetic energy, in joules, of an object with a mass of 9 kilograms traveling at a speed of v meters per second is given by the function K , where $K(v) = \frac{9}{2}v^2$. It follows that in the equation $K(34) = 5,202$, 34 is the value of v , or the speed of the object, in meters per second, and $5,202$ is the kinetic energy, in joules, of the object at that speed. Therefore, the best interpretation of $K(34) = 5,202$ in this context is the object traveling at 34 meters per second has a kinetic energy of $5,202$ joules.

Choice B is incorrect. The object traveling at 340 meters per second has a kinetic energy of $520,200$ joules. *Choice C* is incorrect. The object traveling at $5,202$ meters per second has a kinetic energy of $121,773,618$ joules. *Choice D* is incorrect. The object traveling at $23,409$ meters per second has a kinetic energy of $2,465,915,764.5$ joules.

QUESTION 11

Choice C is correct. Any data point that's located above the line of best fit has a y -value that's greater than the y -value predicted by the line of best fit. For the scatterplot shown, 6 of the data points are above the line of best fit. Therefore, 6 of the data points have an actual y -value that's greater than the y -value predicted by the line of best fit.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect. This is the number of data points that have an actual y -value that's less than the y -value predicted by the line of best fit. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 12

Choice D is correct. It's given that at a movie theater, there are a total of 350 customers and that each customer is located in either theater A, theater B, or theater C. If the probability of selecting a customer in theater A is 0.48, then $(0.48)(350)$, or 168, customers are located in theater A. If the probability of selecting a customer in theater B is 0.24, then $(0.24)(350)$, or 84, customers are located in theater B. It follows that there are $168 + 84$, or 252, customers in theater A and theater B. Therefore, there are $350 - 252$, or 98, customers in theater C.

Choice A is incorrect. This is the percent, not the number, of the customers that are located in theater C. **Choice B** is incorrect and may result from conceptual or calculation errors. **Choice C** is incorrect. This is the number of customers that are located in theater B, not theater C.

QUESTION 13

The correct answer is $\frac{44}{3}$. A linear equation can be written in the form $y = mx + b$, where m is the slope of the graph of the equation in the xy -plane and $(0, b)$ is the y -intercept. Distributing the $\frac{1}{3}$ in the equation $y = \frac{1}{3}(29x + 10) + 5x$ yields $y = \frac{29}{3}x + \frac{10}{3} + 5x$. Combining like terms on the right-hand side of this equation yields $y = \frac{44}{3}x + \frac{10}{3}$. This equation is in the form $y = mx + b$, where $m = \frac{44}{3}$ and $b = \frac{10}{3}$. Therefore, the slope of the graph of the given equation in the xy -plane is $\frac{44}{3}$. Note that $44/3$, 14.66, and 14.67 are examples of ways to enter a correct answer.

QUESTION 14

The correct answer is 4,205. The exterior surface area of a figure is the sum of the areas of all its faces. It's given that the box does not have a lid and that each side of the box is in the shape of a square. Therefore, the box consists of 5 congruent square faces. It's also given that the length of each edge is 29 inches. Let s represent the length of an edge of a square. It follows that the area of a square is equal to s^2 . Therefore, the area of each of the 5 square faces is equal to 29^2 , or 841, square inches. Since the box consists of 5 congruent square faces, it follows that the sum of the areas of all its faces, or the exterior surface area of this box without a lid, is $5(841)$, or 4,205, square inches.

QUESTION 15

Choice A is correct. It's given that the table shows an original data set of 5 values. It's also given that a sixth value is added to create a new data set. The new data set consists of the 5 values in the original data set and one additional value, 121. Since the additional value, 121, is less than any value in the original data set, the mean of the original data set is greater than the mean of the new data set.

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 A is correct. The sum of the measures of the angles of a triangle is 180° . Therefore, the sum of the measures of $\angle R$, $\angle S$, and $\angle T$ is 180° . It's given that the measure of $\angle R$ is 63° . It follows that the sum of the measures of $\angle S$ and $\angle T$ is $(180 - 63)^\circ$, or 117° . Therefore, the measure of $\angle S$, in degrees, must be less than 117 . Of the given choices, only 116 is less than 117 . Thus, the measure, in degrees, of $\angle S$ could be 116 .

Choice B is incorrect. If the measure of $\angle S$ is 118° , then the sum of the measures of the angles of the triangle is greater than, not equal to, 180° . *Choice C* is incorrect. If the measure of $\angle S$ is 126° , then the sum of the measures of the angles of the triangle is greater than, not equal to, 180° . *Choice D* is incorrect. This is the sum of the measures of the angles of a triangle, in degrees.

QUESTION 17

Choice B is correct. The given expression is equivalent to $8x^3 + 8 - x^3 - (-2)$, or $8x^3 + 8 - x^3 + 2$. Combining like terms in this expression yields $7x^3 + 10$.

Choice A is incorrect. This expression is equivalent to $(8x^3 + 8) - 2$, not $(8x^3 + 8) - (x^3 - 2)$. *Choice C* is incorrect. This expression is equivalent to $(8x^3 + 8) - (-2)$, not $(8x^3 + 8) - (x^3 - 2)$. *Choice D* is incorrect. This expression is equivalent to $(8x^3 + 8) - (x^3 + 2)$, not $(8x^3 + 8) - (x^3 - 2)$.

QUESTION 18

Choice B is correct. Dividing each side of the given equation by 4 yields $\sqrt{2x} = 4$. Squaring both sides of this equation yields $2x = 16$. Multiplying each side of this equation by 3 yields $6x = 48$. Therefore, the value of $6x$ is 48 .

Choice A is incorrect. This is the value of $3x$, not $6x$. *Choice C* is incorrect. This is the value of $9x$, not $6x$. *Choice D* is incorrect. This is the value of $12x$, not $6x$.

QUESTION 19

Choice D is correct. All the tables in the choices have the same three values of x , 440 , 441 , and 442 , so each of the three values of x can be substituted in the given inequality to compare the corresponding values of y in each of the tables. Substituting 440 for x in the given inequality yields $2(440) - y > 883$, or $880 - y > 883$. Subtracting 880 from both sides of this inequality yields $-y > 3$. Dividing both sides of this inequality by -1 yields $y < -3$. Therefore, when $x = 440$, the corresponding value of y must be less than -3 . Substituting 441 for x in the given inequality yields $2(441) - y > 883$, or $882 - y > 883$. Subtracting 882 from both sides of this inequality yields $-y > 1$. Dividing both sides of this inequality by -1 yields $y < -1$. Therefore, when $x = 441$, the corresponding value of y must be less than -1 . Substituting 442 for x in the given inequality yields

$2(442) - y > 883$, or $884 - y > 883$. Subtracting 884 from both sides of this inequality yields $-y > -1$. Dividing both sides of this inequality by -1 yields $y < 1$. Therefore, when $x = 442$, the corresponding value of y must be less than 1. For the table in choice D, when $x = 440$, the corresponding value of y is -4 , which is less than -3 ; when $x = 441$, the corresponding value of y is -2 , which is less than -1 ; when $x = 442$, the corresponding value of y is 0 , which is less than 1 . Therefore, the table in choice D gives values of x and their corresponding values of y that are all solutions to the given inequality.

Choice A is incorrect. When $x = 440$, the corresponding value of y in this table is 0 , which isn't less than -3 . *Choice B* is incorrect. When $x = 440$, the corresponding value of y in this table is 0 , which isn't less than -3 . *Choice C* is incorrect. When $x = 440$, the corresponding value of y in this table is -2 , which isn't less than -3 .

QUESTION 20

The correct answer is 20. Adding the first equation to the second equation in the given system yields $5y - 5y = 10x + 5x + 11 - 21$, or $0 = 15x - 10$. Adding 10 to both sides of this equation yields $10 = 15x$. Multiplying both sides of this equation by 2 yields $20 = 30x$. Therefore, the value of $30x$ is 20.

QUESTION 21

The correct answer is 66. It's given that each vertex of the rectangle lies on the circumference of the circle. Therefore, the length of the diameter of the circle is equal to the length of the diagonal of the rectangle. The diagonal of a rectangle forms a right triangle with the shortest and longest sides of the rectangle, where the shortest side and the longest side of the rectangle are the legs of the triangle and the diagonal of the rectangle is the hypotenuse of the triangle. Let s represent the length, in units, of the shortest side of the rectangle. Since it's given that the diagonal is twice the length of the shortest side, $2s$ represents the length, in units, of the diagonal of the rectangle. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b , then $a^2 + b^2 = c^2$. Substituting s for a and $2s$ for c in this equation yields $s^2 + b^2 = (2s)^2$, or $s^2 + b^2 = 4s^2$. Subtracting s^2 from both sides of this equation yields $b^2 = 3s^2$. Taking the positive square root of both sides of this equation yields $b = s\sqrt{3}$. Therefore, the length, in units, of the rectangle's longest side is $s\sqrt{3}$. The area of a rectangle is the product of the length of the shortest side and the length of the longest side. The lengths, in units, of the shortest and longest sides of the rectangle are represented by s and $s\sqrt{3}$, and it's given that the area of the rectangle is $1,089\sqrt{3}$ square units. It follows that $1,089\sqrt{3} = s(s\sqrt{3})$, or $1,089\sqrt{3} = s^2\sqrt{3}$. Dividing both sides of this equation by $\sqrt{3}$ yields $1,089 = s^2$. Taking the positive square root of both sides of this equation yields $33 = s$. Since the length, in units, of the diagonal is represented by $2s$, it follows that the length, in units, of the diagonal is $2(33)$, or 66. Since the length of the diameter of the circle is equal to the length of the diagonal of the rectangle, the length, in units, of the diameter of the circle is 66.

QUESTION 22

Choice D is correct. The area of a rectangle is given by bh , where b is the length of the base of the rectangle and h is its height. Let x represent the length, in units, of the base of rectangle $ABCD$, and let y represent its height, in units.

Substituting x for b and y for h in the formula bh yields xy . Therefore, the area, in square units, of $ABCD$ can be represented by the expression xy . It's given that the length of each side of $EFGH$ is 6 times the length of the corresponding side of $ABCD$. Therefore, the length, in units, of the base of $EFGH$ can be represented by the expression $6x$, and its height, in units, can be represented by the expression $6y$. Substituting $6x$ for b and $6y$ for h in the formula bh yields $(6x)(6y)$, which is equivalent to $36xy$. Therefore, the area, in square units, of $EFGH$ can be represented by the expression $36xy$. It's given that the area of $ABCD$ is 54 square units. Since xy represents the area, in square units, of $ABCD$, substituting 54 for xy in the expression $36xy$ yields $36(54)$, or 1,944. Therefore, the area, in square units, of $EFGH$ is 1,944.

Choice A is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{\frac{1}{6}}$, not 6, times the length of the corresponding side of $ABCD$. **Choice B** is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{\frac{2}{3}}$, not 6, times the length of the corresponding side of $ABCD$. **Choice C** is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{6}$, not 6, times the length of the corresponding side of $ABCD$.

QUESTION 23

Choice D is correct. Two fractions can be added together when they have a common denominator. Since $k > 0$, multiplying the second term in the given

expression by $\frac{k}{k}$ yields $\frac{(42ak)k}{k}$, which is equivalent to $\frac{42ak^2}{k}$. Therefore, the expression $\frac{42a}{k} + 42ak$ can be written as $\frac{42a}{k} + \frac{42ak^2}{k}$ which is equivalent to $\frac{42a+42ak^2}{k}$. Since each term in the numerator of this expression has a factor of $42a$, the expression $\frac{42a+42ak^2}{k}$ can be rewritten as $\frac{42a(1)+42a(k^2)}{k}$, or $\frac{42a(1+k^2)}{k}$, which is equivalent to $\frac{42a(k^2+1)}{k}$.

Choice A is incorrect. This expression is equivalent to $\frac{42a}{k} + \frac{42a}{k}$. **Choice B** is incorrect and may result from conceptual or calculation errors. **Choice C** is incorrect. This expression is equivalent to $\frac{42a}{k} + 42a$.

QUESTION 24

Choice D is correct. The number of solutions to a quadratic equation in 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 greater than zero, then the quadratic equation has 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 less than zero, then the quadratic equation has no real solutions. For the quadratic equation in choice D,

$5x^2 - 14x + 49 = 0$, $a = 5$, $b = -14$, and $c = 49$. Substituting 5 for a , -14 for b , and 49 for c in $b^2 - 4ac$ yields $(-14)^2 - 4(5)(49)$, or -784 . Since -784 is less than zero, it follows that the quadratic equation $5x^2 - 14x + 49 = 0$ has no real solutions.

Choice A is incorrect. The value of the discriminant for this quadratic equation is 392. Since 392 is greater than zero, it follows that this quadratic equation has two real solutions. **Choice B** is incorrect. The value of the discriminant for this quadratic equation is 0. Since zero is equal to zero, it follows that this quadratic equation has exactly one real solution. **Choice C** is incorrect. The value of the discriminant for this quadratic equation is 1,176. Since 1,176 is greater than zero, it follows that this quadratic equation has two real solutions.

QUESTION 25

Choice A is correct. It's given that the function P models the population, in thousands, of a certain city t years after 2003. The value of the base of the given exponential function, 1.04, corresponds to an increase of 4% for every increase of 1 in the exponent, $(\frac{6}{4})t$. If the exponent is equal to 0, then $(\frac{6}{4})t=0$. Multiplying both sides of this equation by $(\frac{4}{6})$ yields $t=0$. If the exponent is equal to 1, then $(\frac{6}{4})t=1$. Multiplying both sides of this equation by $(\frac{4}{6})$ yields $t=\frac{4}{6}$, or $t=\frac{2}{3}$. Therefore, the population is predicted to increase by 4% every $\frac{2}{3}$ of a year. It's given that the population is predicted to increase by 4% every n months. Since there are 12 months in a year, $\frac{2}{3}$ of a year is equivalent to $(\frac{2}{3})(12)$, or 8, months. Therefore, the value of n is 8.

Choice B is incorrect. This is the number of months in which the population is predicted to increase by 4% according to the model $P(t)=260(1.04)^t$, not $P(t)=260(1.04)^{\frac{6}{4}t}$. **Choice C** is incorrect. This is the number of months in which the population is predicted to increase by 4% according to the model $P(t)=260(1.04)^{\frac{4}{6}t}$, not $P(t)=260(1.04)^{\frac{6}{4}t}$. **Choice D** is incorrect. This is the number of months in which the population is predicted to increase by 4% according to the model $P(t)=260(1.04)^{\frac{1}{6}t}$, not $P(t)=260(1.04)^{\frac{6}{4}t}$.

QUESTION 26

Choice C is correct. It's given that the circle has its center at $(-1, 1)$ and that line t is tangent to this circle at the point $(5, -4)$. Therefore, the points $(-1, 1)$ and $(5, -4)$ are the endpoints of the radius of the circle at the point of tangency. The slope of a line or line segment that contains the points (a, b) and (c, d) can be calculated as $\frac{d-b}{c-a}$. Substituting $(-1, 1)$ for (a, b) and $(5, -4)$ for (c, d) in the expression $\frac{d-b}{c-a}$ yields $\frac{-4-1}{5-(-1)}$, or $-\frac{5}{6}$. Thus, the slope of this radius is $-\frac{5}{6}$. A line that's tangent to a circle is perpendicular to the radius of the circle at the point of tangency. It follows that line t is perpendicular to the radius at the point $(5, -4)$, so the slope of line t is the negative reciprocal of the slope of this radius. The negative reciprocal of $-\frac{5}{6}$ is $\frac{6}{5}$. Therefore, the slope of line t is $\frac{6}{5}$. Since the slope of line t is the same between any two points on line t , a point lies on line t if the slope of the line segment connecting the point and $(5, -4)$ is $\frac{6}{5}$. Substituting choice C, $(10, 2)$, for (a, b) and $(5, -4)$ for (c, d) in the expression $\frac{d-b}{c-a}$ yields $\frac{-4-2}{5-10}$, or $\frac{6}{5}$. Therefore, the point $(10, 2)$ lies on line t .

Choice A is incorrect. The slope of the line segment connecting $(0, \frac{6}{5})$ and $(5, -4)$ is $\frac{-4 - \frac{6}{5}}{5 - 0}$, or $-\frac{26}{25}$, not $\frac{6}{5}$. Choice B is incorrect. The slope of the line segment connecting $(4, 7)$ and $(5, -4)$ is $\frac{-4 - 7}{5 - 4}$, or -11 , not $\frac{6}{5}$. Choice D is incorrect. The slope of the line segment connecting $(11, 1)$ and $(5, -4)$ is $\frac{-4 - 1}{5 - 11}$, or $\frac{5}{6}$, not $\frac{6}{5}$.

QUESTION 27

The correct answer is 4,176. It's given that the side length of the larger square is 3 times the side length of the smaller square. This means that the area of the larger square is 3^2 , or 9, times the area of the smaller square. If the area of the smaller square is represented by x , then the area of the larger square can be represented by $9x$. Therefore, the flat surface of the two adjacent squares has a total area of $x + 9x$, or $10x$. It's given that an electric field with strength 29.00 volts per meter passes uniformly through this surface and the total electric flux of the electric field through this surface is 4,640 volts · meters. Since it's given that the electric flux is the product of the electric field's strength and the area of the surface, the equation $29.00(10x) = 4,640$, or $290x = 4,640$, can be used to represent this situation. Dividing each side of this equation by 290 yields $x = 16$. Substituting 16 for x in the expression for the area of the larger square, $9x$, yields $9(16)$, or 144, square meters. Since the area of the larger square is 144 square meters, the electric flux, in volts · meters, of the electric field through the larger square can be determined by multiplying the area of the larger square by the strength of the electric field. Thus, the electric flux is $(144 \text{ square meters})(\frac{29.00 \text{ volts}}{\text{meter}})$, or 4,176 volts · meters.