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Preliminary SAT/National Merit Scholarship Qualifying Test

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**Test begins on the next page.**

# 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 Amy Lowell's 1912 poem "Summer."

It is summer, glorious, deep-toned summer,  
The very crown of nature's changing year  
When all her surging life is at its full.  
To me alone it is a time of pause,  
A void and silent space between two worlds,  
When inspiration lags, and feeling sleeps,  
Gathering strength for efforts yet to come.

As used in the text, what does the phrase "a void" most nearly mean?

- A) A useless
- B) An empty
- C) A forgotten
- D) An incomplete

2

In the 1960s, Sam Gilliam, a Black painter from the southern United States, became the first artist to drape painted canvases into flowing shapes. He later explored a different style, \_\_\_\_\_ quilt-like paintings inspired by the patchwork quilting tradition of Black communities in the South.

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

- A) predicting
- B) refusing
- C) hiding
- D) creating

3

Studying how workload affects productivity, Maryam Kouchaki and colleagues found that people who chose to do relatively easy tasks first were less \_\_\_\_\_ compared to those who did hard tasks first. Finishing easy tasks gave participants a sense of accomplishment, but those who tackled hard tasks first actually became more skilled and productive workers over time.

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

- A) secretive
- B) efficient
- C) outgoing
- D) unsympathetic

4

The following text is from Bram Stoker’s 1897 novel *Dracula*. The narrator is being driven in a carriage through a remote region at night.

The baying of the wolves sounded nearer and nearer, as though they were closing round on us from every side. I grew dreadfully afraid, and the horses shared my fear. The driver, however, was not in the least disturbed; he kept turning his head to left and right, but I could not see anything through the darkness.

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

- A) Disorganized
- B) Alarmed
- C) Offended
- D) Interrupted

5

The following text is adapted from Sadakichi Hartmann’s 1894 short story “Magnolia Blossoms.” The narrator is standing on the deck of a boat.

What a night it was! My soul had left its body to lose itself in the wild unrestrained beauty around me—from where it came—and only left a trembling suggestion of its existence within me. The other passengers moved around me like shadows, and again and again my eyes drank in all the glory and wealth of that night.

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

- A) Trace
- B) Opinion
- C) Dispute
- D) Command

6

The following text is from Lucy Maud Montgomery’s 1908 novel *Anne of Green Gables*. Anne, an eleven-year-old girl, has come to live on a farm with a woman named Marilla in Nova Scotia, Canada.

Anne reveled in the world of color about her.

“Oh, Marilla,” she exclaimed one Saturday morning, coming dancing in with her arms full of gorgeous boughs, “I’m so glad I live in a world where there are Octobers. It would be terrible if we just skipped from September to November, wouldn’t it? Look at these maple branches. Don’t they give you a thrill—several thrills? I’m going to decorate my room with them.”

“Messy things,” said Marilla, whose aesthetic sense was not noticeably developed. “You clutter up your room entirely too much with out-of-doors stuff, Anne. Bedrooms were made to sleep in.”

Which choice best states the main purpose of the text?

- A) To demonstrate that Anne has a newly developed appreciation of nature
- B) To describe an argument that Anne and Marilla often have
- C) To emphasize Marilla’s disapproval of how Anne has decorated her room
- D) To show that Anne and Marilla have very different personalities

7

Early in the Great Migration of 1910–1970, which involved the mass migration of Black people from the southern to the northern United States, political activist and *Chicago Defender* writer Fannie Barrier Williams was instrumental in helping other Black women establish themselves in the North. Many women hoped for better employment opportunities in the North because, in the South, they faced much competition for domestic employment and men tended to get agricultural work. To aid with this transition, Barrier Williams helped secure job placement in the North for many women before they even began their journey.

Which choice best states the main purpose of the text?

- A) To introduce and illustrate Barrier Williams’s integral role in supporting other Black women as their circumstances changed during part of the Great Migration
- B) To establish that Barrier Williams used her professional connections to arrange employment for other Black women, including jobs with the *Chicago Defender*
- C) To demonstrate that the factors that motivated the start of the Great Migration were different for Black women than they were for Black men
- D) To provide an overview of the employment challenges faced by Black women in the agricultural and domestic spheres in the southern United States

8

“How lifelike are they?” Many computer animators prioritize this question as they strive to create ever more realistic environments and lighting. Generally, while characters in computer-animated films appear highly exaggerated, environments and lighting are carefully engineered to mimic reality. But some animators, such as Pixar’s Sanjay Patel, are focused on a different question. Rather than asking first whether the environments and lighting they’re creating are convincingly lifelike, Patel and others are asking whether these elements reflect their films’ unique stories.

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

- A) It reflects a primary goal that many computer animators have for certain components of the animations they produce.
- B) It represents a concern of computer animators who are more interested in creating unique backgrounds and lighting effects than realistic ones.
- C) It conveys the uncertainty among many computer animators about how to create realistic animations using current technology.
- D) It illustrates a reaction that audiences typically have to the appearance of characters created by computer animators.

9

The field of study called affective neuroscience seeks instinctive, physiological causes for feelings such as pleasure or displeasure. Because these sensations are linked to a chemical component (for example, the release of the neurotransmitter dopamine in the brain when one receives or expects a reward), they can be said to have a partly physiological basis. These processes have been described in mammals, but Jingnan Huang and his colleagues have recently observed that some behaviors of honeybees (such as foraging) are also motivated by a dopamine-based signaling process.

What choice best describes the main purpose of the text?

- A) It describes an experimental method of measuring the strength of physiological responses in humans.
- B) It illustrates processes by which certain insects can express how they are feeling.
- C) It summarizes a finding suggesting that some mechanisms in the brains of certain insects resemble mechanisms in mammalian brains.
- D) It presents research showing that certain insects and mammals behave similarly when there is a possibility of a reward for their actions.

10

In 2019, 20 previously unknown moons were confirmed to be orbiting Saturn. Three of the moons have prograde orbits (orbiting in the direction the planet spins), and the other 17 have retrograde orbits (orbiting in the opposite direction of the planet's spin). All but one of the 20 moons are thought to be remnants of bodies that orbited Saturn until they broke apart in collisions. Although the one exceptional moon orbits in the same direction as the planet's spin, its orbit is highly eccentric compared to the rest, which may suggest that it has a different origin than the other 19 moons.

Based on the text, which choice best describes the moon with the eccentric orbit?

- A) It doesn't have a retrograde orbit, but it likely has the same origin as the moons with retrograde orbits.
- B) Its orbit is so tilted with respect to the other moons' orbits that it's neither prograde nor retrograde.
- C) It has a prograde orbit that is likely the result of having collided with another body orbiting Saturn.
- D) It has a prograde orbit and may not be a remnant of an earlier body that orbited Saturn.

11

Several scholars have argued that conditions in England in the late ninth through early eleventh centuries—namely, burgeoning literacy amid running conflicts between England's Anglo-Saxon kingdoms and Danish invaders—were especially conducive to the production of the Old English epic poem *Beowulf*, and they have dated the poem's composition accordingly. It is not inconceivable that *Beowulf* emerged from such a context, but privileging contextual fit over the linguistic evidence of an eighth- or even seventh-century composition requires a level of justification that thus far has not been presented.

Which choice best states the main idea of the text?

- A) Although there are some grounds for believing that *Beowulf* was composed between the late ninth and early eleventh centuries, advocates for that view tend to rely on evidence that has been called into question by advocates for an earlier date.
- B) Although several scholars have dated *Beowulf* to the late ninth through early eleventh centuries, others have argued that doing so privileges a controversial interpretation of the social conditions of the period.
- C) Although *Beowulf* fits well with the historical context of England in the late ninth through early eleventh centuries, it fits equally well with the historical context of England in the seventh and eighth centuries.
- D) Although the claim of a late ninth- through early eleventh-century composition date for *Beowulf* has some plausibility, advocates for the claim have not compellingly addressed evidence suggesting an earlier date.

12

E-book Sales as a Percentage of Total Unit Sales in All Book Formats for a Large US Trade Publisher, by Genre, 2006, 2011, 2016

Genre	2006	2011	2016
science fiction and fantasy	0.6	27.7	36.7
cookbooks	0	2.9	10.5
travel guides	0	5.5	24.6
romance	0.3	40.6	56.2

E-books became an increasingly popular means of reading in the United States in the 2000s and 2010s, though that popularity was concentrated in titles that, like those in most fiction genres, are meant to be read straight through from beginning to end. For books in nonfiction genres that do not tell stories and require the reader to flip back and forth through a volume, e-books were significantly less commercially successful. This can be seen by comparing \_\_\_\_\_

Which choice most effectively uses data from the table to illustrate the claim?

- A) the percentage of 2016 cookbook sales that were e-books with the percentage of 2016 science fiction and fantasy sales that were e-books.
- B) the percentage of 2006 romance sales that were e-books with the percentage of 2016 romance sales that were e-books.
- C) the percentage of 2006 romance sales that were e-books with the 2006 science fiction and fantasy sales that were e-books.
- D) the percentage of 2011 travel guide sales that were e-books with the percentage of 2016 travel guide sales that were e-books.

13

Although most songbirds build open, cupped nests, some species build domed nests with roofs that provide much more protection. Many ecologists have assumed that domed nests would provide protection from weather conditions and thus would allow species that build them to have larger geographic ranges than species that build open nests do. To evaluate this assumption, a research team led by evolutionary biologist Iliana Medina analyzed data for over 3,000 species of songbirds.

Which finding from Medina and her colleagues' study, if true, would most directly challenge the assumption in the underlined sentence?

- A) Species that build open nests tend to have higher extinction rates than species that build domed nests.
- B) Species that build open nests tend to be smaller in size than species that build domed nests.
- C) Species that build open nests tend to use fewer materials to build their nests than species that build domed nests do.
- D) Species that build open nests tend to have larger ranges than species that build domed nests.

14

A student is writing a paper about *One Night in Miami...*, a 2020 film directed by Regina King and written by Kemp Powers. Powers adapted the film’s screenplay from his 2013 play, which he wrote after learning about a 1964 meeting that took place in Miami, Florida, between four prominent figures of the Civil Rights movement: Malcolm X, Muhammad Ali, Jim Brown, and Sam Cooke. The student claims that although Powers was inspired by this meeting, the film is best understood not as a precise retelling of historical events but rather as a largely imagined but informed representation of them.

Which quotation from an article about *One Night in Miami...* would be the most effective evidence for the student to include in support of this claim?

- A) “When Powers learned of the meeting, he initially planned to write a much longer work about its four famous participants rather than focusing on the meeting itself.”
- B) “*One Night in Miami...* received numerous awards and nominations, including an Academy Award nomination for Powers for Best Adapted Screenplay.”
- C) “Powers has described *One Night in Miami...* as the story of four friends encouraging and supporting one another while engaged in a crucial political debate about how best to achieve equality for Black people in the United States.”
- D) “Powers could find only the most superficial historical details about the meeting, so he read extensively about the four individuals and their thinking at the time in an effort to portray what might have happened between them.”

15

When the Vinland Map, a map of the world purported to date to the mid-1400s, surfaced in 1957, some scholars believed it demonstrated that European knowledge of the eastern coast of present-day North America predated Christopher Columbus’s 1492 arrival. In 2021, a team including conservators Marie-France Lemay and Paula Zyats and materials scientist Anikó Bezur performed an extensive analysis of the map and the ink used. They found that the ink contains titanium dioxide, a compound that was first introduced in ink manufacturing in the early 1900s. Therefore, the team concluded that \_\_\_\_\_

Which choice most logically completes the text?

- A) mid-1400s Europeans could not have known about the eastern coast of present-day North America.
- B) the Vinland Map could not have been drawn by mid-1400s mapmakers.
- C) mapmakers must have used titanium compounds in their ink in the 1400s.
- D) there isn’t enough information to determine when the ink was created.

16

Aerogels are highly porous foams consisting mainly of tiny air pockets within a solidified gel. These lightweight materials are often applied to spacecraft and other equipment required to withstand extreme conditions, as they provide excellent insulation despite typically being brittle and eventually fracturing due to degradation from repeated exposure to high heat. Now, Xiangfeng Duan of the University of California, Los Angeles, and colleagues have developed an aerogel with uniquely flexible properties. Unlike earlier aerogels, Duan's team's material contracts rather than expands when heated and fully recovers after compressing to just 5% of its original volume, suggesting that \_\_\_\_\_

Which choice most logically completes the text?

- A) the aerogel's remarkable flexibility results from its higher proportion of air pockets to solidified gel as compared to other aerogels.
- B) the aerogel's overall strength is greater than that of other insulators but its ability to withstand exposure to intense heat is lower.
- C) the aerogel will be more effective as an insulator for uses that involve gradual temperature shifts than for those that involve rapid heat increases.
- D) the aerogel will be less prone to the structural weakness that ultimately causes most other aerogels to break down with use.

17

Some *Astyanax mexicanus*, a river-dwelling fish found in northeast Mexico, have colonized caves in the region. Although there is little genetic difference between river and cave *A. mexicanus* and all members of the species can emit the same sounds, biologist Carole Hyacinthe and colleagues found that the context and significance of those sounds vary by location—e.g., the click that river-dwelling *A. mexicanus* use to signal aggression is used by cave dwellers when foraging—and the acoustic properties of cave fish sounds show some cave-specific variations as well. Hyacinthe and colleagues note that differences in sonic communication could accumulate to the point of inhibiting interbreeding among fish from different locations, suggesting that \_\_\_\_\_

Which choice most logically completes the text?

- A) although *A. mexicanus* living in rivers are genetically similar to those living in caves, river fish rely on sonic communication less than cave fish do.
- B) although *A. mexicanus* is a single species at present, it could be in the process of splitting into distinct populations with different characteristics.
- C) although all *A. mexicanus* emit sounds, the fish living in rivers produce some sounds that the fish living in caves do not, and vice versa.
- D) although *A. mexicanus* from different locations can interbreed currently, river fish and cave fish are sufficiently genetically distinct that they can be considered separate species.

18

Geoglyphs are large-scale designs of lines or shapes created in a natural landscape. The Nazca Lines were created in the Nazca Desert in Peru by several Indigenous civilizations over a period of many centuries. Peruvian archaeologist Johny Isla specializes in these geoglyphs. At a German exhibit about the Nazca Lines, he saw an old photograph of a large geoglyph of a whalelike figure and was surprised that he didn't recognize it. Isla returned to Peru and used a drone to search a wide area, looking for the figure from the air. This approach suggests that Isla thought that if he hadn't already seen it, the whalelike geoglyph \_\_\_\_\_

Which choice most logically completes the text?

- A) must represent a species of whale that went extinct before there were any people in Peru.
- B) is actually located in Germany, not Peru, and isn't part of the Nazca Lines at all.
- C) is probably in a location Isla hadn't ever come across while on the ground.
- D) was almost certainly created a long time after the other Nazca Lines geoglyphs were created.

19

The sun never sets during the Arctic summer in the Far North. In response, reindeer in this region must change their sleep habits. Instead of resting when it gets dark, they rest when they need \_\_\_\_\_ their food.

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

- A) digest
- B) will digest
- C) to digest
- D) digesting

20

Richard Spikes was a prolific African American inventor known for his contributions to automotive engineering. Between 1907 and 1946, he patented many inventions, \_\_\_\_\_ an automobile turn signal, a safety brake, and—most famously—the first automatic gearshift.

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

- A) included
- B) includes
- C) including
- D) will include

21

The radiation that \_\_\_\_\_ during the decay of radioactive atomic nuclei is known as gamma radiation.

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

- A) occurs
- B) have occurred
- C) occur
- D) are occurring

22

In 1903, environmentalist John Muir guided President Theodore Roosevelt on a scenic, sprawling trip through California's Yosemite Valley. Upon returning from the three-day excursion, Roosevelt \_\_\_\_\_ to conserve the nation's wilderness areas, a vow he upheld for his remaining six years in office.

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

- A) is vowing
- B) vowed
- C) will vow
- D) vows

23

Polyphenols are organic compounds \_\_\_\_\_ among their many roles, provide pigment that helps protect plants against ultraviolet radiation from sunlight.

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

- A) that—
- B) that;
- C) that,
- D) that:

24

In the early twentieth century, Joseph Kekuku and other Hawaiian \_\_\_\_\_ in the mainland United States to the bright and lilting sound of the *kīkā kīla*, or Hawaiian steel guitar. The instrument soon became a fixture in American blues and country music.

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

- A) musicians introduced audiences
- B) musicians' introduced audiences'
- C) musician's introduced audience's
- D) musicians' introduced audiences

25

Award-winning cinematographer James Wong Howe was known for his innovative filming techniques. While filming a boxing match for the movie *Body and Soul* \_\_\_\_\_ Howe had a handheld camera operator wear roller skates. This allowed the operator to move smoothly around actors in a boxing ring, creating an immersive experience for viewers.

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

- A) (1947), and
- B) (1947),
- C) (1947) and
- D) (1947)

26

During the American Civil War, Thomas Morris Chester braved the front lines as a war correspondent for the *Philadelphia Press*. Amplifying the voices and experiences of Black soldiers \_\_\_\_\_ of particular importance to Chester, who later became an activist and lawyer during the postwar Reconstruction period.

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

- A) were
- B) have been
- C) are
- D) was

27

Laetitia Ky's hair is her art. Inspired by hairstyles from various African tribes, the Ivorian artist uses wire and thread to sculpt her hair into all kinds of shapes. \_\_\_\_\_ she once made her hair into the shape of the continent of Africa—including the island of Madagascar!

Which choice completes the text with the most logical transition?

- A) Soon,
- B) Elsewhere,
- C) For example,
- D) However,

28

In 1885, Chinese-born California resident Mary Tape became a hero of the Asian American civil rights movement. In January of that year, she won an antidiscrimination case in the California Supreme Court. \_\_\_\_\_ in April, she wrote an open letter criticizing her local board of education for discrimination. Both actions are remembered today as historic stands against racism.

Which choice completes the text with the most logical transition?

- A) Later,
- B) For instance,
- C) In other words,
- D) Rather,

29

Phytoplankton play a crucial role in the ocean's uptake of carbon from the atmosphere. When alive, these tiny marine organisms absorb atmospheric carbon via photosynthesis. \_\_\_\_\_ after they die, the phytoplankton sink to the seafloor, where the carbon in their cells gets stored in sediment, preventing it from cycling back into the atmosphere.

Which choice completes the text with the most logical transition?

- A) Specifically,
- B) By contrast,
- C) Nevertheless,
- D) Then,

30

Originally coined by economist Joan Robinson to refer to markets with multiple sellers of a product but only one buyer, the term “monopsony” can also refer to markets where demand for labor is limited. In a product monopsony, the single buyer can force sellers to lower their prices. \_\_\_\_\_ in a labor monopsony, employers can force workers to accept lower wages.

Which choice completes the text with the most logical transition?

- A) Earlier,
- B) Instead,
- C) Similarly,
- D) In particular,

31

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

- J.R.R. Tolkien’s 1937 novel *The Hobbit* features two maps.
- The novel opens with a reproduction of the map that the characters use on their quest.
- This map introduces readers to the fictional world they are about to enter.
- The novel closes with a map depicting every stop on the characters’ journey.
- That map allows readers to reconstruct the story they have just read.

The student wants to contrast the purposes of the two maps in *The Hobbit*. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) *The Hobbit*’s opening map introduces readers to the fictional world they are about to enter, while the closing map allows them to reconstruct the story they have just read.
- B) *The Hobbit*, a novel published by J.R.R. Tolkien in 1937, features a reproduction of a map that the characters use on their quest, as well as a map that appears at the end of the novel.
- C) *The Hobbit*’s two maps, one opening and one closing the novel, each serve a purpose for readers.
- D) In 1937, author J.R.R. Tolkien published *The Hobbit*, a novel featuring both an opening and a closing map.

32

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

- John Carver was one of the 41 signatories of the Mayflower Compact.
- The Mayflower Compact was a legal agreement among the pilgrims that immigrated to Plymouth Colony.
- It was created in 1620 to establish a common government.
- It states that the pilgrims who signed it wanted to “plant the first colony in the northern parts of Virginia” under King James.
- Carver became the first governor of Plymouth Colony.

The student wants to specify the reason the Mayflower Compact was created. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) Stating that its signatories wanted to “plant the first colony in the northern parts of Virginia,” the Mayflower Compact was a legal agreement among the pilgrims that immigrated to Plymouth Colony.
- B) Created in 1620, the Mayflower Compact states that the pilgrims wanted to “plant the first colony in the northern parts of Virginia.”
- C) The Mayflower Compact was created to establish a common government among the pilgrims that immigrated to Plymouth Colony.
- D) The Mayflower Compact had 41 signatories, including John Carver, the first governor of Plymouth Colony.

33

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

- Cities tend to have a wide range of flowering vegetation in parks, yards, and gardens.
- This vegetation provides a varied diet for honeybees, strengthening bees’ immune systems.
- On average, 62.5 percent of bees in an urban area will survive a harsh winter.
- Rural areas are often dominated by monoculture crops such as corn or wheat.
- On average, only 40 percent of honeybees in a rural area will survive a harsh winter.

The student wants to make and support a generalization about honeybees. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- A) Cities tend to have a wider range of flowering vegetation than do rural areas, which are often dominated by monoculture crops.
- B) In urban areas, over 60 percent of honeybees, on average, will survive a harsh winter, whereas in rural areas, only 40 percent will.
- C) The strength of honeybees’ immune systems depends on what the bees eat, and a varied diet is more available to bees in an urban area than to those in a rural area.
- D) Honeybees are more likely to thrive in cities than in rural areas because the varied diet available in urban areas strengthens the bees’ immune systems.

**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.**

**No Test Material On This Page**

# 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

Archaeologists studying an ancient amphitheater in Switzerland believe that it dates back to the fourth century CE. Their discoveries of a coin made between 337 and 341 CE and era-appropriate building materials \_\_\_\_\_ evidence for this theory.

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

- A) dismiss
- B) provide
- C) regulate
- D) refuse

2

The following text is adapted from Lewis Carroll's 1865 novel *Alice's Adventures in Wonderland*.

“The second thing is to find my way into that lovely garden. I think that will be the best plan.” It sounded like an excellent plan, no doubt, and very neatly and simply arranged; the only difficulty was, that Alice had not the smallest idea how to set about it.

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

- A) Faintly
- B) Hastily
- C) Easily
- D) Foolishly

3

Cucurbits, a group of plants that includes squash and melons, relied on mastodons to spread their seeds in the Ice Age. When these animals died out, cucurbits faced extinction in turn, having lost their means of seed dispersal. Around this time, however, the ancestors of Indigenous peoples in North America began raising cucurbits as crops, thus \_\_\_\_\_ the plants' survival.

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

- A) verifying
- B) multiplying
- C) comforting
- D) ensuring

4

The recent discovery of a carved wooden figure dating to around 2,000 years ago in a ditch in England was truly surprising. Wooden objects \_\_\_\_\_ survive for so long due to their high susceptibility to rot, but archaeologists suspect layers of sediment in the ditch preserved the figure by creating an oxygen-free environment.

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

- A) sturdily
- B) carelessly
- C) rarely
- D) simply

5

Bicycle sharing systems allow users to rent a bicycle at one location within a city and return it to any other designated location in that city, which can cause serious problems of bicycle supply and user demand within the city's system. Tohru Ikeguchi uses open-source data and statistical modeling to identify when a high number of users making one-way trips is likely to leave some locations within the system \_\_\_\_\_ bicycles and other areas with insufficient supply.

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

- A) susceptible to
- B) contingent on
- C) saturated with
- D) depleted of

6

When ancient oak planks were unearthed during subway construction in Rome, Mauro Bernabei and his team examined the growth rings in the wood to determine where these planks came from. By comparing the growth rings on the planks to records of similar rings in oaks from Europe, the team could trace the wood to the Jura region of France, hundreds of kilometers from Rome. Because timber could only have been transported from distant Jura to Rome by boat, the team's findings suggest the complexity of Roman trade routes.

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

- A) It presents a conclusion about Roman trade routes based on the team's findings.
- B) It questions how the team was able to conclude that the planks were used to build a boat.
- C) It explains why the planks were made from oak rather than a different kind of wood.
- D) It describes common methods used in Roman subway construction.

7

For his 1986 album *Keyboard Fantasies*, Beverly Glenn-Copeland wrote songs grounded in traditional soul and folk music, then accompanied them with futuristic synthesizer arrangements featuring ambient sounds and complex rhythms. The result was so strange, so unprecedented, that the album attracted little attention when first released. In recent years, however, a younger generation of musicians has embraced the stylistic experimentation of *Keyboard Fantasies*. Alternative R&B musicians Blood Orange and Moses Sumney, among other contemporary recording artists, cite the album as an influence.

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

- A) It urges contemporary musicians to adopt the unique sound of *Keyboard Fantasies*.
- B) It responds to criticism of *Keyboard Fantasies* by some younger musicians.
- C) It offers examples of younger musicians whose work has been impacted by *Keyboard Fantasies*.
- D) It contrasts *Keyboard Fantasies* with the recordings of two younger musicians.

8

A number of Indigenous politicians have been elected to the United States Congress since 2000 as members of the country's two established political parties. In Canada and several Latin American countries, on the other hand, Indigenous people have formed their own political parties to advance candidates who will advocate for the interests of their communities. This movement has been particularly successful in Ecuador, where Guadalupe Llori, a member of the Indigenous party known as Pachakutik, was elected president of the National Assembly in 2021.

Which choice best states the main purpose of the text?

- A) To trace the history of an Indigenous political movement and speculate about its future development
- B) To argue that Indigenous politicians in the United States should form their own political party
- C) To highlight two approaches to achieving political representation for Indigenous people
- D) To consider how Indigenous politicians in the United States have influenced Indigenous politicians in Canada and Latin America

9

**Text 1**

In a study of the benefits of having free time, Marissa Sharif found that the reported sense of life satisfaction tended to plateau when participants had two hours of free time per day and actually began to fall when they had five hours of free time per day. After further research, Sharif concluded that this dip in life satisfaction mainly occurred when individuals spent all their free time unproductively, such as by watching TV or playing games.

**Text 2**

Psychologist James Maddux cautions against suggesting an ideal amount of free time. The human desire for both free time and productivity is universal, but Maddux asserts that individuals have unique needs for life satisfaction. Furthermore, he points out that there is no objective definition for what constitutes productivity; reading a book might be considered a productive activity by some, but idleness by others.

Based on the texts, how would Maddux (Text 2) most likely respond to the conclusion Sharif (Text 1) reached after her further research?

- A) By acknowledging that free time is more likely to enhance life satisfaction when it is spent productively than when it is spent unproductively
- B) By challenging the reasoning in Text 1, as it has not been proved that productivity commonly contributes to individuals' life satisfaction
- C) By warning against making an overly broad assumption, as there is no clear consensus in distinguishing between productive and unproductive activities
- D) By claiming that the specific activities named in Text 1 are actually examples of productive activities rather than unproductive ones

10

Xin Wang and colleagues have discovered the earliest known example of a flower bud in a 164-million-year-old plant fossil in China. The researchers have named the new species *Florigerminis jurassica*. They believe that the discovery pushes the emergence of flowering plants, or angiosperms, back to the Jurassic period, which occurred between 145 million and 201 million years ago.

According to the text, how old was the fossil that Wang and colleagues discovered?

- A) 150 million years old
- B) 145 million years old
- C) 164 million years old
- D) 201 million years old

11

Modern dog breeds are largely the result of 160 years of owners crossbreeding certain dogs in order to select for particular physical appearances. Owners often say that some breeds are also more likely than others to have particular personality traits—basset hounds are affectionate; boxers are easy to train—but Kathleen Morrill and colleagues found through a combination of owner surveys and DNA sequencing of 2,000 dogs that while physical traits are predictably heritable among purebred dogs, behavior varies widely among dogs of the same breed.

Which choice best states the main idea of the text?

- A) Dog breeds would not exist without many years of human intervention in dogs' reproduction.
- B) Research fails to confirm a commonly held belief about dog breeds and behavior.
- C) The dog breeds most popular among owners have often changed over the past 160 years.
- D) A study of dog breeds is notable for its usage of both opinion surveys and DNA sequencing.

12

Paleontologist Lucas E. Fiorelli and colleagues have reported the discovery at a mine in Brazil of several egg clutches, partially preserved single eggs, and egg shells from the Late Cretaceous period. The researchers have concluded that the area was once a nesting and breeding site for titanosaurs, a group of sauropod dinosaurs. The finding is significant given the previous lack of known nesting sites in northern regions of South America, which led many paleontologists to assume that titanosaurs migrated south to lay eggs.

What does the text most strongly suggest about the site discovered by the researchers?

- A) It is the earliest known example of a titanosaur nesting and breeding site.
- B) It was very difficult to excavate given that it was discovered in a mine.
- C) It may have been occupied by other sauropods in addition to titanosaurs.
- D) It is farther north than any other nesting site discovered in South America.

13

Attendance and Cost of Hosting  
for Past Four US World's Fairs

World's fairs held in the US	Cost (in US dollars)	Number of visitors
Century 21 Exposition (1962)	\$47 million	9.60 million
HemisFair '68	\$156 million	6.40 million
1984 World's Fair	\$350 million	7.35 million
Expo '74	\$78 million	5.60 million

Huge international exhibitions known as world's fairs have been held since 1851, but the United States hasn't hosted one since 1984. Architecture expert Mina Chow argues that this is because some people think the events are too expensive and not popular enough. For example, the 1984 World's Fair cost \$350 million and had only \_\_\_\_\_

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

- A) 7.35 million visitors.
- B) 9.60 million visitors.
- C) 6.40 million visitors.
- D) 5.60 million visitors.

14

Sample of Food Items from Gemini Mission Menus

Food item	Day	Meal
Sugar cookie cubes	1	B
Chicken and vegetables	2	B
Shrimp cocktail	4	C
Hot cocoa	3	A

To make sure they got the nutrition they needed while in space, the astronauts of NASA's Gemini missions were given menus for three meals a day (meals A, B, and C) on a four-day rotating schedule. Looking at the sample of food items from these menus, a student notes that on day 1, the menu included \_\_\_\_\_

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

- A) shrimp cocktail for meal B.
- B) hot cocoa for meal C.
- C) sugar cookie cubes for meal B.
- D) chicken and vegetables for meal A.

15

*An Ideal Husband* is an 1895 play by Oscar Wilde. In the play, which is a satire, Wilde suggests that a character named Lady Gertrude Chiltern is perceived as both extremely virtuous and unforgiving, as is evident when another character says \_\_\_\_\_

Which quotation from *An Ideal Husband* most effectively illustrates the claim?

- A) "Lady Chiltern is a woman of the very highest principles, I am glad to say. I am a little too old now, myself, to trouble about setting a good example, but I always admire people who do."
- B) "Do you know, [Lady Chiltern], I don't mind your talking morality a bit. Morality is simply the attitude we adopt towards people whom we personally dislike."
- C) "[Lady Chiltern] does not know what weakness or temptation is. I am of clay like other men. She stands apart as good women do—pitiless in her perfection—cold and stern and without mercy."
- D) "Lady Chiltern, you are a sensible woman, the most sensible woman in London, the most sensible woman I know."

## Percentage of Available Eggs Eaten by Cane Toad Tadpoles

Amphibian species (common name)	Percentage of eggs eaten	Native to Australia	Produces bufadienolide
Little red tree frog	1%	yes	no
Cane toad	90%	no	yes
Short-footed frog	7%	yes	no
Striped burrowing frog	10%	yes	no
Dainty green tree frog	1%	yes	no

Native to Latin America, the cane toad was introduced to Australia in the 1930s. In recent decades, tadpoles in the Australian population have been shown to consume eggs of their own species. A 2022 study showed that when presented with cane toad eggs as well as eggs of native Australian amphibians, cane toad tadpoles disproportionately consumed eggs of their own species. This behavior results from their attraction to bufadienolide, a chemical produced by the eggs of cane toads but not by the eggs of native amphibians. However, using data from this study, a student wishes to argue that the presence of bufadienolide doesn't entirely explain the cane toad tadpoles' preference for certain eggs over others.

Which choice best describes data from the table that support the student's argument?

- A) The tadpoles consumed a higher percentage of the striped burrowing frog eggs than they did of the eggs of the dainty green tree frog.
- B) The tadpoles left a certain percentage of the eggs of each of the five species unharmed, thus ultimately allowing them to hatch.
- C) The tadpoles consumed a lower percentage of the short-footed frog eggs than they did of the eggs of their own species.
- D) The tadpoles consumed the same percentage of the dainty green tree frog eggs as they did of the little red tree frog eggs.

17

The Intertropical Convergence Zone (ITCZ), a band of clouds that encircles Earth in the tropics and is a major rainfall source, shifts position in response to temperature variations across Earth's hemispheres. Data from Huagapo Cave in Peru suggest the ITCZ shifted south during the Little Ice Age (circa 1300–1850), but a shift as far into South America as Huagapo should have led to dry conditions in Central America, which is inconsistent with climate models. To resolve the issue, geologist Yemane Asmerom and colleagues collected data from Yok Balum Cave in Central America and compared them with the Huagapo data. They concluded that during the Little Ice Age, the ITCZ may have expanded northward and southward rather than simply shifted.

Which finding from Asmerom and colleagues' study, if true, would most directly support their conclusion?

- A) Neither the Yok Balum data nor the Huagapo data show significant local variations in temperature during the Little Ice Age.
- B) Both the Yok Balum data and the Huagapo data show increased temperatures and prolonged dry conditions during the Little Ice Age.
- C) The Yok Balum data show prolonged dry conditions during the same portions of the Little Ice Age in which the Huagapo data show heightened levels of rainfall.
- D) The Yok Balum data and the Huagapo data show strongly correlated patterns of high rainfall during the Little Ice Age.

18

Some businesses believe that when employees are interrupted while doing their work, they experience a decrease in energy and productivity. However, a team led by Harshad Puranik, who studies management, has found that interruptions by colleagues can have a social component that increases employees' sense of belonging, resulting in greater job satisfaction that benefits employees and employers. Therefore, businesses should recognize that \_\_\_\_\_

Which choice most logically completes the text?

- A) the interpersonal benefits of some interruptions in the workplace may offset the perceived negative effects.
- B) in order to maximize productivity, employers should be willing to interrupt employees frequently throughout the day.
- C) most employees avoid interrupting colleagues because they don't appreciate being interrupted themselves.
- D) in order to cultivate an ideal workplace environment, interruptions of work should be discouraged.

19

The US Geological Survey wants to map every human-made structure in the United States, and it is asking volunteers to help. Cassie Tammy Wang and Ashish D'Souza are just two of the many volunteer map editors who \_\_\_\_\_ to the project since it began in 2012.

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

- A) contribute
- B) will contribute
- C) have contributed
- D) will be contributing

20

Smaller than poppy seeds, tardigrades are tiny, but they are tough. These minuscule animals can survive for thirty years without food or water, and \_\_\_\_\_ can withstand extreme temperatures as low as minus 328 degrees and as high as 304 degrees Fahrenheit.

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

- A) that
- B) it
- C) they
- D) he

21

Emperor penguins don't waddle out of the ocean. They launch themselves at such a high speed that they travel up to two meters before landing. How \_\_\_\_\_ A layer of microbubbles on their plumage reduces friction as the penguins speed to the surface.

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

- A) they are able to move so fast!
- B) are they able to move so fast.
- C) they are able to move so fast.
- D) are they able to move so fast?

22

Before the Erie Canal was completed in 1825, transporting goods by wagon between New York City and the Midwest took up to forty-five days and cost one hundred dollars per ton. By linking the Hudson River to Lake \_\_\_\_\_ canal reduced transport time to nine days and cut costs to six dollars per ton.

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

- A) Erie; the
- B) Erie (the
- C) Erie, the
- D) Erie: the

23

Generations of mystery and horror \_\_\_\_\_ have been influenced by the dark, gothic stories of celebrated American author Edgar Allan Poe (1809–1849).

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

- A) writers
- B) writers,
- C) writers—
- D) writers;

24

Midway through her 1968 jazz album *A Monastic Trio*, Alice Coltrane switches instruments, swapping the piano for the harp. With the same fluid style that Coltrane was famous for on piano, she \_\_\_\_\_ her fingers across the harp strings and creates a radiant sound.

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

- A) sweep
- B) are sweeping
- C) were sweeping
- D) sweeps

25

Mathematician and meteorologist Edward Lorenz used the metaphor of the “butterfly effect” to explain how seemingly minor events can have major impacts on future weather. According to Lorenz’s metaphor, the wind from a butterfly flapping \_\_\_\_\_ in Brazil might eventually grow into a storm elsewhere across the globe.

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

- A) its wings
- B) its wings’
- C) it’s wing’s
- D) it’s wings’

26

On sunny days, dark rooftops absorb solar energy and convert it to unwanted heat, raising the surrounding air \_\_\_\_\_ a light-colored covering to an existing dark roof, either by attaching prefabricated reflective sheets or spraying on a paint-like coating, helps combat this effect.

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

- A) temperature; by adding
- B) temperature, adding
- C) temperature. Adding
- D) temperature by adding

27

The haiku-like poems of Tomas Tranströmer, which present nature- and dream-influenced images in crisp, spare language, have earned the Swedish poet praise from leading contemporary \_\_\_\_\_ them Nigerian American essayist and novelist Teju Cole, who has written that Tranströmer’s works “contain a luminous simplicity.”

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

- A) writers. Among
- B) writers among
- C) writers; among
- D) writers, among

28

In studying whether jellyfish sleep, researchers Michael Abrams, Claire Bedbrook, and Ravi Nath attempted to answer three questions. \_\_\_\_\_ is there a period each day when the pulse rates of jellyfish decline? Second, do jellyfish respond more slowly to stimuli during that period? Finally, if prevented from sleeping, are jellyfish adversely affected?

Which choice completes the text with the most logical transition?

- A) As a result,
- B) First,
- C) Additionally,
- D) However,

29

With her room-sized installation *The Interstitium*, Iranian American artist Laleh Mehran succeeded in creating a space that felt, as intended, both “familiar and distant.” \_\_\_\_\_ with a video screen placed at the far end of the coal slag-encrusted room, her installation was reminiscent of a typical movie theater—albeit one found in a subterranean coal mine.

Which choice completes the text with the most logical transition?

- A) Next,
- B) Nevertheless,
- C) Indeed,
- D) Instead,

30

In response to adverse environmental conditions, many plants produce abscisic acid (ABA), a stress hormone. ABA triggers a slowdown in the biological processes of most plants. \_\_\_\_\_ when the mustard plant *Schrenkiella parvula* produces ABA in response to an environmental stressor, the hormone triggers accelerated growth.

Which choice completes the text with the most logical transition?

- A) Moreover,
- B) In contrast,
- C) For example,
- D) Thus,

31

Historically, most conductors of major orchestras and opera companies have been European men, but a new, more diverse generation of artists is stepping up to the podium. Mexico’s Alondra de la Parra took over as conductor for the Queensland Symphony Orchestra in 2017, \_\_\_\_\_ and Colombia’s Lina Gonzalez-Granados did the same for the Los Angeles Opera in 2022.

Which choice completes the text with the most logical transition?

- A) in addition,
- B) lastly,
- C) granted,
- D) for instance,

32

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

- Planetary scientists classify asteroids based on their composition.
- C-type asteroids are composed primarily of carbon.
- They account for roughly 75 percent of known asteroids.
- S-type asteroids are primarily made up of silicate minerals.
- They account for roughly 17 percent of known asteroids.

The student wants to emphasize a difference between C-type and S-type asteroids. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- Planetary scientists classify asteroids into types, two of which are the C-type and the S-type.
- Planetary scientists consider an asteroid's composition (such as whether the asteroid is composed mainly of silicate minerals or carbon) when classifying it.
- Roughly 17 percent of known asteroids are classified as S-type asteroids; another percentage is classified as C-type asteroids.
- C-type asteroids are mainly composed of carbon, whereas S-type asteroids are primarily made up of silicate minerals.

33

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

- A commodity chain is the series of links connecting the production and purchase of a commodity on the world market.
- Chinese American anthropologist Anna Tsing studies the contemporary commodity chain of matsutake mushrooms.
- At one end of the matsutake chain are mushroom pickers in Oregon.
- At the other end are wealthy consumers who buy the costly matsutake in Japan.
- According to Tsing, "Japanese traders began importing matsutake in the 1980s, when the scarcity of matsutake in Japan first became clear."

The student wants to provide an overview of the matsutake commodity chain. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- The contemporary matsutake commodity chain has its origins in the 1980s when, according to Tsing, "the scarcity of matsutake in Japan first became clear."
- Commodity chains include the linked production and purchase of commodities, such as the matsutake mushroom, on the world market.
- Decades after the Japanese import of matsutake began, a commodity chain now links matsutake pickers in Oregon with wealthy consumers of the costly mushrooms in Japan.
- Wealthy consumers who buy the costly mushrooms in Japan are at one end of the matsutake commodity chain.

## STOP

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

# Math

## 27 QUESTIONS

### DIRECTIONS

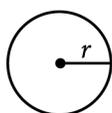
The questions in this section address a number of important math skills. Use of a calculator is permitted for all questions.

### NOTES

Unless otherwise indicated:

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

### REFERENCE

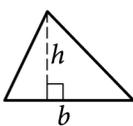


$$A = \pi r^2$$

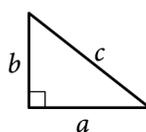
$$C = 2\pi r$$



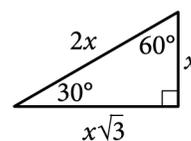
$$A = \ell w$$



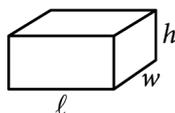
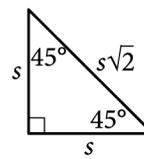
$$A = \frac{1}{2}bh$$



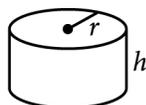
$$c^2 = a^2 + b^2$$



Special Right Triangles



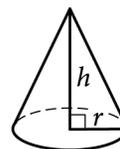
$$V = \ell wh$$



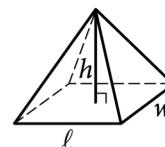
$$V = \pi r^2 h$$



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



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



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

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

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

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

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

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

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

1

How many teaspoons are equivalent to 44 tablespoons? (3 teaspoons = 1 tablespoon)

- A) 47
- B) 88
- C) 132
- D) 176

2

The function  $f$  is defined by  $f(x) = \frac{1}{6x}$ . What is the value of  $f(x)$  when  $x = 3$ ?

- A)  $\frac{1}{3}$
- B)  $\frac{1}{6}$
- C)  $\frac{1}{9}$
- D)  $\frac{1}{18}$

3

If  $x = 40$ , what is the value of  $x + 6$ ?

- A) 34
- B) 40
- C) 46
- D) 64

4

What is 23% of 100?

- A) 23
- B) 46
- C) 77
- D) 123

5

Which expression is equivalent to  $50x^2 + 5x^2$ ?

- A)  $250x^2$
- B)  $10x^2$
- C)  $45x^2$
- D)  $55x^2$

6

The population density of Cedar County is 230 people per square mile. The county has a population of 85,100 people. What is the area, in square miles, of Cedar County?

7

$$\frac{-54}{w} = 6$$

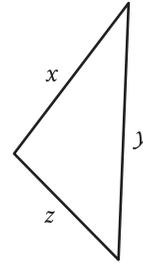
What is the solution to the given equation?

8

For the function  $f$ , the graph of  $y = f(x)$  in the  $xy$ -plane has a slope of 3 and passes through the point  $(0, -8)$ . Which equation defines  $f$ ?

- A)  $f(x) = 3x$
- B)  $f(x) = 3x - 8$
- C)  $f(x) = 3x + 5$
- D)  $f(x) = 3x + 11$

9



Note: Figure not drawn to scale.

The triangle shown has a perimeter of 22 units. If  $x = 9$  units and  $y = 7$  units, what is the value of  $z$ , in units?

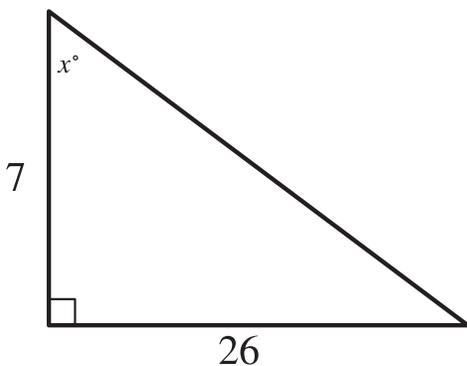
- A) 6
- B) 7
- C) 9
- D) 16

10

The function  $h$  is defined by  $h(x) = 3x - 7$ . What is the value of  $h(-2)$ ?

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

11



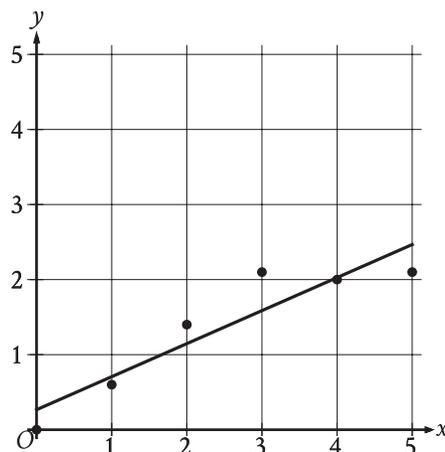
Note: Figure not drawn to scale.

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

- A)  $\frac{1}{26}$
- B)  $\frac{19}{26}$
- C)  $\frac{26}{7}$
- D)  $\frac{33}{7}$

12

The scatterplot shows the relationship between  $x$  and  $y$ . A line of best fit is also shown.



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

- A)  $-2.27$
- B)  $-0.44$
- C)  $0.44$
- D)  $2.27$

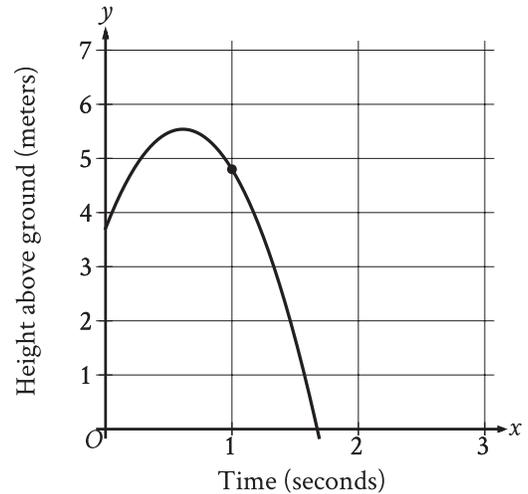
13

The  $y$ -intercept of the graph of  $12x + 2y = 18$  in the  $xy$ -plane is  $(0, y)$ . What is the value of  $y$  ?

14

A model predicts that a certain animal weighed 241 pounds when it was born and that the animal gained 3 pounds per day in its first year of life. This model is defined by an equation in the form  $f(x) = a + bx$ , where  $f(x)$  is the predicted weight, in pounds, of the animal  $x$  days after it was born, and  $a$  and  $b$  are constants. What is the value of  $a$  ?

15



The graph shows the height above ground, in meters, of a ball  $x$  seconds after the ball was launched upward from a platform. Which statement is the best interpretation of the marked point  $(1.0, 4.8)$  in this context?

- A) 1.0 second after being launched, the ball's height above ground is 4.8 meters.
- B) 4.8 seconds after being launched, the ball's height above ground is 1.0 meter.
- C) The ball was launched from an initial height of 1.0 meter with an initial velocity of 4.8 meters per second.
- D) The ball was launched from an initial height of 4.8 meters with an initial velocity of 1.0 meter per second.

16

Based on a random sample from a population, a researcher estimated that the mean value of a certain variable for the population is 20.5, with an associated margin of error of 1. Which of the following is the most appropriate conclusion?

- A) It is plausible that the actual mean value of the variable for the population is between 19.5 and 21.5.
- B) It is not possible that the mean value of the variable for the population is less than 19.5 or greater than 21.5.
- C) Every value of the variable in the population is between 19.5 and 21.5.
- D) The mean value of the variable for the population is 20.5.

17

$$7m = 5(n + p)$$

The given equation relates the positive numbers  $m$ ,  $n$ , and  $p$ . Which equation correctly gives  $n$  in terms of  $m$  and  $p$ ?

- A)  $n = \frac{5p}{7m}$
- B)  $n = \frac{7m}{5} - p$
- C)  $n = 5(7m) + p$
- D)  $n = 7m - 5 - p$

18

A rectangle has a length that is 15 times its width. The function  $y = (15w)(w)$  represents this situation, where  $y$  is the area, in square feet, of the rectangle and  $y > 0$ . Which of the following is the best interpretation of  $15w$  in this context?

- A) The length of the rectangle, in feet
- B) The area of the rectangle, in square feet
- C) The difference between the length and the width of the rectangle, in feet
- D) The width of the rectangle, in feet

19

$$x + 2y = 6$$

$$x - 2y = 4$$

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

- A) 2.5
- B) 5
- C) 6
- D) 10

20

The table shows the frequency of values in a data set.

Value	Frequency
19	7
21	1
23	7
25	4

What is the minimum value of the data set?

21

A number  $x$  is at most 17 less than 5 times the value of  $y$ . If the value of  $y$  is 3, what is the greatest possible value of  $x$ ?

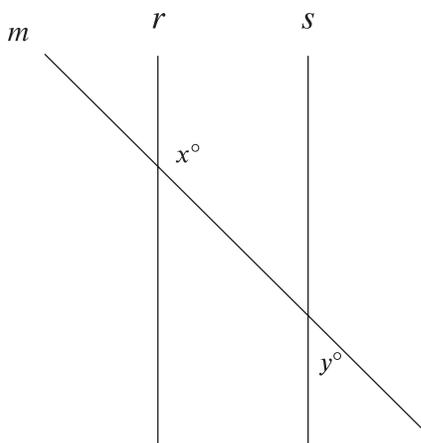
22

$$5x^2 - 37x - 24 = 0$$

What is the positive solution to the given equation?

- A)  $\frac{3}{5}$
- B) 3
- C) 8
- D) 37

23



Note: Figure not drawn to scale.

In the figure shown, lines  $r$  and  $s$  are parallel, and line  $m$  intersects both lines. If  $y < 65$ , which of the following must be true?

- A)  $x < 115$
- B)  $x > 115$
- C)  $x + y < 180$
- D)  $x + y > 180$

24

$$f(x) = \frac{a - 19}{x} + 5$$

In the given function  $f$ ,  $a$  is a constant. The graph of function  $f$  in the  $xy$ -plane, where  $y = f(x)$ , is translated 3 units down and 4 units to the right to produce the graph of  $y = g(x)$ . Which equation defines function  $g$ ?

- A)  $g(x) = \frac{a - 19}{x + 4} + 2$
- B)  $g(x) = \frac{a - 19}{x - 4} + 2$
- C)  $g(x) = \frac{a - 22}{x + 4} + 5$
- D)  $g(x) = \frac{a - 22}{x - 4} + 5$

25

A machine launches a softball from ground level. The softball reaches a maximum height of 51.84 meters above the ground at 1.8 seconds and hits the ground at 3.6 seconds. Which equation represents the height above ground  $h$ , in meters, of the softball  $t$  seconds after it is launched?

- A)  $h = -t^2 + 3.6$
- B)  $h = -t^2 + 51.84$
- C)  $h = -16(t - 1.8)^2 - 3.6$
- D)  $h = -16(t - 1.8)^2 + 51.84$

26

In triangle  $ABC$ , the measure of angle  $B$  is  $90^\circ$  and  $\overline{BD}$  is an altitude of the triangle. The length of  $\overline{AB}$  is 15 and the length of  $\overline{AC}$  is 23 greater than the length of  $\overline{AB}$ . What is the value of  $\frac{BC}{BD}$ ?

- A)  $\frac{15}{38}$
- B)  $\frac{15}{23}$
- C)  $\frac{23}{15}$
- D)  $\frac{38}{15}$

27

$$f(x) = (x + 7)^2 + 4$$

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

**STOP**

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

# Math

## 27 QUESTIONS

### DIRECTIONS

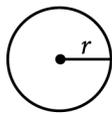
The questions in this section address a number of important math skills. Use of a calculator is permitted for all questions.

### NOTES

Unless otherwise indicated:

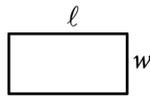
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function  $f$  is the set of all real numbers  $x$  for which  $f(x)$  is a real number.

### REFERENCE

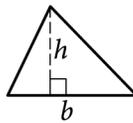


$$A = \pi r^2$$

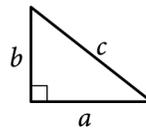
$$C = 2\pi r$$



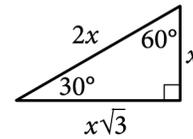
$$A = \ell w$$



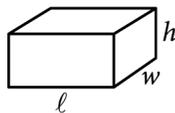
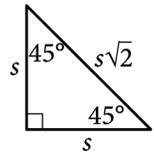
$$A = \frac{1}{2}bh$$



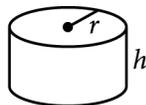
$$c^2 = a^2 + b^2$$



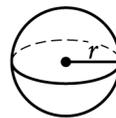
Special Right Triangles



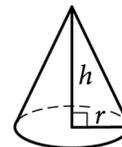
$$V = \ell wh$$



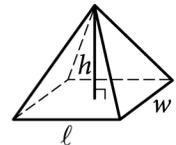
$$V = \pi r^2 h$$



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



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



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

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

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

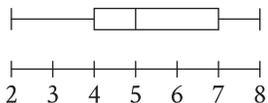
The sum of the measures in degrees of the angles of a triangle is 180.

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

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

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

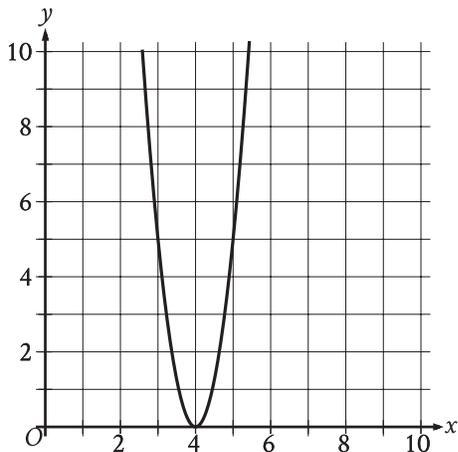
1



The box plot summarizes 15 data values. What is the median of this data set?

- A) 2
- B) 3
- C) 5
- D) 8

2



What is the  $x$ -intercept of the graph shown?

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

3

Henry receives a \$60.00 gift card to pay for movies online. He uses his gift card to buy 3 movies for \$7.50 each. If he spends the rest of his gift card balance on renting movies for \$1.50 each, how many movies can Henry rent?

- A) 10
- B) 25
- C) 35
- D) 40

4

$$\begin{aligned}x &= 49 \\ y &= \sqrt{x} + 9\end{aligned}$$

The graphs of the given equations intersect at the point  $(x, y)$  in the  $xy$ -plane. What is the value of  $y$  ?

- A) 16
- B) 40
- C) 81
- D) 130

5

A cherry pitting machine pits 12 pounds of cherries in 3 minutes. At this rate, how many minutes does it take the machine to pit 96 pounds of cherries?

- A) 8
- B) 15
- C) 24
- D) 36

6

If  $2x = 12$ , what is the value of  $9x$  ?

7

Line  $k$  is defined by  $y = \frac{1}{4}x + 1$ . Line  $j$  is parallel to line  $k$  in the  $xy$ -plane. What is the slope of  $j$  ?

8

6, 6, 8, 8, 8, 10, 21

Which of the following lists represents a data set that has the same median as the data set shown?

- A) 4, 6, 6, 6, 8, 8
- B) 6, 6, 8, 8, 10, 10
- C) 6, 8, 10, 10, 10, 12
- D) 8, 8, 10, 10, 21, 21

9

The length of the base of a certain parallelogram is 89% of the height of the parallelogram. Which expression represents the length of the base of the parallelogram, where  $h$  is the height of the parallelogram?

- A)  $89h$
- B)  $0.089h$
- C)  $8.9h$
- D)  $0.89h$

10

For a camping trip a group bought  $x$  one-liter bottles of water and  $y$  three-liter bottles of water, for a total of 240 liters of water. Which equation represents this situation?

- A)  $x + 3y = 240$
- B)  $x + y = 240$
- C)  $3x + 3y = 240$
- D)  $3x + y = 240$

11

$$y = -4x + 40$$

Which table gives three values of  $x$  and their corresponding values of  $y$  for the given equation?

A) 

$x$	$y$
0	0
1	-4
2	-8

B) 

$x$	$y$
0	40
1	44
2	48

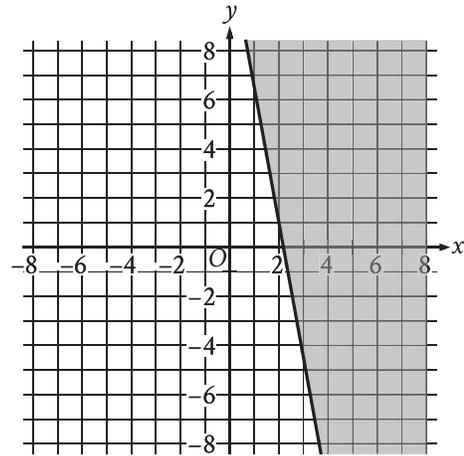
C) 

$x$	$y$
0	40
1	36
2	32

D) 

$x$	$y$
0	0
1	4
2	8

12



The shaded region shown represents solutions to an inequality. Which ordered pair  $(x, y)$  is a solution to this inequality?

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

13

In triangle  $JKL$ , the measures of  $\angle K$  and  $\angle L$  are each  $48^\circ$ . What is the measure of  $\angle J$ , in degrees? (Disregard the degree symbol when entering your answer.)

14

$$y = x^2 + 14x + 48$$
$$x + 8 = 11$$

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

15

A cleaning service that cleans both offices and homes can clean at most 14 places per day. Which inequality represents this situation, where  $f$  is the number of offices and  $h$  is the number of homes?

- A)  $f + h \leq 14$
- B)  $f + h \geq 14$
- C)  $f - h \leq 14$
- D)  $f - h \geq 14$

16

Which expression is a factor of  $2x^2 + 38x + 10$ ?

- A) 2
- B)  $5x$
- C)  $38x$
- D)  $2x^2$

17

The equation  $40x + 20y = 160$  represents the number of sweaters,  $x$ , and number of shirts,  $y$ , that Yesenia purchased for \$160. If Yesenia purchased 2 sweaters, how many shirts did she purchase?

- A) 3
- B) 4
- C) 8
- D) 40

18

$$y = 0.25x^2 - 7.5x + 90.25$$

The equation gives the estimated stock price  $y$ , in dollars, for a certain company  $x$  days after a new product launched, where  $0 \leq x \leq 20$ . Which statement is the best interpretation of  $(x, y) = (1, 83)$  in this context?

- A) The company's estimated stock price increased \$83 every day after the new product launched.
- B) The company's estimated stock price increased \$1 every 83 days after the new product launched.
- C) 1 day after the new product launched, the company's estimated stock price is \$83.
- D) 83 days after the new product launched, the company's estimated stock price is \$1.

19

$$f(x) = 39$$

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

A) 

$x$	$f(x)$
0	0
1	0
2	0

B) 

$x$	$f(x)$
0	39
1	39
2	39

C) 

$x$	$f(x)$
0	0
1	39
2	78

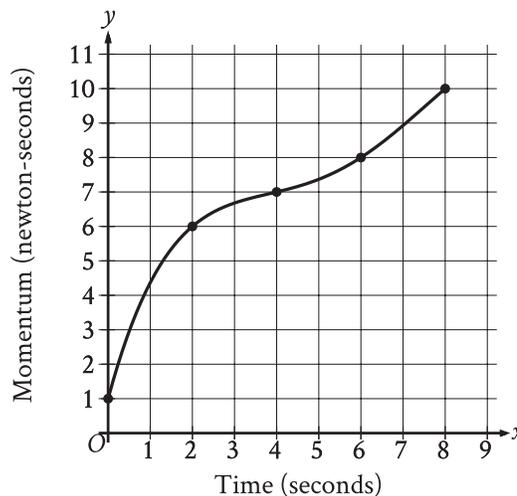
D) 

$x$	$f(x)$
0	39
1	0
2	-39

20

A triangular prism has a height of 8 centimeters (cm) and a volume of  $216 \text{ cm}^3$ . What is the area, in  $\text{cm}^2$ , of the base of the prism? (The volume of a triangular prism is equal to  $Bh$ , where  $B$  is the area of the base and  $h$  is the height of the prism.)

21



The graph shows the momentum  $y$ , in newton-seconds, of an object  $x$  seconds after the object started moving, for  $0 \leq x \leq 8$ . What is the average rate of change, in newton-seconds per second, in the momentum of the object from  $x = 2$  to  $x = 6$ ?

22

$$-15x + 25y = 65$$

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

- A)  $12x + 20y = 52$   
 B)  $12x + 20y = -52$   
 C)  $-12x + 20y = 52$   
 D)  $-12x + 20y = -52$

23

A bus traveled on the highway and on local roads to complete a trip of 160 miles. The trip took 4 hours. The bus traveled at an average speed of 55 miles per hour (mph) on the highway and an average speed of 25 mph on local roads. If  $x$  is the time, in hours, the bus traveled on the highway and  $y$  is the time, in hours, it traveled on local roads, which system of equations represents this situation?

- A)  $55x + 25y = 4$   
 $x + y = 160$
- B)  $55x + 25y = 160$   
 $x + y = 4$
- C)  $25x + 55y = 4$   
 $x + y = 160$
- D)  $25x + 55y = 160$   
 $x + y = 4$

24

Quadrilateral  $P'Q'R'S'$  is similar to quadrilateral  $PQRS$ , where  $P$ ,  $Q$ ,  $R$ , and  $S$  correspond to  $P'$ ,  $Q'$ ,  $R'$ , and  $S'$ , respectively. The measure of angle  $P$  is  $30^\circ$ , the measure of angle  $Q$  is  $50^\circ$ , and the measure of angle  $R$  is  $70^\circ$ . The length of each side of  $P'Q'R'S'$  is 3 times the length of each corresponding side of  $PQRS$ . What is the measure of angle  $P'$ ?

- A)  $10^\circ$
- B)  $30^\circ$
- C)  $40^\circ$
- D)  $90^\circ$

25

$$f(x) = 2x + 244$$

The given function  $f$  represents the perimeter, in centimeters (cm), of a rectangle with a length of  $x$  cm and a fixed width. What is the width, in cm, of the rectangle?

- A) 2
- B) 122
- C) 244
- D) 488

26

The functions  $f$  and  $g$  are defined by the given equations, where  $x \geq 0$ . Which of the following equations displays, as a constant or coefficient, the maximum value of the function it defines, where  $x \geq 0$  ?

I.  $f(x) = 33(0.4)^{x+3}$

II.  $g(x) = 33(0.16)(0.4)^{x-2}$

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

27

$$64x^2 - (16a + 4b)x + ab = 0$$

In the given equation,  $a$  and  $b$  are positive constants. The sum of the solutions to the given equation is  $k(4a + b)$ , where  $k$  is a constant. What is the value of  $k$  ?

**STOP**

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

**No Test Material On This Page**

# PSAT/NMSQT®

Preliminary SAT/National Merit Scholarship Qualifying Test

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## GENERAL DIRECTIONS

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

## TIMING

Reading and Writing, Module 1: 39 minutes

Reading and Writing, Module 2: 39 minutes

*10-minute break*

Math, Module 1: 43 minutes

Math, Module 2: 43 minutes

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

## MARKING YOUR ANSWERS

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

## USING YOUR TEST BOOK

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