Practice Test 1

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Form 25MC1

2025 | 2026

Directions

This booklet contains tests in English, mathematics, reading, and science. These tests measure skills and abilities highly related to high school course work and success in college. **Calculators may be used on the mathematics test only.**

The questions in each test are numbered, and the suggested answers for each question are lettered. On the answer document, the rows of ovals are numbered to match the questions, and the ovals in each row are lettered to correspond to the suggested answers.

For each question, first decide which answer is best. Next, locate on the answer document the row of ovals numbered the same as the question. Then, locate the oval in that row lettered the same as your answer. Finally, fill in the oval completely. Use a soft lead pencil and make your marks heavy and black. **Do not use ink or a mechanical pencil.**

Mark only one answer to each question. If you change your mind about an answer, erase your first mark thoroughly before marking your new answer. For each question, make certain that you mark in the row of ovals with the same number as the question.

Only responses marked on your answer document will be scored. Your score on each test will be based only on the number of questions you answer correctly during the time allowed for that test. You will **not** be penalized for guessing. **It is to your advantage to answer every question even if you must guess.**

You may work on each test **only** when the testing staff tells you to do so. If you finish a test before time is called for that test, you should use the time remaining to reconsider questions you are uncertain about in that test. You may **not** look back to a test on which time has already been called, and you may **not** go ahead to another test. To do so will disqualify you from the examination.

Lay your pencil down immediately when time is called at the end of each test. You may **not** for any reason fill in or alter ovals for a test after time is called for that test. To do so will disqualify you from the examination.

Do not fold or tear the pages of your test booklet.

DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.

ENGLISH TEST

35 Minutes—50 Questions

DIRECTIONS: In the passages that follow, certain words and phrases are underlined and numbered. In the right-hand column, you will find alternatives for the underlined part. You are to choose the best answer to each question. If you think the original version is best, choose "**No Change**."

You will also find questions about a section of the passage, or about the passage as a whole. These questions do not refer to an underlined portion of the passage, but rather are identified by a number or numbers in a box.

For each question, choose the alternative you consider best and fill in the corresponding oval on your answer document. Read each passage through once before you begin to answer the questions that accompany it. For many of the questions, you must read several sentences beyond the question to determine the answer. Be sure that you have read far enough ahead each time you choose an alternative.

PASSAGE I

Alex Atala and Brazilian Cuisine

At first, [1] Brazilian chef Alex Atala opened his restaurant in São Paulo in 1999, people told him he'd never succeed. In a country where European cuisine was held in the highest regard, they said, no one would patronize a restaurant serving Brazilian food. Atala, whose restaurant has consistently ranked among the world's best, has long disproven the naysayers. Using traditional Brazilian ingredients, such as, manioc root [2] and even ants—in innovative ways, he has thrilled [3] diners from around the world.

Still, Atala felt he could do more for his country and its cuisine. [4] In 2012, he founded Instituto Atá to help promote lesser-known ingredients, particularly those of the Amazon basin, while working to protect Brazil's biodiversity. Hearts of palm, for example, were typically

1. Which choice makes the sentence most grammatically acceptable?

A. No Change
B. Years ago,
C. When
D. Delete the underlined portion.

2. Which choice makes the sentence most grammatically acceptable?

F. No Change
G. ingredients—such as manioc root
H. ingredients such as—manioc root
J. ingredients such as, manioc root,

3. The writer wants to emphasize the positive experience diners have had at Atala's restaurant. Which choice best accomplishes that goal?

A. No Change
B. mystified
C. shocked
D. startled

4. Given that all the choices are accurate, which one provides the best transition from the preceding paragraph to this paragraph?

F. No Change
G. Atala is known for sometimes incorporating fragrances into his dishes as well.
H. In fact, Atala's culinary training took place in classic European restaurants.
J. Atala's obvious affection for his homeland is said to be infectious.

GO ON TO THE NEXT PAGE.

harvested from Brazil's wild juçara palms in an unsustainable way. Needing eight years to mature, the tree dies once its[5] large heart is removed. Atala began persuading producers to cultivate Amazonian pupunha palms, which grow clusters of stems, each with a small heart. Careful harvesting ensures that the tree will live to yield[6] more hearts, resulting in environmentally friendly production.

Atala prioritizes his working relationships with Amazonian tribes. Utilizing their historical know-how they have,[7] he aims to bolster tribe members' livelihoods while exposing a wider audience to Brazilian ingredients. For instance, Baniwa women have farmed distinctly flavorful chili peppers for centuries that use[8] indigenous agricultural techniques, to create a seasoning called pimenta jiquitaia. Partnering with Instituto Atá have enabled[9] these women from a remote rain forest region to scale up production and market their product globally.

Expanding awareness of the rich diversity of Brazil's native ingredients, Atala continues to lead in deciphering[10] the country's food culture. With his characteristic passion and intensity, the renowned chef seeks to inspire Brazilians to rediscover the connections between culture, nature, and food.

5. Which choice makes the sentence most grammatically acceptable?

A. No Change
B. tree dies once their
C. trees die once its
D. tree dies once it's

6. Which choice most effectively maintains the essay's tone?

F. No Change
G. pull through and spawn
H. continue to churn out
J. keep doling out

7. Which choice is least redundant in context?

A. No Change
B. knowledge that tribe members know about local plants,
C. knowledge of local plants in the area,
D. knowledge of local plants,

8. Which choice makes the sentence most grammatically acceptable?

F. No Change
G. centuries, which use
H. centuries who use
J. centuries, using

9. Which choice makes the sentence most grammatically acceptable?

A. No Change
B. has enabled
C. are enabling
D. enable

10. Which choice is clearest and most precise in context?

F. No Change
G. transforming
H. dislocating
J. contorting

GO ON TO THE NEXT PAGE.

PASSAGE II

Rediscovering Hrosvitha

Hrosvitha, a medieval author and dramatist—is [11] one of the earliest known European women playwrights. Although little is known about her life, scholars agree Hrosvitha was born to a noble family around 935 CE. As a relation of Holy Roman Emperor Otto I, she most likely spent her early years as part of his court. Later, sometime before 959 CE, she entered the abbey at Gandersheim, it was [12] well known as a significant center of learning.

Hrosvitha entered Gandersheim as a canoness rather than a nun. Her title did not require a vow of poverty, but Hrosvitha did take the abbey's customary vow of chastity, which absolved her of an obligation to marry. This circumstance made it okay for her to keep [13] her financial status without incurring responsibilities to a husband and children. Nevertheless, [14] Hrosvitha had a greater level of independence—she could acquire property, receive guests, employ servants, and visit the royal court—than most women of her time.

Hrosvitha produced at least eight narrative religious poems, two historical epics (about the court of Otto I and [15] Gandersheim), and six comedy-dramas. It is for these dramas that she is best known today.

11. Which choice makes the sentence most grammatically acceptable?

A. No Change
B. author and dramatist,
C. author, and dramatist
D. author and dramatist

12. Which choice makes the sentence most grammatically acceptable?

F. No Change
G. Gandersheim and, historically, this abbey was
H. Gandersheim, it was an abbey
J. Gandersheim, an abbey

13. Which choice most effectively maintains the essay's tone?

A. No Change
B. permitted her to hang on to
C. allowed her to retain
D. let her keep up

14. Which transition word or phrase is most logical in context?

F. No Change
G. On the other hand,
H. As a result,
J. In contrast,

15. Which choice best helps indicate that each historical epic covered different subject matter?

A. No Change
B. (each focused on the court of Otto I and
C. (focusing on the court of Otto I as well as
D. (one about the court of Otto I, the other about

GO ON TO THE NEXT PAGE.

PASSAGE III

A Musical Detour

[1]

Every night while driving home from a hectic day at work, my three-year-old twins quarreling in the backseat, I take a short detour. I turn off the gridlocked highway, onto a stretch of Route 66 that is,[16] surrounded by arid New Mexico hills. When we're nearly three miles into our detour, I roll down the windows. Looking pointedly into the rearview mirror, windows rolled down,[17] I say something about not throwing anything out of the car, but neither boy is listening. I check my speed. [A] Carefully, I steer toward the fog line. "Here it is, boys!" I yell at the backseat, the passenger-side tires finding the rumble strips etched into the asphalt.

[2]

Normal rumble strips create that loud, grating noise when you drive over them—like a built-in alarm for drivers who drift too close to the road's edge.[18] These strips[18] are different. The boys abruptly stop their squalling as the car begins to vibrate. Then, instead of that jolting warning noise, we hear the distinct strain of the song "America the Beautiful." [B] The road is playing us a song.

[3]

I've been taking this detour out of Albuquerque for two years, ever since these musical rumble strips were installed.[19] City planners wanted to find out whether the novelty of hearing a snippet of song would give drivers an incentive to obey the speed limit; the tune is only recognizable if they're going a reasonable forty-five miles per hour. Whether this strategy works, I don't know.

16. Which choice makes the sentence most grammatically acceptable?

F. **No Change**
G. highway onto a stretch of Route 66, that is,
H. highway onto a stretch, of Route 66 that is
J. highway onto a stretch of Route 66 that is

17. Which choice is least redundant in context?

A. **No Change**
B. into the rearview mirror, three miles into our detour,
C. behind me by looking into the rearview mirror,
D. into the rearview mirror,

18. If the writer were to delete the underlined portion (adjusting the punctuation as needed), the paragraph would primarily lose:

F. information that indicates how prevalent rumble strips are on roadways.
G. a detail that reveals the narrator's opinion of distracted drivers.
H. information that clarifies a primary function of rumble strips.
J. a detail that indicates what the rumble strips look like.

19. Which choice is least redundant in context?

A. **No Change**
B. were implemented just outside Albuquerque.
C. that play music were put in.
D. were added a couple years ago.

[C] For me, this brief musical interlude is a charming curiosity, a welcome interruption in my work-week slog. Even though constant traffic has worn down the musical rumble strips and warped the sound of some of the notes, there are currently no plans to restore the strips. [20]

[4]

After the last one of the notes fades [21] into the darkening sky, I glance back at the boys, who have [22] been lulled by the wonder of the song. [D] I stop worrying about work, about how many toy cars might have gotten lost between there and home. Until then, [23] I feel like everything is going to be just fine. [24]

20. Given that all the choices are accurate, which one most effectively leads into the rest of the essay?

F. **No Change**
G. lots of other drivers, not just me, still make this detour to hear the tune.
H. sometimes drivers will turn around and drive over the strips again.
J. this detour on our drive home never fails to buoy my spirits.

21. Which choice makes the sentence most grammatically acceptable?

A. **No Change**
B. have disappeared
C. disappear
D. fade

22. Which choice makes the sentence most grammatically acceptable?

F. **No Change**
G. whom have
H. they have
J. whose

23. Which transition word or phrase is most logical in context?

A. **No Change**
B. Now and then,
C. For now,
D. Later,

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

I hear there is another musical road in the US, somewhere in California.

Should the writer make this addition?

F. Yes, because it makes clear that the narrator has plans to travel on other musical roads.
G. Yes, because it indicates that the musical road in New Mexico is not unique.
H. No, because it draws the focus away from the New Mexico musical road and its effect on the narrator.
J. No, because it fails to provide specific details about the construction of the musical road in California.

GO ON TO THE NEXT PAGE.

Question 25 asks about the preceding passage as a whole.

25. The writer wants to add the following sentence to the essay:

It is marvelously quiet.

The sentence would most logically be placed at:

A. Point A in Paragraph 1.
B. Point B in Paragraph 2.
C. Point C in Paragraph 3.
D. Point D in Paragraph 4.

PASSAGE IV

The Case for Visible Storage

[1]

Public museums exist for two main reasons: to educate the public and provide stewardship (legal and ethical management, care, documentation, and use) of their collections. Unfortunately, due to space constraints, a typical museum only exhibits about ten percent of the items in its collection; the other ninety percent remains in storage. When displaying such a small portion of artifacts severely limits public access and therefore public education. Furthermore, maintaining such a large number of artifacts in storage while acquiring additional items makes finding enough suitable storage space difficult, especially for delicate items. [A]

[2]

To remain true to the goals of education and stewardship, museums should dedicate public access space to visible storage. [B] Also known as open storage, visible storage provides ways to display many items in small or irregular spaces, allowing more artifacts to be on exhibit. [C]

26. If the writer were to delete the underlined portion, the essay would primarily lose a:

F. suggestion that not all public museums provide proper stewardship for their artifacts.
G. clarification of what public museum stewardship entails.
H. list of reasons for educating the public on stewardship.
J. description of the daily tasks performed by curators.

27. Which choice makes the sentence most grammatically acceptable?

A. **No Change**
B. With the display of
C. While displaying
D. Displaying

28. Which choice makes the sentence most grammatically acceptable?

F. **No Change**
G. storage makes providing
H. storage, which provides
J. storage, providing

GO ON TO THE NEXT PAGE.

[3]

In a traditional museum display, each artifact is labeled and positioned at eye level with plenty of space between it (29) and the other objects.

29. Which choice makes the sentence most grammatically acceptable?

A. **No Change**
B. between them
C. among them
D. among it

Subsequently, (30) artifacts in visible storage spaces are placed close together and are often displayed from floor to ceiling with few labels. Areas of a museum that cannot house a traditional display, therefore, might be ideal for a visible storage display. Ceramic pottery where it (31) might otherwise be positioned in individual glass cases might be lined up on shelves behind a glass wall. An antique fork and spoon fastened to a large informational board might instead be part of an entire set of silverware arranged under glass in pull-out cabinet drawers. [D]

30. Which transition word is most logical in context?

F. **No Change**
G. Conversely,
H. Namely,
J. Granted,

31. Which choice makes the sentence most grammatically acceptable?

A. **No Change**
B. that which
C. that
D. **Delete** the underlined portion.

[4]

While some artifacts can never be displayed [32], many pieces that can—and should—be viewed are not. (33)

32. At this point, the writer is considering adding the following parenthetical phrase:

(whether because of light sensitivity or the request of a donor)

Given that the information is accurate, should the writer make this addition here?

F. Yes, because it gives specific examples to help explain why some objects can never be displayed in a museum.
G. Yes, because it offers specific examples of items that require special storage.
H. No, because it detracts from the paragraph's focus on the ideal museum layout.
J. No, because it diminishes the role museums play in educating the public.

33. Which choice makes the sentence most grammatically acceptable?

A. **No Change**
B. can and should—
C. can, and should
D. can and, should

GO ON TO THE NEXT PAGE.

Whereas a museum designates areas for visible storage, it [34] uses space efficiently, providing safe displays for artifacts and allowing visitors greater access to independently study the works that make the museum unique.

34. Which choice is clearest and most precise in context?

F. No Change
G. Although
H. When
J. Since

Question 35 asks about the preceding passage as a whole.

35. The writer wants to add the following sentence to the essay:

This potentially compromises stewardship.

For the sake of logic and cohesion, the sentence should be placed at:

A. Point A in Paragraph 1.
B. Point B in Paragraph 2.
C. Point C in Paragraph 2.
D. Point D in Paragraph 3.

PASSAGE V

The Sociable Weavers' Complex Nest

In the sparse yet relatively green environment of the Kalahari Desert, birds known as sociable weavers build their enormous nests atop the desert's signature camelthorn trees. Slung across the branches, each nest—which can measure up to thirteen feet wide and seven feet thick—is a sprawling community home to hundreds of birds. [36]

36. If the writer were to delete the phrase "which can measure up to thirteen feet wide and seven feet thick" from the preceding sentence (adjusting the punctuation as needed), the sentence would primarily lose:

F. specific information that illustrates the minimum height at which the weavers begin building their nests.
G. specific information that underscores the enormousness of the weavers' nests.
H. details that clarify how the weavers are able to survive in the Kalahari Desert.
J. details that explain how the weavers' nests differ from other birds' nests.

GO ON TO THE NEXT PAGE.

A weaver nest does not resemble a common bowl-like bird nest. Although the weavers use typical materials such as sticks, grass, and feathers to construct their nests, the nests look more like disorganized piles.[37] Built within each nest are as many as one hundred four-to-six-inch-wide chambers. A bird enters a chamber by flying to the underside of the nest, it squeezes[38] through a one-inch-wide entrance hole, and continuing up a passageway to a chamber. In each chamber, up to five of the sparrow-sized birds can huddle as a group together when the Kalahari nights get cold.[39]

The multi-chamber construction of the weaver nest has drawn comparisons to that of an apartment building. Indeed, the nests exemplify communal living at there[40] most effective. Each one houses multiple generations of birds, all of whom work together to maintain their home.

37. The writer wants to emphasize the unusual appearance of the weavers' nests by using playful language to evoke a specific image. Which choice best accomplishes this goal?

A. **No Change**
B. carelessly plunked-down haystacks.
C. collections of disparate items.
D. large knots.

38. Which choice makes the sentence most grammatically acceptable?

F. **No Change**
G. then squeezes
H. squeezing
J. to squeeze

39. Which choice is least redundant in context?

A. **No Change**
B. all together, staying warm when the temperature drops and gets colder at night.
C. and stay warm when temperatures plummet at night and it's cold.
D. for warmth during the cold Kalahari nights.

40. Which choice makes the sentence most grammatically acceptable?

F. **No Change**
G. when its at it's
H. at it's
J. at its

PASSAGE VI

The Artful Stitch of *Paj Ntaub*

She depicts flowers with layers of petals, intricate spirals and rosettes, teardrops bending within circles, and dizzying mazes of lines[41]—embroidering them in vibrant reds, blues, pinks, yellows, and greens on fabric of delicate silk or cotton. Pang Xiong Sirirathasuk Sikoun is a master of *paj ntaub*, or "flower cloth" embroidery, the most difficult of the century's-oldest[42] Hmong needlework arts.

Paj ntaub is increasingly made in lighter, softer shades today.[43] She's been creating stitched textiles since she was a young woman living in northern Laos. For the past several decades, she's been designing *paj ntaub* in Philadelphia, Pennsylvania, where she also teaches her craft.

Flower cloth (commonly as a shirt, dress, coat, or collar)[44] is made to be worn as clothing and, depending on the amount of needlework on the piece, is designed either for everyday wear or for a special occasion.

41. Which choice best maintains the stylistic pattern of descriptions established earlier in the sentence?

A. **No Change**
B. something with a dizzying effect—
C. mazes that she creates—
D. so many lines—

42. Which choice makes the sentence most grammatically acceptable?

F. **No Change**
G. centuries-old
H. centuries'-old
J. century's-old

43. The writer is considering deleting the underlined sentence. Should the sentence be kept or deleted?

A. Kept, because it compares Pang Xiong's embroidery style with that of modern *paj ntaub*.
B. Kept, because it places the subject of the essay in a modern context.
C. Deleted, because it detracts from the paragraph's focus on the various styles of ancient Hmong needlework arts.
D. Deleted, because it adds a detail that is irrelevant to the paragraph's introduction of Pang Xiong's connection to *paj ntaub*.

44. The best placement for the underlined portion would be:

F. where it is now.
G. after the word *made*.
H. after the word *clothing*.
J. after the word *needlework*.

GO ON TO THE NEXT PAGE.

With pattern names such as "elephant's foot" and "snail house" and images of animals framed by geometric designs, *paj ntaub* patterns are versatile. [45] What distinguishes *paj ntaub* from other Hmong needlework arts are the artist's use of tiny, tight stitches and several complex techniques. One technique is reverse appliqué, in which [46] shapes are cut out from, rather than added on top of, the embroidered fabric. Another is elaborate overstitching: thousands of layered stitches are applied to its surface. [47]

Pang Xiong regrets that most people she knows today wear only regular [48] clothes. When she was growing up in Laos, she explains, she had few items of clothing, but each garment she owned was handcrafted *paj ntaub*.

45. Which choice most clearly builds on the information provided earlier in the sentence about a common theme in *paj ntaub* patterns and images?

A. **No Change**
B. only a master artist is able to create *paj ntaub* clothing for special occasions.
C. *paj ntaub* patterns are extraordinarily colorful.
D. *paj ntaub* celebrates the natural world.

46. Which choice makes the sentence most grammatically acceptable?

F. **No Change**
G. appliqué which
H. appliqué and
J. appliqué,

47. Which choice makes the sentence most grammatically acceptable?

A. **No Change**
B. the surface of the fabric.
C. the surface of it.
D. their surface.

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

mass-produced

Should the writer make this revision?

F. Yes, because the revision creates a clearer contrast between the homogeneous styles of clothing that are popular today and the handcrafted *paj ntaub*.
G. Yes, because the revision emphasizes Pang Xiong's desire for her handcrafted *paj ntaub* to be sold on a large scale in stores.
H. No, because the original word reinforces the idea that although *paj ntaub* clothing can be used for everyday wear, it should be saved for special occasions.
J. No, because the original word more specifically describes the type of clothing Pang Xiong disapproves of.

GO ON TO THE NEXT PAGE.

However, she still wears flower cloth every day and
49
would like to inspire others to do so. Pang Xiong teaches *paj ntaub* in art museums—including at the Smithsonian Institution, where some of her textiles are on permanent display—and in community settings around Philadelphia.

50 Pang Xiong is showing a new generation the joys of *paj ntaub* and beautiful handcrafted clothing.

49. Which transition word or phrase, if any, is most logical in context?

A. No Change
B. For example, she
C. Besides, she
D. She

50. Which of the following true statements, if added here, would best build on the ideas presented in this paragraph and connect to the final sentence of the essay?

F. She loves when people, no matter what their ethnicity, wear traditional clothing every day.
G. She often teaches *paj ntaub* to Hmong adults her age who want to learn new techniques.
H. Recently, she worked with nine young Hmong women in a formal apprenticeship.
J. One of her own favorite pieces tells the story of her family.

END OF TEST 1

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

MATHEMATICS TEST

50 Minutes—45 Questions

DIRECTIONS: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose, but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

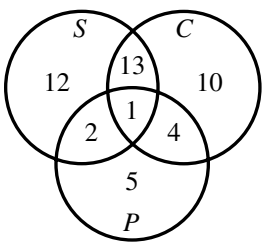
1. Illustrative figures are **not** necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word "line" indicates a straight line.
4. The word "average" indicates arithmetic mean.

DO YOUR FIGURING HERE.

1. Cameron took 4 tests, and his scores were as follows: 100, 60, 80, and 30. Cameron took another test that was scored x. The mean score of the 5 tests he took is 72. What is the value of x?

A. 54
B. 67.5
C. 68.4
D. 90

2. In the Venn diagram below, circles S, C, and P represent farms raising sheep, cows, and pigs, respectively. How many of the 47 farms represented in the diagram do **not** raise cows?



F. 15
G. 17
H. 18
J. 19

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

3. Marco designs a spinner wheel that has exactly 4 sections: red, blue, green, and yellow. He wants the spinner wheel to have a 25% chance of landing on each section. He spins the wheel 500 times. The results of the spins are shown in this table.

Spinner wheel section	Number of times the spinner lands in each section
Red	80
Blue	165
Green	130
Yellow	125

Based on the results in this table, one of the following changes would be the best fix. Which one?

A. He should decrease the area of the red section by increasing the area of the blue section.
B. He should increase the area of the red section by decreasing the area of the blue section.
C. He should increase the area of the red section by decreasing the area of any of the other three sections.
D. He should decrease the area of the blue section, and then it does **not** matter which section's area is increased.

4. In $\triangle ABC$, $\angle A$ and $\angle C$ are congruent, and the measure of $\angle B$ is 143.6°. What is the measure of $\angle A$?

F. 18.2°
G. 36.4°
H. 71.8°
J. 143.6°

5. Which of the following expressions is equivalent to $x^2 - x - 30$?

A. $(x + 3)(x - 10)$
B. $(x + 6)(x - 5)$
C. $(x - 6)(x + 5)$
D. $(x - 15)(x - 15)$

6. Which of the following matrices is equal to $5\begin{bmatrix} -4 & 2 \\ 0 & -5 \end{bmatrix}$?

F. $\begin{bmatrix} -20 & -15 \end{bmatrix}$

G. $\begin{bmatrix} -10 \\ -25 \end{bmatrix}$

H. $\begin{bmatrix} 1 & 7 \\ 5 & 0 \end{bmatrix}$

J. $\begin{bmatrix} -20 & 10 \\ 0 & -25 \end{bmatrix}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

7. Lavonne purchased some tickets and snack vouchers for an upcoming event and gave them to the members of her work group. Each member of her work group received the same number of tickets and the same number of snack vouchers. The total number of tickets she gave to her group was 30, and the total number of snack vouchers was 75. Which of the following could be the number of members in Lavonne's work group?

A. 10
B. 15
C. 25
D. 30

8. The initial speed, in miles per hour, of a certain car that skids to a stop can be estimated by multiplying the length of the skid, in feet, by 35 and then taking the square root of the product. According to this method, what is the estimated initial speed, in miles per hour, of the car when it makes a 108-foot skid?

F. $\sqrt{143}$
G. $7\sqrt{105}$
H. $6\sqrt{105}$
J. $210\sqrt{3}$

9. If $6y = 5x - 1$, then $x = ?$

A. $\frac{6}{5}y - 1$
B. $\frac{6}{5}y + 1$
C. $\frac{6y - 1}{5}$
D. $\frac{6y + 1}{5}$

10. A boat is traveling at a speed of 30 miles per hour. What is the boat's speed in feet per second?

(Note: 1 mile = 5,280 feet)

F. 20
G. 30
H. 44
J. 176

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

11. An object is launched vertically at 30 meters per second from a 55-meter-tall platform. The height, $h(t)$ meters, of the object t seconds after launch is modeled by $h(t) = -4.9t^2 + 30t + 55$. What will be the height, in meters, of the object 3 seconds after launch?

A. 44.1
B. 100.9
C. 145
D. 189.1

12. The whole numbers 1 through 30 were each written on separate pieces of paper. Those 30 pieces of paper were put into a jar. One piece of paper will be randomly drawn from this jar. What is the probability that this piece of paper will have a prime number written on it?

F. $\frac{1}{30}$

G. $\frac{1}{20}$

H. $\frac{1}{10}$

J. $\frac{10}{30}$

13. For an angle with measure α in a right triangle, $\sin\alpha = \frac{5}{13}$ and $\tan\alpha = \frac{5}{12}$. What is the value of $\cos\alpha$?

A. $\frac{12}{13}$

B. $\frac{12}{\sqrt{194}}$

C. $\frac{12}{\sqrt{119}}$

D. $\frac{13}{12}$

14. Which of the following values, if any, is the y-value of the solution set to the system of equations below?

$2x - y = 7$
$-4x + 2y = 2$

F. 2
G. 5
H. 9
J. There is no such value for y.

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

15. Which of the following expressions is equivalent to $(y + 7)^3$?

A. $y^3 + 21y^2 + 147y + 343$
B. $y^3 + 14y + 343$
C. $y^3 + 14y + 49$
D. $y^3 + 343$

16. The sum of 3 positive integers is 180, and the ratio of the integers is 5:3:2. What is the value of the smallest of the integers?

F. 18
G. 36
H. 54
J. 90

17. Which of the following expressions is equivalent to $(x^2 - y^2) - (6x^2 + 4xy - y^2)$?

A. $-5x^2 - 4xy$
B. $-5x^2 + 4xy - 2y^2$
C. $7x^2 + 4xy - 2y^2$
D. $7x^2 + 4xy + 2y^2$

18. Given $i = \sqrt{-1}$, what is $\sqrt{9} + \sqrt{-16}$?

F. $7i$
G. $i\sqrt{7}$
H. $3 - 4i$
J. $3 + 4i$

19. The first 5 terms of an arithmetic sequence are 7, 21, 35, 49, and 63. Let t_n represent the nth term of the sequence. What is the value of t_{25}?

A. 175
B. 343
C. 357
D. 371

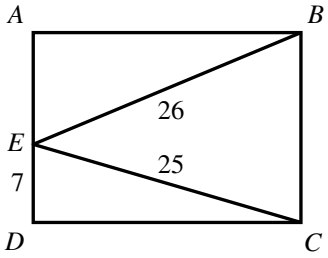
20. At a certain time of day, a flagpole casts a 9.0-foot-long shadow and a nearby 4.0-foot-tall fence post casts a 2.4-foot-long shadow. Given that both the flagpole and the fence post are vertical and on level ground, what is the height, in feet, of the flagpole?

F. 5.4
G. 10.6
H. 15.0
J. 15.4

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

21. In rectangle $ABCD$ shown, segments $\overline{BE}$ and $\overline{CE}$ partition the rectangle into 3 triangles. Given $DE = 7$ centimeters, $BE = 26$ centimeters, and $CE = 25$ centimeters, what is the length, in centimeters, of $\overline{BC}$?



A. 10
B. 15
C. 17
D. 24

22. In a particular cleaning solution, the ratio of concentrated solution to water is 3:40. How many **cups** of concentrated solution should be added to 5 gallons of water to make the cleaning solution in the given ratio?

(Note: 4 cups = 1 quart; 4 quarts = 1 gallon)

F. 12

G. 6

H. $1\frac{1}{2}$

J. $\frac{3}{8}$

23. Let $f(t) = 7e^{3t} + 1$. Which of the following numbers is closest to the value of $f(5)$?

A. -2×10^{-1}
B. 3×10^{2}
C. 2×10^{7}
D. 6×10^{7}

24. Which of the following expresses 40° in radians?

F. $\frac{2}{9\pi}$

G. $\frac{2\pi}{9}$

H. $\frac{9\pi}{2}$

J. $\frac{7{,}200}{\pi}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

25. Let the function f be defined as $f(x) = -9x^2$. In the standard (x,y) coordinate plane, the graph of $y = f(x)$ undergoes a transformation such that the result is the graph of $y = f(x) - 4$. Under this transformation the graph of $y = f(x)$ is:

A. shifted downward 4 coordinate units.
B. shifted left 4 coordinate units.
C. stretched horizontally by a factor of 4.
D. stretched vertically by a factor of 4.

26. For all positive values of a, b, c, and d, when $\frac{1}{2}ab^2 + c = d$, which of the following expressions is equal to b?

F. $\sqrt{\frac{a(d-c)}{2}}$

G. $\sqrt{\frac{2(d-c)}{a}}$

H. $\sqrt{\frac{2d-c}{a}}$

J. $\sqrt{\frac{d-c}{2a}}$

27. On a trip, 2 sisters counted 1,430 vehicles. They divided the vehicles into categories: cars, trucks, and other. They noted the color of each as white, black, red, or other, as shown in the table. What is the probability that a randomly selected truck is black?

	White	Black	Red	Other	Total
Car	118	62	97	197	474
Truck	100	31	116	232	479
Other	86	85	94	212	477
Total	304	178	307	641	1,430

A. $\frac{31}{178}$

B. $\frac{31}{479}$

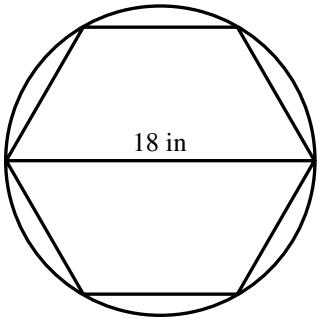
C. $\frac{31}{1{,}430}$

D. $\frac{479}{1{,}430}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

28. A regular hexagon is inscribed in a circle with diameter 18 inches, as shown. What is the perimeter, in inches, of the hexagon?



F. 54
G. 108
H. $27\sqrt{3}$
J. $54\sqrt{3}$

29. Tanya earns $34,000 in her 1st year at a job. She is given a raise of the same dollar amount each year, resulting in her earning $38,080 in the 4th year at the job. What is the total of Tanya's earnings during her 4 years at the job?

A. $136,000
B. $140,080
C. $144,160
D. $152,320

30. In the standard (x,y) coordinate plane, how many points are both 5 coordinate units from the origin and also 2 coordinate units from the line $y = 0$?

F. 0
G. 1
H. 2
J. 4

31. In $\triangle ABC$, if the measure of $\angle A$ is less than the measure of $\angle B$, and the measure of $\angle B$ is less than the measure of $\angle C$, what is the correct ordering of the side lengths, from least to greatest?

A. $AB < BC < AC$
B. $AB < AC < BC$
C. $BC < AC < AB$
D. $BC < AB < AC$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

32. Lajuan sells exactly 4 kinds of pies in his bakery: apple, pecan, coconut cream, and peach. Of the pies he sold on Thursday, $\frac{1}{4}$ were apple, $\frac{1}{2}$ were pecan, 24 were coconut cream, and 8 were peach. How many total pies did Lajuan sell on Thursday?

F. 40
G. 42
H. 56
J. 128

33. In a certain quadrilateral, 2 opposite angles each measure $(3x + 5)°$. The other 2 opposite angles each measure $(x + 3)°$. What is the value of x?

A. 1
B. 9
C. 43
D. 88

34. The first 4 terms of a sequence are shown in the table. The sequence is defined by $a_1 = 2$ and $a_n = a_{n-1} + (n-1)^2$ for $n \geq 2$. What is the sixth term, a_6, of this sequence?

a_1	a_2	a_3	a_4
2	3	7	16

F. 68
G. 57
H. 41
J. 32

35. On the real number line, how many integers are between $-\frac{65}{6}$ and $\frac{75}{2}$?

A. 8
B. 28
C. 48
D. 140

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

36. During a particular experiment, 2 events, A and B, can each occur. Events A and B are mutually exclusive during this experiment. Which of the following probabilities is 0?

F. P(A)
G. P(B)
H. P(A or B)
J. P(A and B)

37. The polynomial function defined by $p(x) = x^3 + x^2 - 8x - 12$ has $(x - 3)$ as one of its linear factors. What are all and only the zeros of p?

A. −3 and −2
B. −3 and 2
C. −2 and 3
D. 2 and 3

38. Jonathan rode his bike every day for 18 days. The table shows each of the distances he rode. The table also shows the number of days he rode each of those distances.

Distance (in miles)	Number of days
1	2
3	4
4	3
5	6
7	3

What is the median daily distance, in miles, that Jonathan rode his bike for the 18 days?

F. 3
G. 3.5
H. 4
J. 4.5

39. A tourism organization randomly selected 100 tourists finishing their summer visit to Spain. The organization asked them how many cities they had toured in the country. The table shows the results. Based on these data, for the population of tourists that visited Spain during the summer, what is the best estimate of the mean number of cities toured?

Number of cities	1	2	3
Number of tourists	10	40	50

A. 0.8
B. 2
C. 2.4
D. 3

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

40. Given the equation $\sqrt[4]{x} = y$, where y is a real number, what **must** be true of x? x is:

F. an even real number.
G. a rational number.
H. an integer.
J. a nonnegative real number.

41. Given that $1 \le m \le 4$, $4 \le n \le 6$, and $8 \le p \le 10$, what is the greatest possible value for $\left(\frac{m}{n}\right)\left(\frac{1}{p}\right)$?

A. $\frac{3}{20}$

B. $\frac{1}{15}$

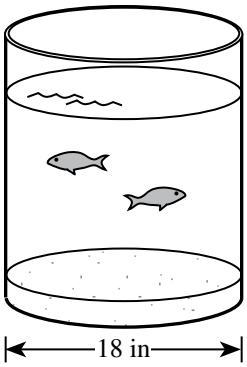
C. $\frac{1}{10}$

D. $\frac{1}{8}$

42. Which of the following datasets has the largest standard deviation?

F. 0, 0, 10, 10
G. 0, 1, 9, 10
H. 2, 3, 5, 7
J. 5, 5, 5, 5

43. Michael has a cylindrical fish tank, shown, that has an inside diameter of 18 inches. When he put colored gravel in his fish tank, the water level of the tank rose 2 inches. What is the volume of the gravel in cubic inches?



A. 18π
B. 36π
C. 162π
D. 648π

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

44. The table gives values of $f(x)$, $g(x)$, and $h(x)$ for all positive integers $x \leq 5$. Given $h(f(g(a))) = 1$ where a is a positive integer less than or equal to 5, what is the value of a?

x	$f(x)$	$g(x)$	$h(x)$
1	2	4	3
2	1	5	1
3	4	2	5
4	5	3	4
5	3	1	2

F. 2
G. 3
H. 4
J. 5

45. Each time Coin C is tossed, it lands faceup or facedown. The probability of landing faceup is 3 times the probability of landing facedown. In a certain game, the player wins \$1.00 when Coin C lands faceup and the player wins \$2.00 when Coin C lands facedown. To the nearest cent, what is the expected value of each toss of Coin C in this game?

A. \$1.25
B. \$1.33
C. \$1.50
D. \$1.67

END OF TEST 2

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

DO NOT RETURN TO THE PREVIOUS TEST.

READING TEST

40 Minutes—36 Questions

DIRECTIONS: There are several passages in this test. Each passage is accompanied by several questions. After reading a passage, choose the best answer to each question and fill in the corresponding oval on your answer document. You may refer to the passages as often as necessary.

Passage I

LITERARY NARRATIVE: This passage is adapted from the short story "Janus" by Ann Beattie (©1985 by The New Yorker Magazine, Inc.).

The bowl was perfect. Perhaps it was not what you'd select if you faced a shelf of bowls, and not the sort of thing that would inevitably attract a lot of attention at a crafts fair, yet it had real presence. It was as predictably admired as a mutt who has no reason to suspect he might be funny. Just such a dog, in fact, was often brought out (and in) along with the bowl.

Andrea was a real-estate agent, and when she thought that some prospective buyers might be dog-lovers, she would drop off her dog at the same time she placed the bowl in the house that was up for sale. She would put a dish of water in the kitchen for Mondo, take his squeaking plastic frog out of her purse and drop it on the floor. He would pounce delightedly, just as he did every day at home, batting around his favorite toy. The bowl usually sat on a coffee table, though recently she had displayed it on top of a pine blanket chest and on a lacquered table. It was once placed on a cherry table beneath a glorious still-life painting, where it held its own.

Everyone who has purchased a house or who has wanted to sell a house must be familiar with some of the tricks used to convince a buyer that the house is quite special: a fire in the fireplace in early evening; jonquils in a pitcher on the kitchen counter, where no one ordinarily has space to put flowers; perhaps the slight aroma of spring, made by a single drop of scent vaporizing from a lamp bulb.

The wonderful thing about the bowl, Andrea thought, was that it was both subtle and noticeable—a paradox of a bowl. Its glaze was the color of cream and seemed to glow no matter what light it was placed in. There were a few bits of color in it—tiny geometric flashes—and some of these were tinged with flecks of silver. They were as mysterious as cells seen under a microscope; it was difficult not to study them, because they shimmered, flashing for a split second, and then resumed their shape. Something about the colors and their random placement suggested motion. People who liked country furniture always commented on the bowl, but then it turned out that people who felt comfortable with opulence loved it just as much. But the bowl was not at all ostentatious, or even so noticeable that anyone would suspect that it had been put in place deliberately. They might notice the height of the ceiling on first entering a room, and only when their eye moved down from that, or away from the refraction of sunlight on a pale wall, would they see the bowl. Then they would go immediately to it and comment. Yet they always faltered when they tried to say something. Perhaps it was because they were in the house for a serious reason, not to notice some object.

Once, Andrea got a call from a woman who had not put in an offer on a house she had shown her. That bowl, she said—would it be possible to find out where the owners had bought that beautiful bowl? Andrea pretended that she did not know what the woman was referring to. A bowl, somewhere in the house? Oh, on a table under the window. Yes, she would ask, of course. She let a couple of days pass, then called back to say that the bowl had been a present and the people did not know where it had been purchased.

She was sure that the bowl brought her luck. Bids were often put in on houses where she had displayed the bowl. Sometimes the owners, who were always asked to be away or to step outside when the house was being shown, didn't even know that the bowl had been in their house. Once—she could not imagine how—she left it behind, and then she was so afraid that something might have happened to it that she rushed back to the house and sighed with relief when the owner opened the door. The bowl, Andrea explained—she had purchased a bowl and set it on the chest for safekeeping while she toured the house with the prospective buyers, and she . . . She felt like rushing past the frowning woman and seizing her bowl. The owner stepped aside. In the few seconds before Andrea picked up the bowl, she realized that the owner must have just seen that it had been perfectly placed, that the sunlight struck the bluer part of it. Her pitcher had been moved to the far side of the chest, and the bowl predominated. All the way home, Andrea wondered how she could have left the bowl behind. It was like leaving a friend at an outing—just walking off. Sometimes there were stories in the paper about families forgetting a child somewhere and driving to the next city. Andrea had only gone a mile down the road before she remembered.

GO ON TO THE NEXT PAGE.

1. The point of view from which the passage is told is best described as that of a:

A. first person narrator, present in the action, who relates events as they happen.
B. first person narrator, not present in the action, who relates events that happened in the past.
C. third person narrator, present in the action, who relates the thoughts and feelings of many characters.
D. third person narrator, not present in the action, who relates the thoughts and feelings of primarily one character.

2. The passage as a whole can best be described as an exploration of the:

F. career of a real estate agent and the agent's typically mundane transactions with clients.
G. special glaze on a bowl and why the glaze makes the bowl both subtle and noticeable.
H. perceived perfection of an object and that object's effect on people.
J. problems that can result from a person's unyielding focus on obtaining material goods.

3. The passage most strongly suggests that a useful characteristic of the bowl, in terms of Andrea's purpose for the object, is the bowl's:

A. universal appeal.
B. famous designer.
C. ostentatious look.
D. commercial availability.

4. In lines 53–75, Andrea responds to an inquiry about her bowl and explains why her bowl was placed in a client's home with statements that can best be described as:

F. vague generalizations.
G. absolute truths.
H. half-truths.
J. lies.

5. In the passage, Andrea is characterized as believing that compared to most tricks used by real estate agents to impress potential buyers, her trick of placing the bowl in a home is:

A. more humorous to potential buyers.
B. more obvious to potential buyers.
C. less familiar to potential buyers.
D. less enticing to potential buyers.

6. According to the passage, the random placement of colors in the bowl's glaze creates a surface that:

F. acts as a mirror.
G. seems to move.
H. appears cracked in the sunlight.
J. scatters prisms on the walls of a room.

7. One main point of the fifth paragraph (lines 53–62) is that:

A. Andrea's bowl sometimes attracts more interest than does the house itself.
B. Andrea's bowl does not actually belong to her, but she hopes to find its owner.
C. Andrea is often asked about the bowl when a client puts in an offer on a house.
D. Andrea sometimes forgets where in a house she has placed the bowl.

8. In the passage, the admiration the bowl receives is directly compared to the admiration received by:

F. a mutt.
G. a plastic frog.
H. a cherry table.
J. the aroma of spring.

9. The passage suggests that one reason prospective home buyers have difficulty sharing their thoughts about the bowl is that they realize:

A. they are not visiting the home for the purpose of noticing decorative objects.
B. they do not want to reveal that they have the financial means to buy the bowl.
C. Andrea might start talking about the bowl instead of discussing the home that is for sale.
D. Andrea might find the bowl even more intriguing than they do.

GO ON TO THE NEXT PAGE.

Passage II

INFORMATIONAL: This passage is from the book *The Botany of Desire: A Plant's-Eye View of the World* by Michael Pollan.

Originally cultivated in the Ottoman Empire, tulips were introduced to Europe at the end of the sixteenth century and became wildly popular in the seventeenth century.

One crucial element of the beauty of the tulip that intoxicated the Dutch, the Turks, the French, and the English has been lost to us. To them the tulip was a magic flower because it was prone to spontaneous and brilliant eruptions of color. In a planting of a hundred tulips, one of them might be so possessed, opening to reveal the white or yellow ground of its petals painted, as if by the finest brush and steadiest hand, with intricate feathers or flames of a vividly contrasting hue. When this happened, the tulip was said to have "broken," and if a tulip broke in a particularly striking manner—if the flames of the applied color reached clear to the petal's lip, say, and its pigment was brilliant and pure and its pattern symmetrical—the owner of that bulb had won the lottery. For the offsets of that bulb would inherit its pattern and hues and command a fantastic price. The fact that broken tulips for some unknown reason produced fewer and smaller offsets than ordinary tulips drove their prices still higher. Semper Augustus was the most famous such break.

The closest we have to a broken tulip today is the group known as the Rembrandts—so named because Rembrandt painted some of the most admired breaks of his time. But these latter-day tulips, with their heavy patterning of one or more contrasting colors, look clumsy by comparison, as if painted in haste with a thick brush. To judge from the paintings we have of the originals, the petals of broken tulips could be as fine and intricate as marbleized papers, the extravagant swirls of color somehow managing to seem both bold and delicate at once. In the most striking examples—such as the fiery carmine that Semper Augustus splashed on its pure white ground—the outbreak of color juxtaposed with the orderly, linear form of the tulip could be breathtaking, with the leaping, wayward patterns just barely contained by the petal's edge.

Anna Pavord recounts the extraordinary lengths to which Dutch growers would go to make their tulips break, sometimes borrowing their techniques from alchemists, who faced what must have seemed a comparable challenge. Over the earth above a bed planted with white tulips, gardeners would liberally sprinkle paint powders of the desired hue, on the theory that rainwater would wash the color down to the roots, where it would be taken up by the bulb. Charlatans sold recipes believed to produce the magic color breaks; pigeon droppings were thought to be an effective agent, as was plaster dust taken from the walls of old houses. Unlike the alchemists, whose attempts to change base metals into gold reliably failed, now and then the would-be tulip changers would be rewarded with a good break, inspiring everybody to redouble their efforts.

What the Dutch could not have known was that a virus was responsible for the magic of the broken tulip, a fact that, as soon as it was discovered, doomed the beauty it had made possible. The color of a tulip actually consists of two pigments working in concert—a base color that is always yellow or white and a second, laid-on color called an anthocyanin; the mix of these two hues determines the unitary color we see. The virus works by partially and irregularly suppressing the anthocyanin, thereby allowing a portion of the underlying color to show through. It wasn't until the 1920s, after the invention of the electron microscope, that scientists discovered the virus was being spread from tulip to tulip by *Myzus persicae*, the peach potato aphid. Peach trees were a common feature of seventeenth-century gardens.

By the 1920s the Dutch regarded their tulips as commodities to trade rather than jewels to display, and since the virus weakened the bulbs it infected (the reason the offsets of broken tulips were so small and few in number), Dutch growers set about ridding their fields of the infection. Color breaks, when they did occur, were promptly destroyed, and a certain peculiar manifestation of natural beauty abruptly lost its claim on human affection.

I can't help thinking that the virus was supplying something the tulip needed, just the touch of abandon the flower's chilly formality called for. Maybe that's why the broken tulip became such a treasure in seventeenth-century Holland: the wayward color loosed on a tulip by a good break perfected the flower, even as the virus responsible set about destroying it.

On its face the story of the virus and the tulip would seem to throw a wrench into any evolutionary understanding of beauty.

10. The main purpose of the passage is to:

- **F.** highlight changes in the flower industry from the seventeenth century through today.
- **G.** examine the way certain plants have been represented in art over the centuries.
- **H.** provide an overview of plant viruses and the way they affect the flower market.
- **J.** explain a particular flower variation and how it has been perceived historically.

GO ON TO THE NEXT PAGE.

11. The main point of the second paragraph (lines 21–36) is that:

- **A.** modern Rembrandt tulips have been painted by many of today's most famous artists.
- **B.** compared to seventeenth-century broken tulips, today's multicolored tulips are less visually appealing.
- **C.** the tulip break known as Semper Augustus was a striking example of the seventeenth-century broken tulip.
- **D.** Rembrandt was responsible for painting the most famous tulip breaks of his time.

12. It can reasonably be inferred from the passage that some seventeenth-century tulip growers believed tulip breaks were mainly caused by:

- **F.** suppliers' storage conditions.
- **G.** diseased tulip bulbs.
- **H.** certain growing techniques.
- **J.** certain weather patterns.

13. The information in lines 57–64 primarily functions to:

- **A.** describe the range of potential tulip colors.
- **B.** explain how the color variation in a broken tulip occurs.
- **C.** argue that yellow and white are the only natural tulip colors.
- **D.** indicate why broken tulips contain no anthocyanin.

14. The sixth paragraph (lines 79–85) differs from the rest of the passage in that it:

- **F.** questions whether the virus that caused broken tulips was harmful to bulbs.
- **G.** argues that growers should have dealt with broken tulips differently.
- **H.** challenges the idea that broken tulips were beautiful.
- **J.** presents a personal meditation on broken tulips.

15. According to the passage, in the seventeenth century, the fact that broken tulip bulbs tended to produce fewer and smaller offsets compared to typical tulip bulbs resulted in:

- **A.** a decrease in the demand for broken tulips.
- **B.** a fear among growers that broken tulips were diseased.
- **C.** an increase in prices for broken tulips.
- **D.** a desire among growers to plant a wider variety of crops.

16. In the passage, the author compares broken tulips as they are represented in Rembrandt's paintings to:

- **F.** peach-tree blossoms.
- **G.** paint powders sprinkled on the ground.
- **H.** a painting hastily done with a thick brush.
- **J.** intricately marbleized papers.

17. The passage author most likely mentions that peach trees were a staple of seventeenth-century gardens to:

- **A.** highlight a crop favored by growers who did not cultivate tulips.
- **B.** emphasize that peach trees are not as popular in gardens today.
- **C.** explain how peach potato aphids spread the tulip virus.
- **D.** compare tulips to another popular seventeenth-century crop.

18. As it is used in line 80, the word *abandon* most nearly means:

- **F.** uninhibitedness.
- **G.** relinquishment.
- **H.** retreat.
- **J.** denial.

GO ON TO THE NEXT PAGE.

Passage III

INFORMATIONAL: Passage A is from the book *Foundation: B-Boys, B-Girls, and Hip-Hop Culture in New York* by Joseph G. Schloss (©2009 by Oxford University Press). Passage B is from the book *The Tanning of America: How Hip-Hop Created a Culture That Rewrote the Rules of the New Economy* by Steve Stoute with Mim Eichler Rivas (©2011 by Steve Stoute).

Passage A by Joseph G. Schloss

The term *b-boying* refers to break dancing.

In the first sense of the term, hip-hop refers collectively to a group of related art forms in different media (visual, sound, movement) that were practiced in Afro-Caribbean, African American, and Latino neighborhoods in New York City in the 1970s. The term, when used in this sense, also refers to the events at which these forms were practiced, the people who practiced them, their shared aesthetic sensibility, and contemporary activities that maintain those traditions.

Perhaps the most important aspect of this variety of hip-hop is that it is unmediated, in the sense that most of the practices associated with it are both taught and performed in the context of face-to-face interactions between human beings. To some degree, this constitutes an intentional rejection of the mass media by its practitioners, but to a great extent it is just the natural result of the practices themselves. Activities like b-boying and graffiti writing are simply not well suited to the mass media. Although in both cases, brief attempts were made to bring these forms of expression into mainstream contexts (b-boying in a series of low-budget "breaksploition" movies in the early 1980s and graffiti as part of a short-lived gallery trend around the same time), neither developed substantially in those environments. This, it has been suggested, was not so much because the forms lacked appeal, but because—on an economic level—b-boying was an advertisement with no product. This reality is reflected in the phrase that is often used to refer to this branch of hip-hop: "hip-hop culture," which suggests something that is lived rather than bought and sold.

The second sense of the term *hip-hop* refers to a form of popular music that developed, or was developed, out of hip-hop culture. This hip-hop, also known as "rap music," resulted from the interaction between hip-hop culture and the preexisting music industry. As we would expect, this hip-hop features elements of both sensibilities. My students are often surprised when I point out that, even when hip-hop lyrics seem to reject every aspect of mainstream culture and morality, the one thing they almost never reject is a strict 16-bar verse structure derived from Tin Pan Alley pop music. But this should not be surprising. This hip-hop, in contrast to hip-hop culture, is deeply intertwined with the mass media and its needs, largely because it *does* have a product: records, CDs, MP3s, and ringtones.

Passage B by Steve Stoute

It wasn't until I was nine years old, late in 1979, that I even heard the words "hip" and "hop" strung together or was able to grasp the notion of what being a rapper actually meant. That was when, fatefully, I heard a record that changed my life (and pop culture) forever.

Like it's yesterday, I can still remember that moment over at my aunt's home in Brooklyn—where it seemed there was always a party under way with relatives and neighbors hanging out, a great spread of food, and new, hot music on the record player. Most stereo systems in those days could be adapted for the single two-sided records that were smaller and had the big hole in the middle (45 RPM) as well as the bigger records with the small holes (33⅓ RPM)—which were the full albums that had several songs on each side.

But as the intro plays to what I recognize as "Good Times" by the group Chic and I'm drawn into the living room because it's a familiar hit song from the previous summer, I encounter a record on the turntable that defies categorization. Instead of the sweet female lead vocals of that disco smash, I hear something totally different and spot a baby-blue label on the black vinyl record I've never seen before. Even though it's a twelve-inch disc, the size of an album, as I listen to the rhyming words being spoken—"*Singin' on 'n' 'n' on 'n' on / The beat don't stop until the break of dawn / Singin' on 'n' 'n' on 'n' on on 'n' on / Like a hot buttered a pop da pop da pop dibbie dibbie pop da pop pop / Ya don't dare stop*"—it hits me that this entire side is one long song.

Almost fifteen minutes long as it turns out. Or, to be exact, fourteen minutes and thirty-six seconds of pure fun laid over the thumping bass beat from the break of "Good Times" with sing-along words easy to remember and repeat. The record, I discover, is by an unknown group, the Sugarhill Gang, and is called "Rapper's Delight."

From then on, nobody ever has to tell me what rap is. It's whatever words are spoken, chanted, or talk-sung, or whatever philosophies, stories, or ideas are espoused, by the house party Master of Ceremonies.

19. According to Passage A, one reason elements of hip-hop culture such as b-boying are rarely represented in mass media is that these art forms:

- **A.** have never been brought to the public's attention.
- **B.** are not bought and sold as products.
- **C.** do not appeal to young people.
- **D.** declined in popularity after the 1970s.

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20. As it is used in line 38, the word *sensibilities* most nearly means:

F. emotions.
G. sensitivities.
H. perspectives.
J. feelings of gratitude.

21. Based on Passage A, which statement best captures the relationship between Tin Pan Alley pop music and rap music?

A. Rap artists have rejected every aspect of Tin Pan Alley pop.
B. Rap artists have been aware of Tin Pan Alley pop but not influenced by it.
C. Tin Pan Alley pop developed at the same time as rap.
D. Tin Pan Alley pop has influenced many rap artists.

22. Which of the following details does the author of Passage B highlight as one that caused "Rapper's Delight" to stand out as different compared to other songs he knew?

F. The song's intro
G. The female vocals
H. The length of the song
J. The fact that the song was on a vinyl record

23. In the context of Passage B, the main point of the third paragraph (lines 62–76) is that the author was:

A. struck by the combination of new and established musical elements in the music he was hearing.
B. uncomfortable with what he viewed as an unwelcome change to a favorite song.
C. more interested in an unfamiliar album label than in the new music that was playing.
D. convinced that the new form of music he was hearing would become more popular than disco.

24. Based on Passage B, it can reasonably be inferred that the author views his first exposure to rap music as:

F. memorable but ultimately not very important.
G. significant for his childhood but less so for his adulthood.
H. a transformative experience.
J. a disappointing experience.

25. Compared to Passage A, Passage B focuses more on:

A. early hip-hop's interaction with the marketplace.
B. attempts to move hip-hop art into galleries.
C. the mass media.
D. the author's personal experience.

26. Which of the following elements of Passage B is not included in Passage A?

F. A story involving a particular rap song
G. A discussion of the early days of hip-hop
H. A mention of the New York City area in the context of hip-hop
J. An acknowledgment of rap's interaction with other musical forms

27. The authors of both passages would most likely agree with the idea that early rap music:

A. represented artists' rejection of the music industry and its practices.
B. represented a significant development in American popular culture.
C. was more popular than today's rap music.
D. was slow to find an audience.

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Passage IV

INFORMATIONAL: This passage is from the article "The Rise and Fall of the Living Fossil" by Ferris Jabr (©2015 by *Nautilus*).

The term "living fossil" refers to creatures that had emerged long ago and seemed to have stopped evolving.

Like all living fossils, crocodiles were thought to have emerged in the distant past and then stayed largely unchanged. The standard theory held that the crocodilian species we know today originated in Africa during the Cretaceous (145 to 66 million years ago), when the seven continents were much closer together. As the continents drifted apart, the crocodilians went with them, explaining how they ended up in a band of tropics encircling the globe. If that were true, then modern crocodilian species should be very different from one another at the level of genes and molecules, because there would have been more than enough time for substantial mutations to accumulate. By the 1990s, however, molecular analysis revealed that immune system molecules conserved across living crocodilian species were remarkably similar in structure and behavior.

Intrigued by this puzzle, a post-doctoral research fellow at the University of Washington named Jamie Oaks began collecting DNA samples from all 23 living crocodilian species, comparing sections of the genome where mutations were most likely to have appeared. Oaks did not find nearly as many differences between the modern crocodilian genomes as one would expect had those species diverged all the way back in the Cretaceous. He concluded that modern crocodilian species split from their last common ancestor between 8 and 13 million years ago, not long before ancient hominins split from their last common ancestor with chimpanzees. The living fossil theory of crocodiles had overestimated their evolutionary age by about a factor of 10.

Oaks also noticed something odd about the DNA samples he had acquired from the iconic Nile crocodiles (*Crocodylus niloticus*): they did not match up with each other. In fact, the variation between them was great enough to suggest that he was looking at two distinct species. If so, then not only were modern crocodiles much too young to be living fossils, but they had also continued to speciate after diverging from their basal ancestor—something living fossils are not supposed to do. On its own, Oaks' study was intriguing, but not enough to convince the larger scientific community to cleave the Nile crocodile into two species.

Unbeknownst to him, however, a separate team of scientists was preparing to corroborate his results. In the early 2000s, on an excursion to Chad, the wildlife conservationist Michael Klemens encountered some odd little crocodiles in a desert oasis. They were so docile that he and his companions could swim beside them without concern. He took a tissue sample from one that had recently perished and sent it to the American Museum of Natural History in New York City, where Evon Hekkala, an assistant professor at Fordham University studying crocodilian diversity, sequenced its genome. When she compared the docile croc's DNA to other Nile crocodiles, she noticed some rather striking differences. Could these tame crocs be an entirely distinct species?

DNA analysis of 123 African crocodiles—as well as 57 separate samples from museum specimens, including crocodiles mummified in ancient Egypt—confirmed her suspicion. In a few sections of their respective genomes, all the mild-mannered crocs would have one DNA sequence, and all the typical Nile crocs another. They even had different numbers of chromosomes. "That made us very confident that there were actually two different populations and they were not mixing their DNA," Hekkala says. The two different species had diverged between 3 and 6 million years ago: *Crocodylus niloticus* in the East and the smaller, less aggressive *Crocodylus suchus* in the West. The vast majority of mummified crocodiles were *C. suchus*, suggesting that ancient Egyptians had recognized the difference.

Together, Hekkala, Oaks, and other scientists helped redraw the map of how crocodilians evolved in space and time, and conclusively removed them from the category of living fossils.

28. In the context of the passage, how does the analysis of crocodilian immune system molecules relate to the living fossil theory of crocodilian evolution?

- **F.** The analysis confirms the living fossil theory.
- **G.** The analysis suggests the living fossil theory is accurate.
- **H.** The analysis supports the living fossil theory in some ways and does not support the theory in other ways.
- **J.** The analysis does not support the living fossil theory.

29. Which of the following statements best summarizes Oaks's analysis of Nile crocodiles' DNA as it is presented in the third paragraph (lines 31–42)?

- **A.** It suggested that Nile crocodiles are older than what was previously believed, which does not support the living fossil theory of crocodiles.
- **B.** It suggested that different species of crocodiles do not share a basal ancestor, which the scientific community has confirmed.
- **C.** It suggested that the analysis was hastily done, which prompted the scientific community to ignore it.
- **D.** It suggested that the DNA came from two species, which did not support the living fossil theory of crocodiles.

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30. The main purpose of the fifth paragraph (lines 58–73) is to:

- **F.** describe the DNA analysis that confirmed *Crocodylus niloticus* and *Crocodylus suchus* were two distinct species.
- **G.** provide information on the mummification of crocodiles that was pertinent to Hekkala's analysis.
- **H.** explain how Hekkala revolutionized DNA analysis by comparing the DNA of 123 different African crocodiles.
- **J.** introduce the behavioral differences between *Crocodylus niloticus* and *Crocodylus suchus*.

31. According to the passage, molecular analysis revealed that immune system molecules from living crocodilian species were similar in:

- **A.** structure and behavior.
- **B.** color and size.
- **C.** density and age.
- **D.** shape and weight.

32. In the context of the passage, the statement in lines 47–49 mainly serves to:

- **F.** indicate that Klemens and his companions believed that the crocodiles were diseased.
- **G.** establish the tameness of the crocodiles in the desert oasis.
- **H.** suggest that Klemens and his companions suspected they were swimming with *Crocodylus niloticus*.
- **J.** indicate that the crocodiles in the desert oasis had not yet fully matured.

33. According to the passage, after Klemens sent a tissue sample of a perished crocodile to Hekkala, Hekkala then:

- **A.** estimated the crocodile's age.
- **B.** studied the crocodile's immune system.
- **C.** sequenced the crocodile's genome.
- **D.** identified mutations in the crocodile's molecular structure.

34. In the context of the passage, the detail that *Crocodylus niloticus* and *Crocodylus suchus* have different numbers of chromosomes provides support for the claim that the two species:

- **F.** diverged during the Cretaceous.
- **G.** had similar diets.
- **H.** did not evolve from the same ancestor.
- **J.** were not mixing their DNA.

35. According to the passage, *Crocodylus niloticus* and *Crocodylus suchus* diverged between:

- **A.** 1 and 2 million years ago.
- **B.** 3 and 6 million years ago.
- **C.** 8 and 13 million years ago.
- **D.** 66 and 145 million years ago.

36. Based on the passage, the phrase "redraw the map" (line 75) is most likely meant to be read:

- **F.** literally; scientists no longer believed crocodiles originated in Africa.
- **G.** literally; scientists no longer believed crocodiles once lived in a band of tropics.
- **H.** figuratively; scientists amended the narrative of the natural history of crocodiles.
- **J.** figuratively; scientists believed their findings would have broader implications on archaeology.

END OF TEST 3

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

DO NOT RETURN TO A PREVIOUS TEST.

SCIENCE TEST

40 Minutes—40 Questions

DIRECTIONS: There are several passages in this test. Each passage is followed by several questions. After reading a passage, choose the best answer to each question and fill in the corresponding oval on your answer document. You may refer to the passages as often as necessary.

You are **not** permitted to use a calculator on this test.

Passage I

Green anoles and brown anoles (2 species of reptiles) behave differently when the species are together in a habitat than when the species are in separate habitats. Table 1 lists the anole species present in each of 3 habitats (Habitats X, Y, and Z).

Table 1	
Habitat	Anole species present:
X	green only
Y	green and brown
Z	brown only

Figure 1 shows, for each anole species, the average perching height in a habitat.

Figure 1

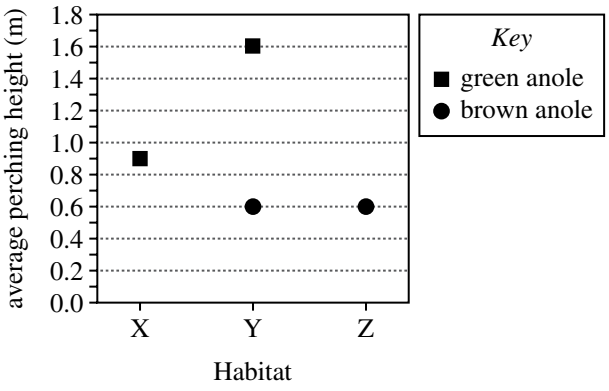

Table 2 lists the number of times each of Behaviors 1–4 was displayed by the anoles in a habitat. Green anoles display Behaviors 1–3 only; brown anoles display Behavior 4 only.

Table 2			
Behavior	Number of times behavior was displayed in Habitat:		
	X	Y	Z
1	4	5	N.A.
2	3	6	N.A.
3	24	13	N.A.
4	N.A.	5	17
Note: N.A. indicates the behavior was not displayed in the habitat.			

Table 3 lists, for the anole species in a habitat, the average display time for Behavior 5.

Table 3		
Anole species	Habitat	Average display time for Behavior 5 (s)
Green	X	23.1
Green	Y	23.7
Brown	Y	49.6
Brown	Z	33.1

Figure 1 and Tables 2 and 3 adapted from Jessica R. Edwards and Simon P. Lailvaux, "Display Behavior and Habitat Use in Single and Mixed Populations of *Anolis carolinensis* and *Anolis sagrei* Lizards." ©2012 by Blackwell Verlag GmbH.

1. Based on Table 2, which of the following ratios best represents the number of times Behavior 2 was displayed in Habitat X compared to the number of times Behavior 2 was displayed in Habitat Y?

A. 1:2
B. 1:8
C. 4:5
D. 5:6

2. Which of the following observations for brown anoles was(were) the same in both Habitats Y and Z?

1. Average perching height
2. The number of times Behavior 4 was displayed
3. Average display time for Behavior 5

F. 1 only
G. 3 only
H. 1 and 2 only
J. 2 and 3 only

3. Based on Table 3, how many display times were measured for Behavior 5 in Habitat Z?

A. 2
B. 4
C. 12
D. Cannot be determined from the given information

4. Based on Figure 1, for green anoles, the difference in average perching height between Habitat X and Habitat Y was closest to which of the following?

F. 0.0 m
G. 0.3 m
H. 0.7 m
J. 1.0 m

5. A student claimed that anoles are endotherms. Which of the following explains why this claim is incorrect? Anoles are:

A. amphibians and primarily generate heat from internal metabolic processes to maintain body temperature.
B. amphibians and primarily absorb heat from the surrounding environment to maintain body temperature.
C. reptiles and primarily generate heat from internal metabolic processes to maintain body temperature.
D. reptiles and primarily absorb heat from the surrounding environment to maintain body temperature.

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Passage II

The coastline of Antarctica consists of many ice shelves (floating 100–1,000 m thick sheets of ice that extend from a landmass). Many of these ice shelves are melting, causing them to calve (break off) large pieces known as icebergs. Four students each explain iceberg calving.

Student 1

Antarctic ice shelves melt due to the warming of the air above the surface of the ice during the summer. When the air temperature increases, the surface ice melts and water pools. The meltwater moves downward into the ice shelf, causing fractures to form. The accumulation of many fractures in the ice over many summers gradually leads to icebergs calving from an ice shelf.

Student 2

Student 1 is correct that an increase in air temperature during the summer leads to surface ice melting and water pooling, causing fractures to form in the ice. However, the action of the meltwater alone is insufficient to produce fractures deep enough to cause calving. When the air temperature lowers at the beginning of winter, falling snow accumulates in the fractures, increasing the pressure on the ice, eventually causing calving. After a large snowfall, calving can occur within a few days.

Student 3

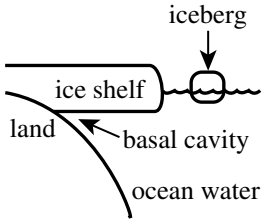
Antarctic ice shelves melt only from below. During the summer, ocean currents circulate water that is just above freezing into and out of the basal cavity (the area underneath an ice shelf), causing the ice within the cavity to melt. For every 0.1°C that the ocean water is above freezing, the water melts a thickness of 10 m of ice from the bottom per year. When the ice shelf thickness has been reduced by at least 50 m, calving occurs.

Student 4

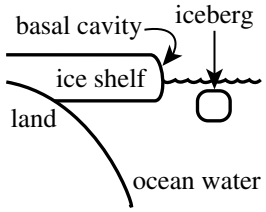
The warmer water circulated by ocean currents melts the ice shelf as described by Student 3. However, calving cannot occur from this process alone. Snow accumulates on the surface of the ice each winter, but each following summer, warm air leads to the melting and compaction of the snow. The compaction lowers the surface of the ice shelf, pushing the ice down into the basal cavity, where it is melted by the ocean water. After several winter-summer cycles, the ice shelf becomes top-heavy due to the snow and the melting from below, and calving occurs.

6. Which of the following diagrams best shows the location of the basal cavity as described by Student 3?

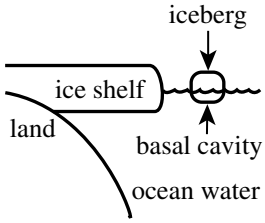
F.



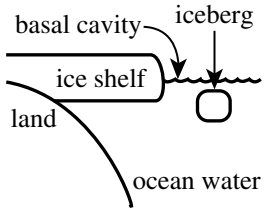
H.



G.



J.



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7. Suppose that the air temperature along the Antarctic coastline is never warmer than −10°C and that the atmospheric pressure is always 1.0 atmosphere. Does this information support the description given by Student 1?

A. Yes, because ice cannot melt at those temperatures.
B. Yes, because ice can melt at those temperatures.
C. No, because ice cannot melt at those temperatures.
D. No, because ice can melt at those temperatures.

8. Based on the description of the icebergs that are calved along the coastline of Antarctica, do the icebergs sink or float?

F. Sink; they are more dense than ocean water.
G. Sink; they are less dense than ocean water.
H. Float; they are more dense than ocean water.
J. Float; they are less dense than ocean water.

9. Which of Students 1 and 4, if either, implied that the processes involved in iceberg calving will take more than one year to result in the formation of an iceberg?

A. Student 1 only
B. Student 4 only
C. Both Student 1 and Student 4
D. Neither Student 1 nor Student 4

10. In regard to the season(s) involved in iceberg calving, how does Student 2's description differ from Student 3's description? Student 2 indicated that:

F. summer and winter are involved in calving, whereas Student 3 indicated that only summer is involved in calving.
G. summer and winter are involved in calving, whereas Student 3 indicated that only winter is involved in calving.
H. only summer is involved in calving, whereas Student 3 indicated that summer and winter are involved in calving.
J. only winter is involved in calving, whereas Student 3 indicated that only summer is involved in calving.

11. Which of Students 2, 3, and 4 agree(s) with Student 1 that some form of melting occurs on the ice shelf surface?

A. Student 2 only
B. Students 2 and 3 only
C. Students 2 and 4 only
D. Students 3 and 4 only

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Passage III

Amphiprion percula, a species of clownfish, are kept in many home aquariums. Two experiments were conducted to determine how diet and stocking density (number of fish per liter of seawater, fish/L) affect the specific growth rate (SGR; percent increase in length per day, percent/day) in *A. percula*.

Experiment 1

Each of 12 identical 15 L tanks received 10 L of seawater having a salinity of 33 parts per thousand (ppt), a temperature of 27°C, and a pH of 8.2. Salinity, temperature, and pH were kept constant over the course of the experiment. *A. percula* of similar lengths were selected, and their lengths were measured, in cm, with a ruler. Then they were equally distributed among the tanks at a stocking density of 1 fish/L. The tanks were then divided equally into 4 groups.

For 4 months, each group was fed a different diet (Diets Q–T). Each group was fed the same mass of food 3 times daily. At the end of 4 months, the length of each fish was measured, in cm, with a ruler, and the SGR of each fish was calculated. The average SGR was then determined for each group (see Table 1).

Table 1

Diet	Average SGR (percent/day)
Q	0.30
R	0.40
S	0.50
T	0.35

Experiment 2

The procedures for Experiment 1 were repeated except that each group was kept at a different stocking density, 0.5 fish/L, 1 fish/L, 2 fish/L, or 3 fish/L, and all fish were fed Diet T. At the end of 4 months, the average SGR was determined for each group (see Table 2).

Table 2

Stocking density (fish/L)	Average SGR (percent/day)
0.5	0.50
1	0.35
2	0.25
3	0.20

Tables adapted from João Chambel et al., "Effect of Stocking Density and Different Diets on Growth of Percula Clownfish, *Amphiprion percula* (Lacepede, 1802)." ©2015 by Springer.

12. Which of the following statements about the relationship between the number of *A. percula* per tank and the average SGR is consistent with the results of Experiment 2? On average, as the number of *A. percula* per tank increased, the average SGR:

F. increased only.
G. decreased only.
H. remained the same.
J. varied with no general trend.

13. The following table gives the percent protein in each of the 4 diets.

Diet	Percent protein
Q	52.5
R	48.0
S	41.1
T	38.1

Which of the following statements about the percent protein in each diet and the average SGR is consistent with the data shown in the table and the results of Experiment 1? The diet that resulted in the:

A. highest average SGR also had the highest percent protein.
B. highest average SGR had the lowest percent protein.
C. lowest average SGR had the highest percent protein.
D. lowest average SGR also had the lowest percent protein.

14. Based on the results of Experiment 1, if Experiment 2 were repeated except that all the *A. percula* were fed Diet R, would the average SGRs more likely have been lower or higher for each group?

F. Lower; on average, *A. percula* fed Diet R had an SGR 0.05 percent/day less than those fed Diet T.
G. Lower; on average, *A. percula* fed Diet R had an SGR 0.10 percent/day less than those fed Diet T.
H. Higher; on average, *A. percula* fed Diet R had an SGR 0.05 percent/day greater than those fed Diet T.
J. Higher; on average, *A. percula* fed Diet R had an SGR 0.10 percent/day greater than those fed Diet T.

15. Suppose that, in the experiments, 1 g of food were added to each tank at each feeding. A total of how many grams of food would have been placed into an individual tank each day?

A. 1 g
B. 3 g
C. 12 g
D. 36 g

16. How many *A. percula* were placed in each of the tanks in Experiment 1?

F. 1
G. 4
H. 10
J. 12

17. Which of the following was a dependent variable in Experiment 1?

A. Volume of seawater in each tank
B. Specific growth rate
C. Diet fed to the *A. percula*
D. Stocking density of the *A. percula*

Passage IV

Scientists hypothesized that heating tomatoes affects the concentration of nutrients such as vitamin C and lycopene (a red pigment) in the tomatoes. They conducted 2 experiments to test their hypothesis.

Experiment 1

Two kilograms of a particular variety of raw tomatoes were sliced and then blended in a food processor until a homogeneous (uniform) tomato mixture was produced. The mixture was divided into 4 equal samples (Samples 1–4). Each sample was placed in a separate plastic bag, and the bags were sealed. The bag containing Sample 1 was immediately frozen at −40°C. The bags containing Samples 2–4 were each incubated in a water bath at 88°C for a different period of time (see Table 1) and then frozen at −40°C.

Table 1

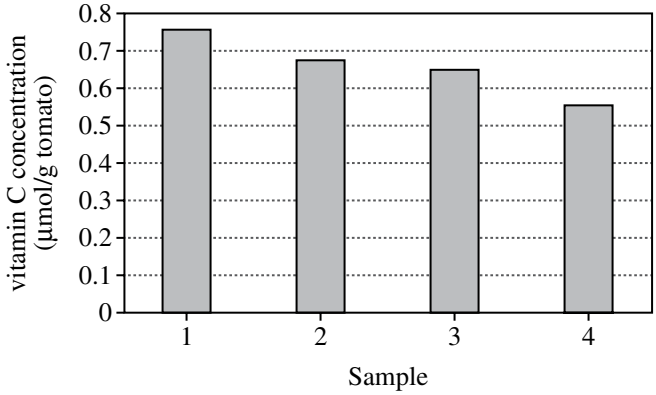
Sample	Incubation time at 88°C (min)
1	0
2	2
3	15
4	30

Then, 2 days later, Steps 1–3 were performed for each sample.

1. The sample was thawed, and then 100 g of the sample was placed in a beaker containing 200 mL of Solvent A.
2. The contents of the beaker were mixed for 5 min at 25°C and then filtered using a paper filter. The filtered liquid was collected.
3. The filtered liquid was analyzed to determine the vitamin C concentration in micromoles per gram of tomato (μmol/g tomato).

The results for each sample are shown in Figure 1.

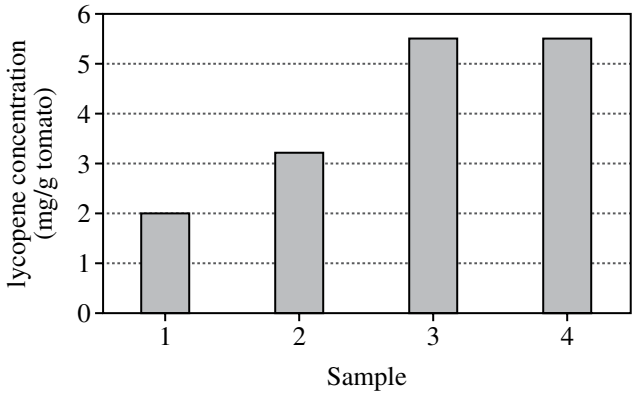
Figure 1



Experiment 2

Experiment 1 was repeated except that in Step 3 the filtered liquid was analyzed to determine the lycopene concentration in milligrams per gram of tomato (mg/g tomato). The results for each sample are shown in Figure 2.

Figure 2



Figures 1 and 2 adapted from Veronica Dewanto et al., "Thermal Processing Enhances the Nutritional Value of Tomatoes by Increasing Total Antioxidant Activity." ©2002 by American Chemical Society.

18. Which of the samples in Experiment 1 was most likely intended as a control for the concentration of vitamin C present in the unheated tomatoes?

F. Sample 1
G. Sample 2
H. Sample 3
J. Sample 4

19. Based on the results of Experiment 2, which of the following incubation times would most likely have produced a tomato mixture with a lycopene concentration between 5 mg/g tomato and 6 mg/g tomato?

A. 0 min
B. 0.2 min
C. 2 min
D. 20 min

20. A student claimed that heating tomatoes decreases the concentration of nutrients present. This claim is consistent with the results shown for which of vitamin C and lycopene, if either?

F. Vitamin C only
G. Lycopene only
H. Both vitamin C and lycopene
J. Neither vitamin C nor lycopene

21. Assume that, in the experiments, the water bath contained pure water at standard atmospheric pressure (1 atmosphere; atm). While the bags containing the samples were being incubated, was the water in the water bath most likely boiling?

A. Yes; the incubation temperature was less than the boiling point of water at 1 atm.
B. Yes; the incubation temperature was greater than the boiling point of water at 1 atm.
C. No; the incubation temperature was less than the boiling point of water at 1 atm.
D. No; the incubation temperature was greater than the boiling point of water at 1 atm.

22. In Experiment 1, how many of the samples had a vitamin C concentration of less than 1.0 μmol/g tomato?

F. 0
G. 1
H. 3
J. 4

23. Consider the following procedures performed in Experiment 2 for Sample 2.

1. The sample was frozen.
2. The sample was incubated in the water bath.
3. The sample and solvent mixture was filtered.

These procedures were performed in what order?

A. 1, 2, 3
B. 1, 3, 2
C. 2, 1, 3
D. 2, 3, 1

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Passage V

A molten alloy (a mixture of 2 or more metallic elements) can be poured into a cylindrical mold and cooled to form an ingot. Crystals form inside the ingot as it cools. The average crystal length, L, in micrometers (μm), determines how brittle the ingot will be. A method for reducing L using rotating magnetic fields was applied to Alloy Q as it cooled in the molds. Table 1 shows the elemental composition of Alloy Q. Figure 1 shows the effect of the relative magnetic stirring force, F, on L for ingots formed from molten Alloy Q that had an initial temperature of either 280°C or 550°C.

Table 1

Element	Symbol	Percent by mass in Alloy Q
Aluminum	Al	88.7
Silicon	Si	10.8
Manganese	Mn	0.28
Magnesium	Mg	0.22

Figure 1

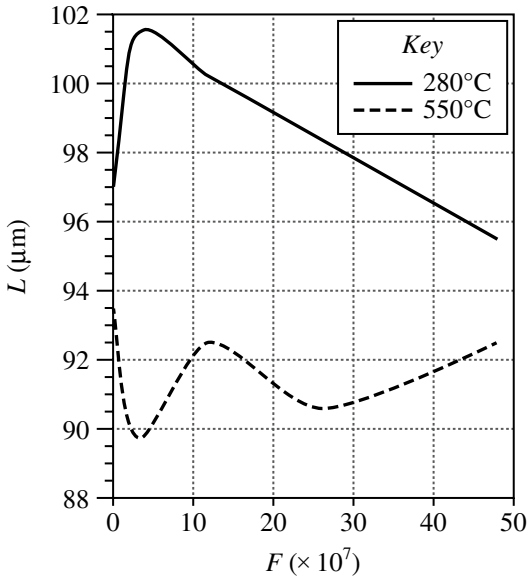

Figure 1 is adapted from S. Denisov, et al., "The Effect of Traveling and Rotating Magnetic Fields on the Structure of Aluminum Alloy During Its Crystallization in a Cylindrical Crucible." ©2014 by Institute of Physics, University of Latvia.

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24. A linear region of a graph is a range of data that can be approximated with a straight line. Based on Figure 1, for Alloy Q initially at a temperature of 550°C, which of the following ranges of F best represents a linear region?

F. Between 0 and 10×10^7
G. Between 10×10^7 and 20×10^7
H. Between 20×10^7 and 30×10^7
J. Between 30×10^7 and 40×10^7

25. Consider the 2 trends shown for Alloy Q initially at the temperatures of 280°C and 550°C, from $F = 40 \times 10^7$ through $F = 48 \times 10^7$. If these lines were to continue along the same trend, at which of the following values of F would the average crystal lengths most likely be the same?

A. $F = 50 \times 10^7$
B. $F = 60 \times 10^7$
C. $F = 70 \times 10^7$
D. $F = 80 \times 10^7$

26. Based on Figure 1, which of the following combinations of values for initial temperature and F would produce the shortest average crystal length in an ingot of Alloy Q? The smallest L would be produced with a temperature of:

F. 280°C and $F = 10 \times 10^7$.
G. 280°C and $F = 40 \times 10^7$.
H. 550°C and $F = 10 \times 10^7$.
J. 550°C and $F = 40 \times 10^7$.

27. The following table lists the mass of silicon in 50 g samples of 4 different alloys, one of which is Alloy Q.

Sample	Mass of Si (g)
W	0.11
X	0.14
Y	2.7
Z	5.4

Given the composition of Alloy Q, which sample is most likely Alloy Q?

A. Sample W
B. Sample X
C. Sample Y
D. Sample Z

28. Based on Table 1, if an ingot of Alloy Q had a mass of 200 g, that ingot would contain what mass of Mg?

F. 0.22 g
G. 0.44 g
H. 2.2 g
J. 4.4 g

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Passage VI

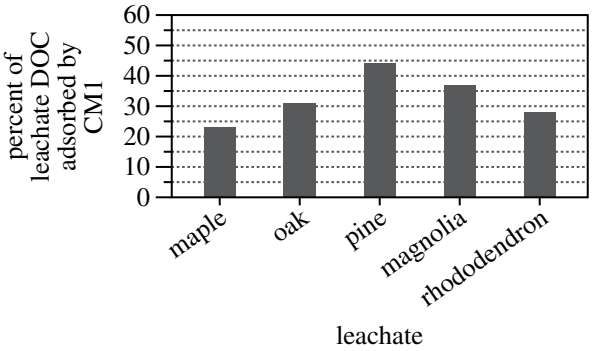
In a lake, water leaches (dissolves out) soluble organic compounds from decaying tree leaves, producing dissolved organic carbon (DOC). DOC is subsequently removed from the water if it is adsorbed by (becomes adhered to the surface of) clay mineral particles that are suspended in the water. Three studies done at a lake examined DOC adsorption by 3 clay minerals—CM1, CM2, and CM3—found in the lake's sediment.

Green leaves were collected from 5 types of trees around the lake (maple, oak, pine, magnolia, and rhododendron). A 5 L volume of lake water was filtered to remove all solid particles. The following procedures were performed for each type of leaf: A 100 g sample of the leaves was mixed with a 1 L volume of the filtered lake water. The mixture was then placed in the dark for 10 weeks at 4°C while leaching occurred. At 10 weeks, the mixture was filtered to remove all solid particles. The resulting liquid (the leachate) was analyzed for DOC.

Study 1

The following procedures were performed for each leachate: A 100 mL volume of the leachate was mixed with 10 g of CM1. The mixture was stirred continuously for 2 hr, then filtered to remove all solid particles. The resulting liquid (the filtrate) was analyzed for DOC. The percent of the leachate DOC that had been adsorbed by CM1 was calculated (see Figure 1).

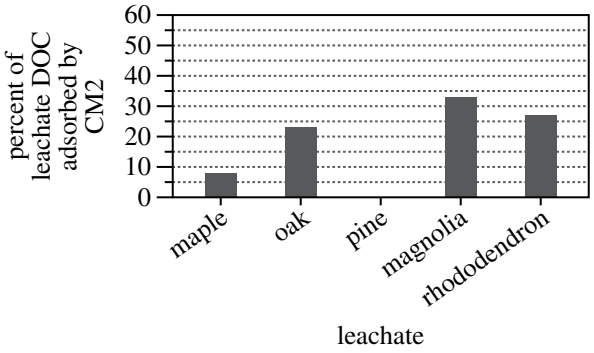
Figure 1



Study 2

Study 1 was repeated, substituting CM2 for CM1 (see Figure 2).

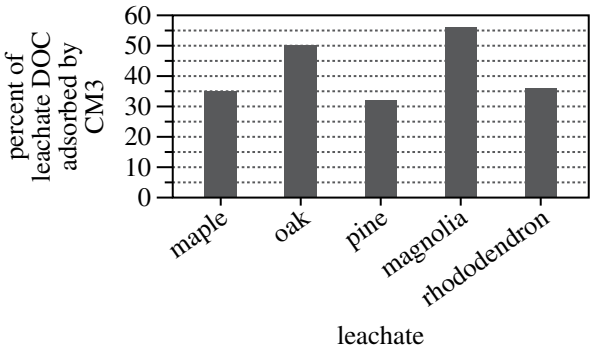
Figure 2



Study 3

Study 1 was repeated, substituting CM3 for CM1 (see Figure 3).

Figure 3



Figures and table adapted from Todd Tietjen, Anssi Vähätalo, and Robert Wetzel, "Effects of Clay Mineral Turbidity on Dissolved Organic Carbon and Bacterial Production." ©2005 by the Swiss Federal Institute for Environmental Science and Technology.

29. Based on the results of the studies, from which of the 5 leachates was the greatest percent of DOC adsorbed by CM1, CM2, and CM3, respectively?

A. CM1: maple
CM2: maple
CM3: rhododendron

B. CM1: oak
CM2: pine
CM3: magnolia

C. CM1: pine
CM2: magnolia
CM3: rhododendron

D. CM1: pine
CM2: magnolia
CM3: magnolia

30. Based on the results of Study 3, the percent of leachate DOC adsorbed by CM3, averaged across the 5 types of leaves, is closest to which of the following?

F. 10%
G. 20%
H. 30%
J. 40%

31. Is the statement "CM2 adsorbed a greater percent of the DOC in the maple leachate than did CM3" supported by the results of Studies 2 and 3?

A. Yes; CM2 adsorbed 35% of the leachate DOC, whereas CM3 adsorbed 7%.
B. Yes; CM2 adsorbed 55% of the leachate DOC, whereas CM3 adsorbed 17%.
C. No; CM2 adsorbed 7% of the leachate DOC, whereas CM3 adsorbed 35%.
D. No; CM2 adsorbed 17% of the leachate DOC, whereas CM3 adsorbed 55%.

32. Based on the results of the studies, which of the 3 clay minerals, if any, reduced the DOC in the oak leachate by more than 50%?

F. CM1 only
G. CM2 only
H. CM1 and CM3 only
J. None of the 3 clay minerals

33. Is a mixture of any one of the leachates and any one of the clay minerals properly considered a solution?

A. Yes, because the clay mineral particles are dissolved in the leachate.
B. Yes, because the clay mineral particles are not dissolved in the leachate.
C. No, because the clay mineral particles are dissolved in the leachate.
D. No, because the clay mineral particles are not dissolved in the leachate.

34. In lake water, DOC is broken down into simpler compounds by electromagnetic energy in the visible wavelength range. What action was taken in the studies to prevent this process from occurring?

F. Each mixture of leaves and filtered lake water was placed in the dark.
G. Each mixture of filtrate and clay mineral was placed in the dark.
H. Each mixture of leaves and lake water was filtered.
J. Each mixture of leachate and clay mineral was filtered.

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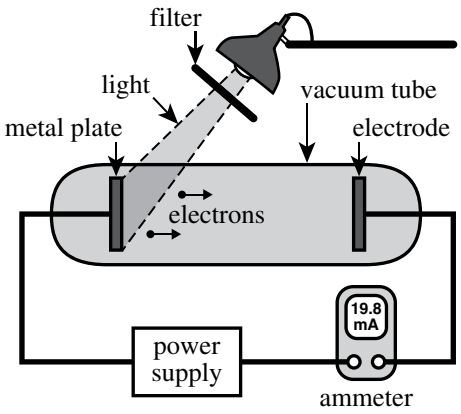
Passage VII

When light shines on a metal plate, electrons can be ejected from the plate. An electron will be ejected if the energy, E, of a photon (particle of light) striking the plate is greater than the minimum energy, M, required for the electron to be removed from the plate. The maximum kinetic energy of the ejected electron, K, is the difference between E and M as shown in the equation:

$K = E - M$

Students conducted 2 experiments to examine how differences in the light striking a metal plate affect K. The setup included a light source, a removable filter, a circuit with an ammeter to measure current, a power supply that could be adjusted to measure K, and a vacuum tube containing a metal plate and an electrode (see Figure 1).

Figure 1



Experiment 1

A filter was placed between the metal plate and the light source, and the K of the ejected electrons was measured. This procedure was repeated with each of 4 additional filters. Each filter transmitted light of only one frequency. Table 1 lists the following:

- color of light transmitted by the filter
- frequency of light in hertz, Hz
- E in electron volts, eV
- K in electron volts

Table 1

Color	Frequency ($\times 10^{14}$ Hz)	E (eV)	K (eV)
Red	4.4	1.81	N.A.*
Yellow	5.2	2.14	N.A.*
Green	5.6	2.31	0.11
Blue	6.3	2.60	0.40
Violet	7.5	3.10	0.90

*N.A.—Not available; no electrons were ejected.

Experiment 2

With the same setup as in Experiment 1 except without a filter, the current, in milliamperes (mA), and K were measured as the intensity of the light was varied. Table 2 shows the current and K for 4 different relative light intensities, each given as a percent of maximum intensity.

Table 2

Relative intensity	Current (mA)	K (eV)
100%	40.0	0.90
50%	19.8	0.90
25%	9.8	0.90
12.5%	4.8	0.90

35. Consider the current shown on the ammeter in Figure 1. Based on the results of Experiment 2, when this current was measured, what was the relative intensity of the light?

A. 100%
B. 50%
C. 25%
D. 12.5%

36. What aspect of the experimental setup was held constant in Experiment 2 but not in Experiment 1?

F. Color of light
G. Light source
H. Type of metal plate
J. Distance between metal plate and electrode

37. Based on Figure 1, are the particles ejected from the metal plate moving toward the electrode or away from the electrode, and are those particles positively charged or negatively charged?

A. Toward; positively charged
B. Toward; negatively charged
C. Away from; positively charged
D. Away from; negatively charged

38. Based on the equation in the passage and the results of Experiment 1, what was the value of M for the metal plate used in the setup?

F. 2.14 eV
G. 2.20 eV
H. 2.31 eV
J. 2.42 eV

39. The *cutoff frequency* for a particular metal is the lowest frequency of light at which electrons are ejected from the metal. Based on the results of Experiment 1, the cutoff frequency for the metal plate was:

A. less than 4.4×10^{14} Hz.
B. between 4.4×10^{14} Hz and 5.2×10^{14} Hz.
C. between 5.2×10^{14} Hz and 5.6×10^{14} Hz.
D. greater than 5.6×10^{14} Hz.

40. The relationship between E and the frequency of light is given by the equation:

$E = hf$

where h is Planck's constant and f is the frequency of light. Based on the data for green light in Table 1, which of the following expressions could be used to determine the value of h?

F. $\frac{5.6 \times 10^{14}\ \text{Hz}}{0.11\ \text{eV}}$

G. $\frac{0.11\ \text{eV}}{5.6 \times 10^{14}\ \text{Hz}}$

H. $\frac{5.6 \times 10^{14}\ \text{Hz}}{2.31\ \text{eV}}$

J. $\frac{2.31\ \text{eV}}{5.6 \times 10^{14}\ \text{Hz}}$

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

Practice Writing Test Prompt 1

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Month			Day			Year		

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You will write your essay on the lined pages in the **answer document** provided. Your writing on those pages will be scored. You may use the unlined pages in this test booklet to plan your essay. Your work on these pages will not be scored.

Your essay will be evaluated based on the evidence it provides of your ability to:

- clearly state your own perspective on a complex issue and analyze the relationship between your perspective and at least one other perspective
- develop and support your ideas with reasoning and examples
- organize your ideas clearly and logically
- communicate your ideas effectively in standard written English

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Outer Space

The United States and other nations have been exploring outer space for more than 50 years. Orbiting Earth, visiting the Moon, and maintaining an international space station have been landmarks of technological and scientific achievement. But major problems persist on the home planet, including hunger, disease, and pollution. Plans for further space exploration—sending people to Mars, for example—compete for financial and intellectual resources that could be used to help address these problems. To what extent, then, should we continue to explore outer space?

Read and carefully consider these perspectives. Each suggests a particular way of thinking about the question above.

Perspective One

The pursuit of greater knowledge is worth any expense. Even if exploring space does not solve problems at home, it increases our understanding of the universe and our place within it.

Perspective Two

Life on Earth must always be our first priority. Exploring outer space is not more important than feeding people on Earth and ensuring the health of the planet.

Perspective Three

Scientific and technological achievements are the key to progress for humankind. By exploring outer space, we may discover new solutions to old problems.

Essay Task

Write a unified, coherent essay in which you address the question of whether we should continue to explore outer space. In your essay, be sure to:

- clearly state your own perspective and analyze the relationship between your perspective and at least one other perspective
- develop and support your ideas with reasoning and examples
- organize your ideas clearly and logically
- communicate your ideas effectively in standard written English

Your perspective may be in full agreement with any of those given, in partial agreement, or completely different.

Planning Your Essay

Your work on these prewriting pages will not be scored.

Use the space below and on the back cover to generate ideas and plan your essay. You may wish to consider the following as you think critically about the task:

Strengths and weaknesses of different perspectives on the issue

- What insights do they offer, and what do they fail to consider?
- Why might they be persuasive to others, or why might they fail to persuade?

Your own knowledge, experience, and values

- What is your perspective on this issue, and what are its strengths and weaknesses?
- How will you support your perspective in your essay?

Note

- For your practice essay, you will need scratch paper to plan your essay and four lined sheets of paper for your response.
- On test day, if you are taking the paper test, you will receive a test booklet with space to plan your essay and an answer document with four lined pages on which to write your response.
- Read pages 78 –80 for information and instructions on scoring your practice writing test.

