9th

PLAN Form 31A

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9R-142

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1

ENGLISH TEST

30 Minutes—50 Questions

DIRECTIONS: In the four passages that follow, certain words and phrases are underlined and numbered. In the right-hand column, you will find alternatives for the underlined part. In most cases, you are to choose the one that best expresses the idea, makes the statement appropriate for standard written English, or is worded most consistently with the style and tone of the passage as a whole. If you think the original version is best, choose "NO CHANGE." In some cases, you will find in the right-hand column a question about the underlined part. You are to choose the best answer to the question.

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 folder. 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

Beauty in Landscape

Until recently, I had only lived in the western United States—along the Pacific coast, near mountains, and in the high deserts of California, New Mexico, Oregon, and Utah. It was when I moved east that has been when[1] I came to understand something essential about my taste. My idea of what is beautiful in landscape is shaped by the geography that is most familiar to my eye.

My friends in the East,[2] describe parks, farms, or cities as beautiful, but when[3] I visit these places, I find them bland and uninspiring. Just a lot of trees, I think—I can hardly see the sky. There are no vistas. Those are small hills, not mountains. I feel claustrophobic in dense forests of maple, oak, and sycamore.

As I puzzled over this, I realize[4] that the landscapes I know best are dramatic: soaring, rocky mountains; fast rivers running through giant boulders and over steep slabs of granite; empty land so vast it might be a brown, tideless

1. **A.** NO CHANGE
B. being when
C. is
D. DELETE the underlined portion.

2. **F.** NO CHANGE
G. friends' in the East,
H. friends in the East
J. friends' in the East

3. **A.** NO CHANGE
B. because
C. as if
D. DELETE the underlined portion.

4. **F.** NO CHANGE
G. realized
H. am to realize
J. have realized

ocean meeting the sky in a sharp line against the horizon. My landscape is dominated by earth, sky, and rock. I don't of dense foliage know how to appreciate the softness.
5

However, a landscape that is primarily green rather
6
than brown is not lovely to me. Acres of trees block the sunlight, hide the sky, and foster a thick underbrush that limits where you can walk and explore.
7

Since I live in the East now, I find myself trying to
8
understand the beauty of this new landscape. I've learned
8

to appreciate winter when the trees, are bare, and more
9

of the land and sky are visible. After, when the ground
10

is covered with snow, I like its spare white beauty.
11

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

A. where it is now.
B. after the word *know.*
C. after the word *appreciate.*
D. after the word *softness* (and before the period).

6. **F.** NO CHANGE
G. A
H. Yet, a
J. When a

7. Which of the following alternatives to the underlined portion would NOT be acceptable?

A. people
B. a person
C. they
D. I

8. Which choice provides the most effective transition into this paragraph?

F. NO CHANGE
G. I often think about the beauty of the landscape of the West.
H. I have the opportunity to see several of my friends more often.
J. parks, farms, and cities are what most of my neighbors consider to be beautiful.

9. **A.** NO CHANGE
B. winter when, the trees are bare,
C. winter when, the trees are bare
D. winter, when the trees are bare

10. **F.** NO CHANGE
G. When the
H. Next, the
J. The

11. **A.** NO CHANGE
B. it's
C. its'
D. how its

I'm also building fond of the marshes and beaches along
12

the Atlantic coast, which are as open as the desert. [13] And wherever I am, when I look up I notice that, even framed by trees, the sky is beautiful.

12. **F.** NO CHANGE
G. expanding
H. increasing
J. growing

13. The writer is considering deleting the clause "which are as open as the desert" from the preceding sentence (changing the comma after the word *coast* to a period). Should this clause be kept or deleted?

A. Kept, because it helps the reader understand what the narrator finds appealing about the marshes and beaches along the Atlantic coast.
B. Kept, because it makes clear that the narrator still longs to live in the high deserts of California.
C. Deleted, because it is unnecessary since the essay has already made clear that the narrator is fond of deserts.
D. Deleted, because it detracts from this paragraph's focus on the appearance of the landscape of the East during winter.

PASSAGE II

The Worldly Sunflower

Sunflowers are native, only to the Americas. Yet,
14

surprisingly, the gigantic sunflowers commercially harvested in the United States today were developed in Europe.

As early as 3000 BC, in both North and South America, Native peoples began cultivating small sunflowers with seeds the size of grains of rice. [15] The growers put the entire sunflower to good use.

14. **F.** NO CHANGE
G. native only,
H. native only
J. native, only,

15. At this point, the writer is considering adding the following true statement:

> Since they grow wild in Kansas, the state adopted the sunflower as its official flower in 1903.

Should the writer make the addition here?

A. Yes, because it adds important background information about sunflowers.
B. Yes, because it demonstrates the sunflower's cultural importance to part of the Americas.
C. No, because it doesn't clarify which variety of sunflower Kansas chose.
D. No, because it is unrelated to the paragraph's focus on Native uses of the sunflower.

They cracked the seeds shells and either ate the kernels
16

within and pounded them into flour. Various plant parts
17
produced medicinal ointments; seed oil provided purple dye for ceremonial body painting; and the petals offered a yellow dye to brighten textiles. Even the dried stalks supplied people with building materials.

[1] Around AD 1500, Spanish explorers returned home from South America with sunflower seeds. [2] In North America during the 1700s, European settlers adopted a Native method of raising sunflowers, planting them among
18
rows of beans and corn. [3] Although sunflower production eventually decreased among the settlers, they continued to grow the flower for decorative use. [4] The plant's popularity spread across Europe so quickly that by the 1600s sunflowers have became a
19
common sight. [20]

In the early 1800s, however
21
Russians began growing sunflowers commercially, making Russia a leading source of sunflower oil. Attempting to boost their sunflower oil output. The
22
Russians began a successful program that bred taller and more productive sunflowers.

16. **F.** NO CHANGE
G. seeds' shells
H. seeds shell's
J. seeds shells'

17. **A.** NO CHANGE
B. within, pounding
C. within or pounded
D. within to pound

18. **F.** NO CHANGE
G. planting themselves between
H. they were planted with
J. with them planting among

19. **A.** NO CHANGE
B. have become
C. had became
D. had become

20. For the sake of the logic and coherence of this paragraph, Sentence 4 should be placed:

F. where it is now.
G. before Sentence 1.
H. after Sentence 1.
J. after Sentence 2.

21. **A.** NO CHANGE
B. 1800s, however,
C. 1800s however,
D. 1800s however

22. **F.** NO CHANGE
G. output because the
H. output; the
J. output, the

1

In the late 1800s, Russian immigrants brought the seeds of these larger varieties with them to the United States. With these new seeds, farmers started commercially growing sunflowers so far exceeded in size and number those produced by the original plants. [25]

23. Which of the following placements for the underlined portion would be LEAST acceptable?
    - A. Where it is now
    - B. After the word *immigrants*
    - C. After the word *brought*
    - D. After the words *United States* (and before the period)

24. F. NO CHANGE
    - G. that
    - H. had
    - J. too

25. The writer wants to effectively conclude this paragraph and tie it more closely to the opening paragraph of the essay. Which of the following true statements would best accomplish this purpose?
    - A. Many people in the United States today plant sunflowers because they add a natural beauty to any garden.
    - B. Sunflower production is now again on the rise as people discover the health benefits of the flower's oil and seeds.
    - C. After the sunflower's alterations overseas, widespread sunflower production has found a home again in the Americas.
    - D. To this day, many organizations support the cultivation of and research on sunflowers throughout the world.

PASSAGE III

When the Steel Drums Go Marching In

Inspired by a musician from the Caribbean island of Trinidad, some Shriners in North Carolina formed the first steel drum band in Shriners history. Wearing beige bolero shirts and flat-topped hats, parades and civic events regularly feature the band. The Shriners' goal, which they regularly attain, is to attract attention to their service organization and it's important work.

26. F. NO CHANGE
    - G. band members play in parades and at civic events.
    - H. civic events and parades are occasions when the group plays.
    - J. many local civic events, such as parades, feature the band's playing.

27. A. NO CHANGE
    - B. their service organization and its
    - C. there service organization and it's
    - D. there service organization and its

1

[1] Accordingly, steel drums, or pans, start out as fifty-five-gallon metal barrels. [2] Pan makers hammer one end into a bowl-shaped playing surface. [3] The depth of the bowls varies: high-pitched tenor drums have deep bowls, while low-pitched bass drums have shallower ones. [4] Makers then fashioned specially tuned ridges into the bowls that, when struck with a mallet, produce distinct pitches and tones. [5] The result is a melodic, percussive sound that evokes images of the gentle climate of the instrument's Caribbean birthplace. [32]

A pan group can produce sounds as varied as the voices in a choir and may include lead, baritone, cello, and tenor bass drums as well as a six bass, which is itself composed of six pans. The Shriners, like other steel groups, can play tunes in almost any musical style. Their favorite songs range from "Jamaica Farewell" to "When the Saints Go Marching In."

The Shriners formed their band. After they met Mikey Enoch, a musician from Trinidad. Enoch, both a performer and pan maker, agreed to build the drums and teach the Shriners how to play them.

The Shriners say performing before an audience requires courage and preparation, so they practice weekly. To their twenty-five steel drums, the Shriners add tambourines, maracas, and cowbells to their drums. The band is hugely popular with audiences, and profits from their performances help children at Shrine hospitals.

28. **F.** NO CHANGE
G. Moreover, steel
H. Thus, steel
J. Steel

29. **A.** NO CHANGE
B. than fashioned
C. then fashion
D. than fashion

30. **F.** NO CHANGE
G. mallet produce
H. mallet, produces
J. mallet produces

31. **A.** NO CHANGE
B. evoke images
C. evoke images,
D. evokes images,

32. Upon reviewing this paragraph and realizing that some information has been left out, the writer composes the following sentence, incorporating that information:

> A pitch pipe helps the pan maker ensure that each of these notes is neither sharp nor flat.

This new sentence should most logically be placed after Sentence:

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

33. **A.** NO CHANGE
B. band; after
C. band: after
D. band after

34. **F.** NO CHANGE
G. proclaim the point that
H. articulate distinctly that
J. speak volumes about how

35. **A.** NO CHANGE
B. cowbells to the steel drums.
C. cowbells to their many steel drums.
D. cowbells.

36. **F.** NO CHANGE
G. elicits affirmative responses from
H. wins some big hands from
J. does the job with

1

Question 37 asks about the preceding passage as a whole.

37. Suppose that as one goal, the writer wants the essay to briefly describe the history of steel drum playing. Would this essay accomplish this goal?
    - **A.** Yes, because it shows how the instruments are made from what were originally just metal barrels.
    - **B.** Yes, because it provides information about the first steel drum band in the history of the Shriners.
    - **C.** No, because it details the history of one steel drum band but not the history of the instrument.
    - **D.** No, because it fails to include important historical facts, such as where the instrument originally came from.

PASSAGE IV

Libraries Are Needed and Wanted

As many of us know from experience, libraries do more than hold books; (38) they hold the power to change lives. However, through computer and Internet access, a wealth of information will have been (39) available outside of a traditional library. As a result, many city and state governments across the United States, (40) debate the purpose of public libraries and the amount of funding needed to maintain their services.

Many of our communities are looking at cuts of as much as 50 percent (41) in library funding, having been suggested (42) that the library isn't as important as other government services. Perhaps some government

38. **F.** NO CHANGE
    G. books
    H. books,
    J. books and

39. **A.** NO CHANGE
    B. had been
    C. was
    D. is

40. **F.** NO CHANGE
    G. governments across the United States
    H. governments across the United States;
    J. governments, across the United States

41. If the writer were to delete the underlined portion, the paragraph would primarily lose:
    - **A.** a specific example of one city official's attempt at a library budget cut.
    - **B.** a statistic indicating the number of libraries affected by budget cuts.
    - **C.** an estimate that suggests the size of many library budget cuts.
    - **D.** a detail that explains the reason library budgets have been cut.

42. **F.** NO CHANGE
    G. suggested
    H. suggesting
    J. DELETE the underlined portion.

officials consider the public library a luxury—a service citizens could of done (43) without. Libraries don't build roads or put food on people's tables. They also don't protect us, as police and fire departments do. However, libraries build our sense of community and has improved (44) the quality of our lives.

Nationwide, 97 percent of the population has access to public libraries. Students depend on library research materials for homework, preschoolers, and (45) their parents look forward to weekly story times, and people of all ages checking out for their enjoyment books (46) for leisure reading. Other resources include job search assistance, tax preparation advice, (47) and health-related seminars. Overall, libraries provide a comfortable place for exploring and the expansion in (48) our world.

Those of us who use the public library system consider its services essential. Journalist Pete Hamill once said, (49) that the road to our imaginations begins at the public library. To keep that road maintained we must continue encouraging all generations to foster a lifelong (50) love of reading.

43. **A.** NO CHANGE
B. done
C. of did
D. do

44. **F.** NO CHANGE
G. improve
H. improves
J. is improving

45. **A.** NO CHANGE
B. preschoolers and
C. preschoolers; and
D. preschoolers,

46. **F.** NO CHANGE
G. enjoying their books they check out
H. checked out books for their enjoyment
J. enjoy the books they check out

47. Given that all the choices are true, which one most clearly provides the paragraph with a new example of the wide variety of services offered by the library?

A. NO CHANGE
B. information for school projects,
C. interesting books,
D. children's events,

48. **F.** NO CHANGE
G. the expanse of
H. expanding
J. for expanding to

49. **A.** NO CHANGE
B. once said:
C. once, said
D. once said

50. Which choice would best conclude the sentence and this essay by clearly restating the writer's main argument?

F. NO CHANGE
G. using the library as a location for holding meetings of local organizations.
H. demanding adequate government funding for our local libraries.
J. helping people learn to find the books they need.

END OF TEST 1

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

2

MATHEMATICS TEST

40 Minutes—40 Questions

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

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.

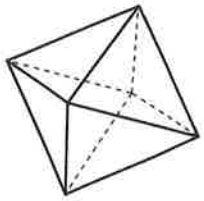
1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

DO YOUR FIGURING HERE.

1. An elevator in a high-rise office building let off passengers on the 20th floor and then went up 12 floors to pick up Abe, who rode down 7 floors and got off the elevator. As Abe got off, Betty got on and rode up 15 floors, where she got off and Carlos got on. Carlos rode down 4 floors and got off. At what floor did Carlos get off the elevator?

A. 4th
B. 14th
C. 20th
D. 26th
E. 36th

2. The point at the intersection of 4 faces of an octahedron (shown below) is called a *vertex point*. How many vertex points does an octahedron have?



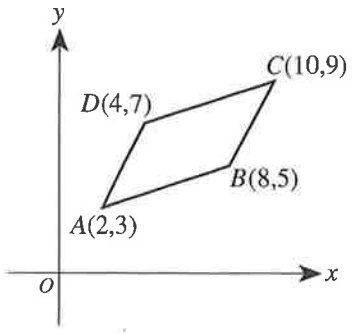
F. 6
G. 8
H. 12
J. 16
K. 24

3. A formula commonly used to calculate distance traveled is $d = rt$, in which d is distance, r is rate, and t is time traveled. How many hours will it take you to travel 360 miles at an average rate of 45 miles per hour?

A. 0.125
B. 1.25
C. 8
D. 315
E. 16,200

DO YOUR FIGURING HERE.

4. As shown in the standard (x,y) coordinate plane below, parallelogram $ABCD$ has vertices $A(2,3)$, $B(8,5)$, $C(10,9)$, and $D(4,7)$. The midpoint of $\overline{AC}$ is the same as the midpoint of what other segment?



F. $\overline{AB}$
G. $\overline{AD}$
H. $\overline{BC}$
J. $\overline{BD}$
K. $\overline{CD}$

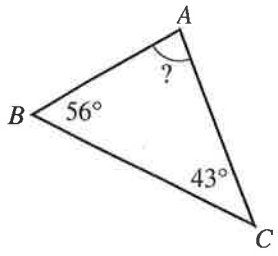
5. Which of the following is equivalent to $2x^4$?

A. $2 \cdot x \cdot 4$
B. $2 \cdot 4 \cdot x \cdot 4$
C. $2 \cdot x \cdot x \cdot x \cdot x$
D. $2 \cdot 4 \cdot x \cdot x \cdot x \cdot x$
E. $2 \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot x$

6. The area of a rectangle is 28 square millimeters. The length of the rectangle is 7 millimeters. What is the width of the rectangle, in millimeters?

F. 4
G. 7
H. 8
J. 21
K. 35

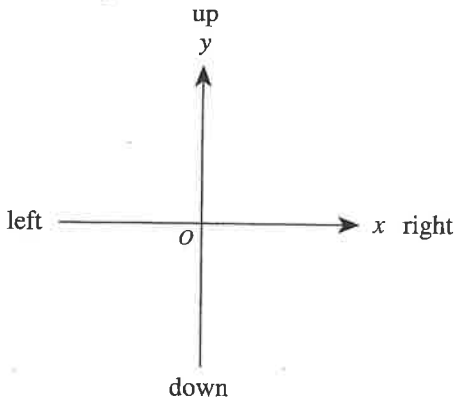
7. In $\triangle ABC$ below, what is the measure of $\angle A$?



A. 77°
B. 81°
C. 90°
D. 99°
E. 103°

DO YOUR FIGURING HERE.

8. Which of the following phrases describes the location of the point (4,−7) relative to the origin in the standard (x,y) coordinate plane below?



F. Left 7 units, up 4 units
G. Left 4 units, up 7 units
H. Right 7 units, down 4 units
J. Right 4 units, up 7 units
K. Right 4 units, down 7 units

9. The city block that Addie lives on is rectangular, having a length of 420 feet and a width of 350 feet. When Addie walks along the entire perimeter of the city block once, how many feet does she walk?

A. 770
B. 1,400
C. 1,470
D. 1,540
E. 1,680

10. Tama, a member of the school basketball team, has made 18 free throws of the 25 free throws she has attempted. What percent of her free throws has she made?

F. 7%
G. 13%
H. 18%
J. 25%
K. 72%

11. The sum of 6 numbers is 108, and the sum of 9 other numbers is 162. What is the average of these 15 numbers?

A. 7.5
B. 18
C. 20
D. 36
E. 135

DO YOUR FIGURING HERE.

12. The operation $B \ @ \ C$ is defined as $B + 2C$. What is the value of $8 \ @ \ 3$?

F. 14
G. 19
H. 22
J. 24
K. 48

13. Which of the following lists the fractions $\frac{11}{21}$, $\frac{13}{25}$, and $\frac{2}{3}$ in order from least to greatest?

A. $\frac{2}{3} < \frac{11}{21} < \frac{13}{25}$

B. $\frac{11}{21} < \frac{13}{25} < \frac{2}{3}$

C. $\frac{11}{21} < \frac{2}{3} < \frac{13}{25}$

D. $\frac{13}{25} < \frac{2}{3} < \frac{11}{21}$

E. $\frac{13}{25} < \frac{11}{21} < \frac{2}{3}$

14. Which of the following inequalities is equivalent to $2x - 9 \geq 11$?

F. $x \leq 10$

G. $x \geq -\frac{7}{2}$

H. $x \geq 1$

J. $x \geq 10$

K. $x \geq \frac{29}{2}$

15. For every integer n, the sum of n and $(n + 1)$ is:

A. odd.
B. even.
C. divisible by 3.
D. divisible by 5.
E. divisible by 7.

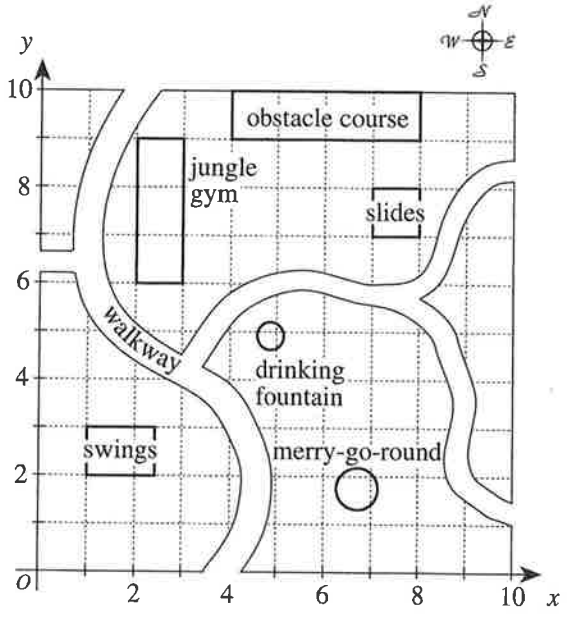
16. What is the value of the expression $200 - 3\left(\sqrt{9 - 4}\right)^2$?

F. 125
G. 169
H. 185
J. 191
K. 197

DO YOUR FIGURING HERE.

Use the following information to answer questions 17 and 18.

A diagram of a playground is shown in Quadrant I in the standard (x,y) coordinate plane below. Each unit on each axis represents 10 yards. The playground has a walkway, sections for 5 activities (swings, merry-go-round, slides, jungle gym, and obstacle course), and a drinking fountain near the center.



17. Freddie always enters the playground from the south and plays on the swings first. He proceeds to the other 4 activities at random. In how many different orders can he visit each of the other 4 activities exactly once?

A. 4
B. 10
C. 24
D. 120
E. 720

18. Which of the following is closest to the distance, in yards, from the northwest corner of the swings to the northwest corner of the slides?

F. 80
G. 90
H. 110
J. 120
K. 140

DO YOUR FIGURING HERE.

19. What is the positive difference between the mean and the median of the 6 numbers given below?

13 23 12 20 13 15

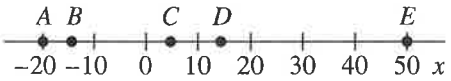
A. 0
B. 1
C. 2
D. 3
E. 4

20. The monthly expenses and income from March through May for the Footloose Shoe Store are shown in the chart below. What was the total profit or loss from March through May?

	Income	Expense
March	$172,000	$156,000
April	$158,000	$146,000
May	$192,000	$186,000

F. Loss of $14,000
G. Loss of $30,000
H. Profit of $ 6,000
J. Profit of $20,000
K. Profit of $34,000

21. One of the points on the real number line shown below represents the sum of $3\sqrt{36}$ and $-8\sqrt{16}$. Which one?



A. *A*
B. *B*
C. *C*
D. *D*
E. *E*

22. When the sum of the digits in a number is divisible by 3, then so is the number. The 5-digit number below will be divisible by 3 if which of the following digits is in the tens place?

27,8□5

F. 9
G. 6
H. 3
J. 2
K. 1

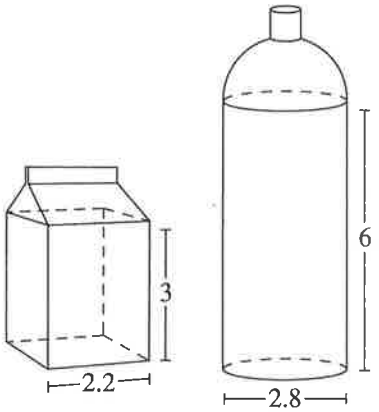
23. $|2(1-5)+3| = ?$

A. −5
B. 5
C. −11
D. 11
E. 15

DO YOUR FIGURING HERE.

Use the following information to answer questions 24–27.

The Juice-To-Go Company uses 2 different kinds of containers for its juice. The cardboard carton holds 8 ounces of juice in a rectangular prism with a square base that is 2.2 inches on a side. The plastic bottle holds 20 ounces of juice in a right circular cylinder with a diameter of 2.8 inches. The containers and the heights, in inches, to which they are filled with juice are shown in the figure below.



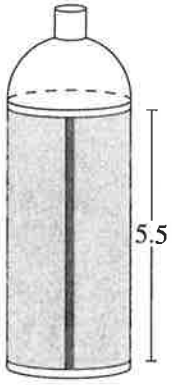
8-ounce cardboard carton

20-ounce plastic bottle

24. The nutrition label on the plastic container states that 1 serving is 8 ounces and that each serving has 110 calories. How many calories are in the plastic bottle of juice?

F. 130
G. 220
H. 275
J. 330
K. 880

25. The rectangular label of the plastic bottle goes all the way around the cylindrical part of the bottle and has 0.5 inches of overlap, as shown in the figure below. The height of the label is 5.5 inches. Which of the following is an expression for the area, in square inches, of the label?



A. $5.5(2.8 + 0.5)$
B. $5.5(2.8\pi + 0.5)$
C. $5.5(2.8\pi) + 0.5$
D. $5.5[(2.8 + 0.5)\pi]$
E. $2[5.5 + (2.8 + 0.5)]$

DO YOUR FIGURING HERE.

26. Which of the following is closest to the volume, in cubic inches, of the juice in the cardboard carton?

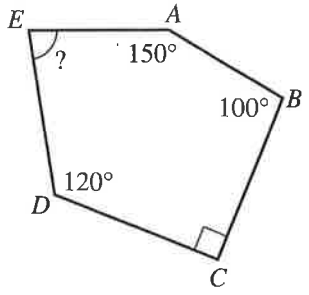
F. 6.6
G. 11.4
H. 14.5
J. 19.8
K. 45.6

27. The Juice-To-Go Company is promoting a new cardboard carton that holds 20% more juice than the old cardboard carton. To the nearest 0.1 ounce, how many ounces of juice will the new cardboard carton hold?

A. 8.1
B. 8.2
C. 9.2
D. 9.6
E. 10.0

---

28. If you add up the measures of all 5 interior angles in the pentagon below, the sum is the same as you would get for any other pentagon. What is the measure of $\angle E$?



F. 60°
G. 65°
H. 70°
J. 75°
K. 80°

29. The polynomial expression $(2x - 3)(x - 4)$ is equivalent to which of the following?

A. $2x^2 - 7$
B. $2x^2 - 12$
C. $2x^2 + 12$
D. $2x^2 - 11x - 12$
E. $2x^2 - 11x + 12$

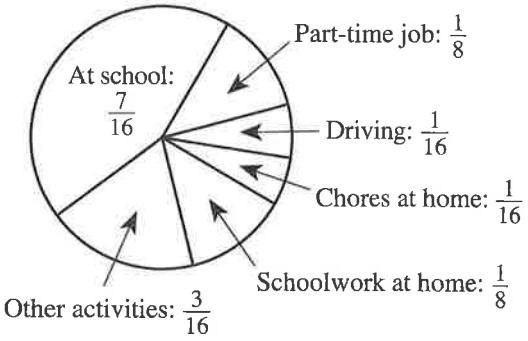
DO YOUR FIGURING HERE.

30. The Dawn Theater charges \$6.00 for each adult ticket and \$2.50 for each child's ticket for an early movie. For last Saturday's early movie, 240 tickets were sold for a total of \$1,265.00. How many adult tickets were sold?

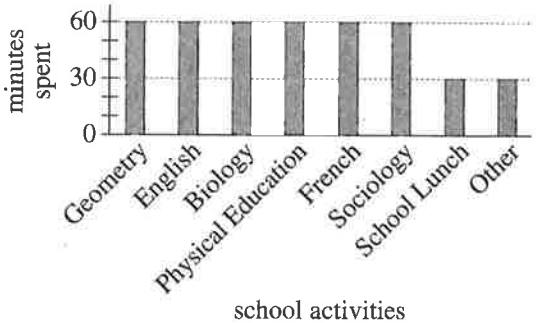
F. 28
G. 50
H. 120
J. 125
K. 190

31. According to the graphs below, what fraction of Girard's 16 waking hours on each weekday is spent at School Lunch?

Fraction of Girard's 16 waking hours spent on activities each weekday



Distribution of Girard's time "At school"



A. $\frac{1}{16}$

B. $\frac{1}{24}$

C. $\frac{1}{32}$

D. $\frac{1}{48}$

E. $\frac{7}{128}$

DO YOUR FIGURING HERE.

32. What is the ratio of the number of positive common multiples less than 100 of the numbers 3 and 5 to the number of positive common multiples less than 100 of the numbers 2 and 7 ?

(Note: For example, the positive common multiples less than 100 of 2 and 3 are 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, and 96.)

F. $\frac{6}{7}$

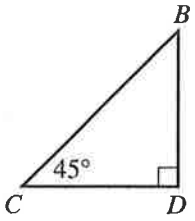
G. $\frac{6}{13}$

H. $\frac{7}{6}$

J. $\frac{7}{13}$

K. $\frac{13}{6}$

33. In $\triangle BCD$ below, altitude $\overline{BD}$ is 4 inches long. What is the perimeter, in inches, of $\triangle BCD$?



A. 8

B. $8 + 4\sqrt{2}$

C. $12\sqrt{2}$

D. $12 + \sqrt{3}$

E. 16

34. A circular play area has a diameter of 12 yards. A fence is put around the play area, with a 2-yard section of the circle left open as the entrance. Which of the following is closest to the minimum number of yards of fencing needed?

F. 32
G. 36
H. 38
J. 69
K. 73

DO YOUR FIGURING HERE.

35. At Toys-for-Less, Zorts sell for a particular unit price, regardless of how many you purchase. For x dollars, you can purchase 200 Zorts. How many Zorts can you purchase for n dollars, if n is a multiple of the unit price of the Zorts?

A. $\frac{xn}{200}$

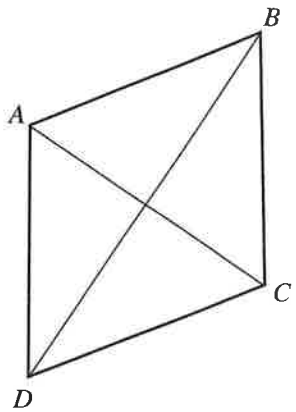
B. $\frac{200}{xn}$

C. $\frac{x}{200n}$

D. $\frac{200n}{x}$

E. $\frac{200x}{n}$

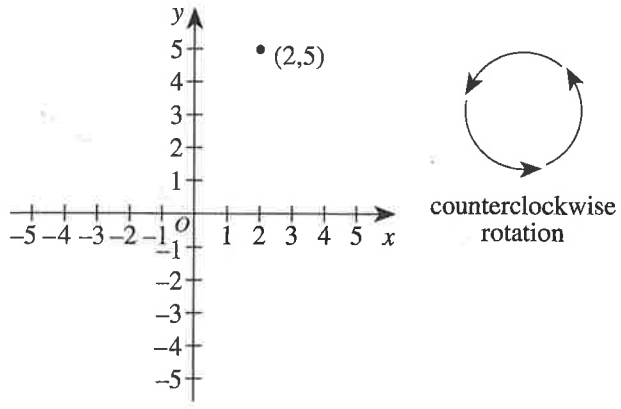
36. In the figure below, $ABCD$ is a quadrilateral with all 4 sides congruent. The diagonals, $\overline{AC}$ and $\overline{BD}$, bisect each other and have lengths of 30 centimeters and 40 centimeters, respectively. What is the area of $ABCD$, in square centimeters?



F. 150
G. 300
H. 600
J. 625
K. 1,200

DO YOUR FIGURING HERE.

37. The point (2,5) is shown in the standard (x,y) coordinate plane below. What are the coordinates of the image of (2,5) under a counterclockwise rotation of 90° about the origin?



A. (–5, 2)
B. (–2,–5)
C. (–2, 5)
D. (5,–2)
E. (5, 2)

38. In the standard (x,y) coordinate plane, the slope of the line $\overleftrightarrow{AB}$ is 3 times the y-intercept of the line $\overleftrightarrow{BC}$. The equation for $\overleftrightarrow{BC}$ is $8x + 4y = 10$. What is the slope of $\overleftrightarrow{AB}$?

F. –6

G. –2

H. $\frac{5}{2}$

J. $\frac{5}{6}$

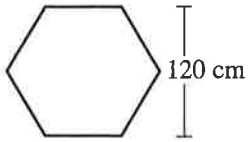
K. $\frac{15}{2}$

39. A line drawn in the standard (x,y) coordinate plane passes through the points (p,q) and $(m,-q)$. The slope of the line is 2. What is $p - m$, in terms of q ?

A. $-4q$
B. $-q$
C. 0
D. q
E. $4q$

DO YOUR FIGURING HERE.

40. What is the length, in centimeters, of 1 side of the regular hexagon shown below?



F. $20\sqrt{3}$
G. $40\sqrt{3}$
H. $80\sqrt{3}$
J. $120\sqrt{2}$
K. 120

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.

3

READING TEST

20 Minutes—25 Questions

DIRECTIONS: There are three 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 folder. You may refer to the passages as often as necessary.

Passage I

PROSE FICTION: This passage is adapted from the novel *Bee Season* by Myla Goldberg (©2000 by Myla Goldberg).

Studying has always been a chore on the level of dish-washing and room-cleaning, approached with the same sense of distraction and reluctance. Eliza fears that studying will leech her of spelling enthusiasm. The days following her spelling bee win, she resolutely maintains her after-school schedule of television reruns, pretends not to notice her father's raised eyebrows at the sight of her in her regular chair, nary a spelling list or dictionary in sight. More than her father's unspoken expectations, it is Eliza's growing suspicion that she has stumbled upon a skill that convinces her to break out the word lists. She realizes she has never been naturally good enough at anything to want to get better before. She renames studying "practice." Spelling is her new instrument, the upcoming bee the concert for which she must prepare her part.

Within a few days Eliza has developed a routine. After two TV reruns, she retreats to her room. Though she knows there is little chance of anyone disturbing her, she closes and locks her door. She likes the idea, however unlikely, of her father, Saul, or her brother, Aaron, stuck outside, reduced to slipping a note under her door or to waiting for her to emerge. After dinner, she allows herself one prime-time show and then, with Aaron and Saul playing guitar in the study and her mother, Miriam, either cleaning the kitchen or reading her magazines, she returns to her room. The click of the bedroom door becomes one of her favorite sounds, filling her with a sense of well-being.

Eliza starts walking around with the kind of smile usually associated with Mona Lisas and sphinxes. *I am the best speller on this bus*, she thinks on the way home from school. After a few days of studying, when she's feeling more daring, she goes as far as *I am the best speller at the dinner table*, Saul, Miriam, and Aaron innocently eating around her. Eliza knows that something special is going on. On Wednesday, she remembers the words she studied on Monday and Tuesday. On Thursday, she remembers all the old words, plus the new ones from the day before. The letters are magnets, her brain a refrigerator door.

Eliza finally understands why people enjoy talent shows or performing in recitals. She stops hating Betsy Hurley for only doing double-Dutch jump rope at recess. If Eliza could, she would spell all the time. She starts secretly spelling the longer words from Ms. Bergermeyer's droning class lessons and from the nightly TV news broadcasts. When Eliza closes her eyes to spell, the inside of her head becomes an ocean of consonants and vowels, swirling and crashing in huge waves of letters until the word she wants begins to rise to the surface. The word spins and bounces. It pulls up new letters and throws back old ones, a fisherman sorting his catch, until it is perfectly complete.

Eliza can sense herself changing. She has often felt that her outsides were too dull for her insides, that deep within her there was something better than what everyone else could see.

1. The passage is best described as being told from the point of view of:
   - **A.** Eliza, a young girl preparing for an upcoming spelling bee.
   - **B.** a member of Eliza's family, who carefully observes Eliza's study habits.
   - **C.** an unidentified narrator who focuses primarily on relating the thoughts, feelings, and actions of Eliza.
   - **D.** an unidentified narrator who spends about an equal amount of time relating the thoughts, feelings, and actions of several characters, including Eliza.

2. The author makes clear that before the events described in the passage, Eliza had:
   - **F.** won a spelling bee.
   - **G.** changed her after-school schedule.
   - **H.** argued with her father about chores.
   - **J.** begun to lose interest in spelling.

3. According to the passage, the factor most responsible for Eliza beginning to use the word lists is her:

   A. father's wishes, expressed without words.
   B. increasing boredom with after-school television.
   C. desire to avoid chores, such as washing dishes.
   D. growing sense that she has a great skill.

4. The passage most strongly suggests that for Eliza, changing the name of "studying" to "practice" helps her to:

   F. become more interested in preparing for the spelling bee.
   G. remember that she has to get ready for a concert as well as a spelling bee.
   H. switch from studying the dictionary to practicing her word lists.
   J. stop worrying about missing so many television shows.

5. The passage implies that for Eliza, locking her door is something that she:

   A. needs to do to avoid having her studying interrupted by a family member.
   B. likes to do but that earns her disapproval from other members of her family.
   C. probably doesn't need to do to ensure her privacy but that she nonetheless enjoys doing.
   D. sometimes regrets doing because it keeps her apart from the rest of her family.

6. By the end of the events described in the passage, Eliza's attitude toward Betsy Hurley is most likely one of:

   F. hatred.
   G. discontent.
   H. understanding.
   J. devotion.

7. The only information the passage provides about Eliza's teacher is that Ms. Bergermeyer:

   A. encouraged Eliza to compete in a local spelling bee.
   B. recognized Eliza's talent for spelling long before Eliza herself did.
   C. teaches spelling in a way that excites and entertains Eliza.
   D. teaches dull lessons that Eliza borrows some words from to spell.

8. The best summary of the last paragraph is that Eliza:

   F. worries that her insides are too dull for her outsides.
   G. feels increasingly sure that she is more special than she might appear.
   H. realizes that people can see her true self with a simple glance at her.
   J. wonders what other people think when they look at her.

Passage II

SOCIAL SCIENCE: This passage is adapted from the article "Farming the Wind in Minnesota" by Melanie Radzicki McManus (©2002 by National Wildlife Federation).

The rugged terrain and unforgiving gusts that characterize a southwestern portion of Minnesota known as Buffalo Ridge have always tormented local farmers. Its rocky hills make cultivation difficult, and the stiff winds create a trail of swirling dust and flapping clotheslines. But today, the wind is blowing new life into this rural area, providing a second income for local farmers by powering more than 400 turbines that supply clean energy to 100,000 homes in the Minneapolis–St. Paul area.

Spread across about 35 miles of farmland in Lincoln and Pipestone counties, the turbines in 2002 produced more energy than any other wind farm in the nation, collectively churning out 325 megawatts of electricity for a mere 3.2 cents per kilowatt hour versus the national average of 8 cents for electricity generated using fossil fuels. Energy developers pay farmers $2,000 to $3,000 a year in royalties for every turbine on their land. Each one only takes up about an eighth of an acre, while a full acre of corn yields only $150 in a good year.

Even farmers with land adjacent to turbines can get into the game by selling wind rights to energy developers who want to prevent other companies from "stealing" their wind by building their turbines too close.

Besides putting cold, hard cash straight into farmers' pockets, the wind farm project, which began two years ago, added 50 full-time turbine maintenance jobs in Lincoln County alone. The county now also receives $715,000 in annual property taxes from wind developers—money needed for education and services. Another pleasant, unexpected benefit of the wind farm is tourism. Fifty-one busloads of tourists traveled to the region in 2000, just to drive through the countryside and watch the turbines at work.

Standing at more than 200 feet tall, the majestic turbines have 75- to 85-foot rotor blades that spin quietly and effortlessly.

Locals weren't always so enthusiastic about wind energy, which was first brought to their attention in the early 1990s. "None of us had ever even seen a wind turbine before," says Jim Nichols, a Lincoln County commissioner. "And there were no major projects in the world to study. People were afraid that the turbines would be noisy, expensive to operate and that they'd kill birds."

Their fears had some merit. California is home to a number of wind farms, built following the 1970s energy crisis, that became major disappointments. The farms, often erected on remote mountain peaks or passes, contain many small, noisy turbines that produce a tiny amount of expensive electricity.

Dramatic advances in wind turbine technology have changed the picture completely. Today's more sophisticated wind catchers generate 120 times as much electricity as their predecessors, and they do so at virtually the same cost as energy produced from new coal-fired power plants. And wind, of course, is a clean energy source. Use of coal causes health and environmental problems such as asthma, smog, global warming, and acid rain, which add another 2 to 4 cents per kilowatt hour to the total cost of coal, note energy experts at Stanford University.

9. Which of the following questions about the wind farm at Buffalo Ridge is NOT answered by the passage?

- **A.** About how much land does a turbine take up?
- **B.** What effect has the wind farm had on tourism?
- **C.** How many farmers have turbines on their land?
- **D.** About how much do farmers earn annually per turbine?

10. The passage mentions that the wind farm has resulted in all of the following benefits for Lincoln County EXCEPT:

- **F.** an increase in tourism.
- **G.** cheap energy for local schools.
- **H.** increased revenue from property taxes.
- **J.** new jobs in the area.

11. Based on the passage, all of the following are reasons to use energy from wind rather than from coal EXCEPT that:

- **A.** coal contributes to global warming.
- **B.** coal contributes to the creation of smog.
- **C.** wind power is ultimately less expensive than power from coal.
- **D.** wind power generates 120 times more electricity than coal.

12. The description of Buffalo Ridge in the passage indicates that its environment has:

- **F.** provided ideal conditions for grain farming.
- **G.** proved challenging for traditional farmers.
- **H.** become drier and windier in recent years.
- **J.** encouraged young people to go into traditional farming.

13. According to the passage, the turbines at Buffalo Ridge supply energy to homes located:

    A. in Lincoln and Pipestone counties.
    B. in California.
    C. in the Minneapolis–St. Paul area.
    D. throughout the nation.

14. As it is used in line 25, the word *stealing* most nearly refers to:

    F. farmers illegally taking turbine equipment.
    G. energy developers building turbines that block the wind for others' turbines.
    H. energy developers not paying farmers for the turbines placed on their land.
    J. farmers and energy developers not paying their local property taxes.

15. In the passage, when Nichols notes the early fears of people in Lincoln County about wind turbines, he specifically includes all of the following EXCEPT their fear that the turbines would:

    A. be ugly.
    B. be noisy.
    C. be expensive to run.
    D. kill birds.

16. The passage suggests that the wind farms built in California after the energy crisis of the 1970s were less successful than that built later at Buffalo Ridge because the turbines in California were:

    F. taller but less efficient in producing energy.
    G. smaller and often in remote locations.
    H. noisier though more productive.
    J. built in larger groups.

3

Passage III

HUMANITIES: This passage is adapted from the essay "Enigma" by Naomi Shihab Nye (©1996 by University of South Carolina).

He keeps the heavy doors of his old-fashioned piñata shop locked up tight since he's usually in the attic working. You have to ring a bell if you want to shop here. By then you're semicommitted, buying party favors even if you have no party in mind. Tomorrow I turn forty and today Mr. Beto, who has always seemed old, seems distinctively older. Did some wind blow through in the night? His face has grown thinner, more gently defined, his skin softly tissue-like. He's becoming his favorite substance. He's switching on lights for us, muttering, "It's here, it's all here."

Party favors loop down the walls. Plastic babies, sparklers, poppers, whistles. Mountains of confetti. My son Madison stares up at the crowds of piñatas dangling from the ceiling. "Does he really make all these?" he whispers to me, and Mr. Beto grumbles, "I do." He's married to tissue. He's snipped it into a million strips.

Once I climbed with him into the attic, the flamboyant topple of half-finished superheroes, turquoise sailing ships, chipmunks and brides, to ask him serious piñata questions. For my newspaper column I used to interview people who ran feed stores and built toothpick dispensers.

He told me how long it took and how much thinking it took and the sun coming in through a tiny slit of window lit up sheaves of paper along the walls. I wanted to buy just the uncut paper, plain and sheer and tropical fruit–colored, and made the mistake of saying so. It seemed to hurt him. After that I thought of him living here alone with all these faces.

Today Madison's dragging a huge pink rabbit-shaped piñata around. Mr. Beto growls, "Put it back where you found it." How people stuff these with candy and smash them still eludes me. I can't do it. I leave them hanging till they grow dusty webs between their toes. Madison's fingering a giant birthday cake, smiling. A fish, and a police officer. Mr. Beto could supply every party between here and Saltillo till the end of the world.

My eyes fall onto a single standing girl done in odd shades of gray and brown with the word ENIGMA planted on her chest in blocky white letters. Who's this?

I carry her by the string in her head to Mr. Beto where he sits.

Two little gray braids poke out on either side of the string. She's not smiling. She looks uncharacteristically gloomy for a piñata. Does she represent a robot? A character in a cartoon?

He's waving his graceful fingers, looking for a word with sudden urgency.

"She's like *mystery*, you know? Like something you can't answer even when it stands right next to you? Like *puzzle*."

"Yes, yes, I know what the *word* means, but who *is* she? Is she a character from a story or did you make her up?"

He pauses. Looks as if he's deciding whether to tell the truth. "I just thought of her."

He stares at the floor. She costs eight dollars. He peers up curiously when I say I thought of her too.

It takes a long time to decide not to buy her. It seems philosophical. I could hang her over the breakfast table tomorrow when forty comes to claim me. Or I could think of her in the dark shop down the street from my house, waiting, waiting.

17. The author characterizes Mr. Beto as all of the following EXCEPT:

- **A.** cheerful.
- **B.** dedicated.
- **C.** solitary.
- **D.** clever.

18. The author uses the word *faces* in line 30 to refer to the:

- **F.** customers who frequent Mr. Beto's shop.
- **G.** shadows created by the lit-up tissue paper.
- **H.** old friends from Mr. Beto's youth.
- **J.** piñatas in Mr. Beto's attic.

19. According to the passage, if customers want to shop in Mr. Beto's store, they must:

- **A.** telephone first to make an appointment.
- **B.** ring the doorbell before entering.
- **C.** be prepared to admire the half-finished piñatas in the attic.
- **D.** be prepared for a lecture on the history of piñata construction.

20. As it is used in lines 24 and 25, the word *it* most likely refers to the:

- **F.** construction of Mr. Beto's attic.
- **G.** process of making tissue paper.
- **H.** operation of a party favor store.
- **J.** creation of one of Mr. Beto's piñatas.

21. One purpose of the fourth paragraph (lines 24–30) is to reveal that Mr. Beto:

- **A.** is hesitant to reveal the process he uses to create piñatas.
- **B.** finds beauty in the way the light in the attic illuminates the colorful tissue paper.
- **C.** takes pride in his efforts to construct creative piñatas.
- **D.** has little interest in keeping his attic clean and organized.

22. It is reasonable to conclude from the passage that the author avoids smashing piñatas because she:

- **F.** appreciates the care required to construct them.
- **G.** fears being embarrassed if she should swing and miss.
- **H.** prefers to use the same piñata at more than one party.
- **J.** enjoys watching the tissue paper on the piñatas turn colors as the tissue ages.

23. The author states that compared to other piñatas, Enigma appears to be unusually:

- **A.** insulting.
- **B.** peaceful.
- **C.** cartoonish.
- **D.** gloomy.

24. According to Mr. Beto, Enigma represents:

- **F.** a lost love.
- **G.** all of his yet-to-be-created piñatas.
- **H.** a cartoon character.
- **J.** a bewildering question.

25. According to the passage, what does the author ultimately choose to do about Enigma?

- **A.** Use it at her birthday party
- **B.** Hang it over her breakfast table the next morning
- **C.** Leave it behind in the shop with Mr. Beto
- **D.** Buy it for her son's birthday

END OF TEST 3

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

DO NOT RETURN TO A PREVIOUS TEST.

4

SCIENCE TEST

25 Minutes—30 Questions

DIRECTIONS: There are five 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 folder. You may refer to the passages as often as necessary.

You are NOT permitted to use a calculator on this test.

Passage I

Photosynthesis (the process through which plants convert light energy to chemical energy) can be summarized by the equation

$$6CO_2 + 6H_2O + \text{light energy} \rightarrow C_6H_{12}O_6 + 6O_2$$

As plants photosynthesize, a gas is produced. To determine whether the distance of a plant from a light source affects the rate of photosynthesis, students found the *gas production rate* (volume of gas produced in 1 hr) of a piece of *Elodea* (a water plant) when it was located at 6 different distances from a lamp that emitted light at a constant intensity. The experiment took place in a room lit by an overhead light. The results are shown in the figure.

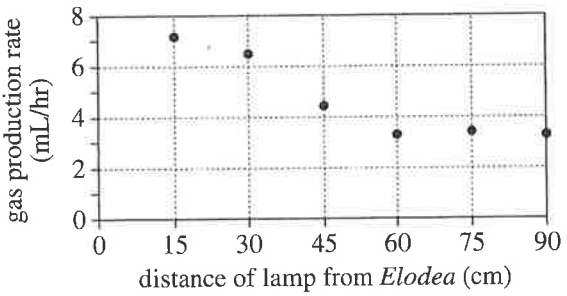


Figure adapted from Neil A. Campbell, Lawrence G. Mitchell, and Jane B. Reece, *Biology Concepts & Connections*, 2nd ed. ©1997 by The Benjamin/Cummings Publishing Company.

1. Based on the figure, the rate of photosynthesis was greatest when the lamp was located at which of the following distances from the *Elodea* ?

   A. 15 cm
   B. 30 cm
   C. 45 cm
   D. 75 cm

2. According to the figure, when the lamp distance was doubled from 15 cm to 30 cm, the rate of gas production was:

   F. doubled.
   G. increased, but not doubled.
   H. halved.
   J. decreased, but by less than half.

3. If a trial had been conducted with the lamp 22.5 cm from the *Elodea*, the gas production rate would most likely have been closest to which of the following?

   A. 2 mL/hr
   B. 4 mL/hr
   C. 7 mL/hr
   D. 9 mL/hr

4. Based on the passage, the gas produced by the *Elodea* through the process of photosynthesis was:

   F. carbon dioxide.
   G. oxygen.
   H. hydrogen.
   J. nitrogen.

5. Suppose that when the lamp was 60 cm from the *Elodea*, the students measured the volume of gas produced during a period of 8 hr. Based on the figure, the volume of gas produced was most likely closest to which of the following?

   (Note: Assume the gas production rate was constant.)

   A. 4 mL
   B. 8 mL
   C. 15 mL
   D. 25 mL

4

Passage II

Introduction

Upheaval Dome was formed between 30 million and 100 million years ago in the sedimentary rocks at a location in the western U.S. The circular structure, 5.5 km across, is a central peak surrounded by a ring depression that is lined with folded and faulted rocks. Figure 1 shows a cross section through the structure and the flat-lying rock layers around it. Two scientists discuss the creation of Upheaval Dome.

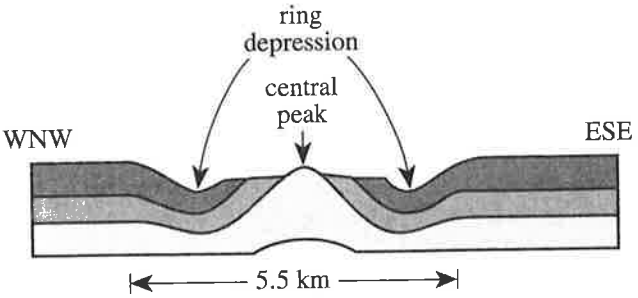


Figure 1

Scientist 1

Upheaval Dome was created when a large salt column rose to near the surface from a deeply buried salt layer. The area that includes Upheaval Dome was covered by a shallow sea from 320 million years ago to 285 million years ago. The sea then dried up, leaving behind a 0.5 km thick salt layer. Rocks that were deposited on top of the salt layer produced enough pressure to change the salt to fluid. Once a sufficient mass of rock and sediment had been eroded from above the salt layer, the salt began to rise through surrounding rock.

Over a million years, the rising salt column pushed up the rock layers above it, creating a dome. Before the salt reached the surface, the column stopped rising and then settled downward. During the settling some of the rocks were folded into a U shape, forming the ring depression (see Figure 2). Since the salt column never reached the surface, no salt is exposed. Salt columns have created similar domes at other locations in this area, and at other places on Earth.

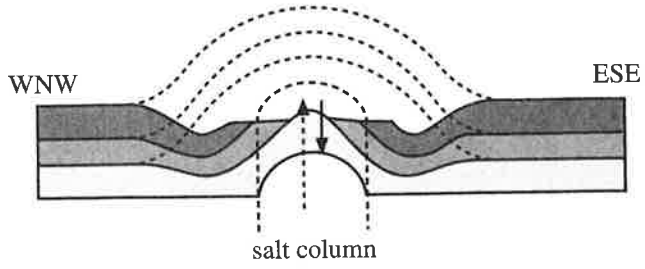


Figure 2

Scientist 2

Upheaval Dome was created by the impact of a 0.3 km diameter meteorite. The initial impact excavated a bowl-shaped crater, 1.5 km deep, out of the sediment and rock. Seconds after the impact, the material in the center of the crater rebounded upward, creating a raised peak in the center. Within hours, the rocks around the edge of the crater had collapsed into the cavity around the central peak, creating the ring depression (see Figure 3).

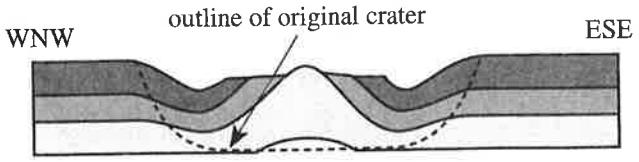


Figure 3

The rocks in the central peak contain certain minerals that are formed from other minerals only under the high pressures associated with a meteorite impact. The faulting of the rocks in the ring depression occurred when rock layers slid down into the cavity around the central peak. No salt column exists beneath the structure.

6. According to Scientist 1, how did the now-buried salt layer form?

   F. Seawater evaporated, causing the salt to dissolve.
   G. Seawater evaporated, leaving behind the salt.
   H. Seawater condensed from water vapor, causing the salt to dissolve.
   J. Seawater condensed from water vapor, leaving behind the salt.

7. According to Scientist 1 and Scientist 2, how long did it take Upheaval Dome (central peak and ring depression) to form?

	Scientist 1	Scientist 2
A.	a hundred years	a million years or more
B.	a million years or more	a hundred years
C.	less than a day	a million years or more
D.	a million years or more	less than a day

4

8. Suppose it were discovered that a sea had never covered the area where Upheaval Dome is located. This discovery would weaken the viewpoint of:

   F. Scientist 1, because the flat-lying rock layers adjacent to the structure would have been thicker.
   G. Scientist 1, because the salt column beneath the structure would not have existed.
   H. Scientist 2, because the flat-lying rock layers adjacent to the structure would have been thicker.
   J. Scientist 2, because the salt column beneath the structure would not have existed.

9. Assume the rock layers shown in Figure 1 are sandstone and siltstone. Is this assumption consistent with information provided in the introduction?

   A. Yes, because both sandstone and siltstone are sedimentary rocks.
   B. Yes, because both sandstone and siltstone are igneous rocks.
   C. No, because both sandstone and siltstone are sedimentary rocks.
   D. No, because both sandstone and siltstone are igneous rocks.

10. A present-day examination of the subsurface beneath the central peak of the dome has shown that there is no salt column within 500 m of the surface. Which of the following statements would Scientist 1 most likely offer to explain this result? Beneath the central peak, the salt column has:

    F. risen to the surface from a depth of 500 m.
    G. risen to a depth of 500 m from a much greater depth.
    H. settled downward to a depth of more than 500 m.
    J. settled downward to a depth of less than 500 m.

11. Scientist 2 states that during the creation of Upheaval Dome, certain minerals in the rocks in the central peak were formed from other minerals. This process is an example of:

    A. erosion.
    B. weathering.
    C. metamorphism.
    D. volcanism.

4

Passage III

Air pressure is the force on a surface, per unit area, exerted by the weight of air above that surface. Air pressure at different elevations is usually measured with a barometer. The air pressure can also be indirectly measured using a thermometer and boiling water. As air pressure decreases, the boiling point of water or any other liquid decreases. At sea level (0 m elevation) the boiling point of distilled water is approximately 100°C.

Three studies involving air pressure were performed in a mountainous region.

Study 1

At 5 locations (A–E), each at a different elevation, distilled water was heated until it boiled. The temperature of the boiling water, in °C, was measured using a thermometer. The air pressure, in millibars (mb), was also measured. The results are shown in Table 1.

Table 1

Location	Boiling point of distilled water (°C)	Air pressure (mb)
A	94.6	812.7
B	93.1	778.9
C	91.9	745.0
D	90.5	711.1
E	89.7	677.3

Study 2

At 4 locations (A, C, F, and G), rainwater was heated until it boiled and the temperature at boiling was recorded. These measurements were taken at the same time of day as the measurements in Study 1, but were taken 1 day later. No barometer readings were taken. The elevation, in meters (m), was measured at each location. The results are shown in Table 2.

Table 2

Location	Boiling point of rainwater (°C)	Elevation (m)
A*	95.2	1,700
C*	92.4	2,200
F	90.3	3,000
G	89.3	3,500

*Locations A and C are the same as Locations A and C in Study 1.

Study 3

At Location A, air pressure readings were taken continuously over a 24-hour period. The data showed that maximum air pressure was recorded at 10 A.M. and at 10 P.M. Minimum air pressure was recorded at 4 A.M. and at 4 P.M.

12. According to the results of Study 2, as elevation increased, the boiling point of rainwater:

F. increased only.
G. decreased only.
H. increased, then decreased.
J. remained the same.

13. Which of the following was directly measured *both* in Study 1 and in Study 2 ?

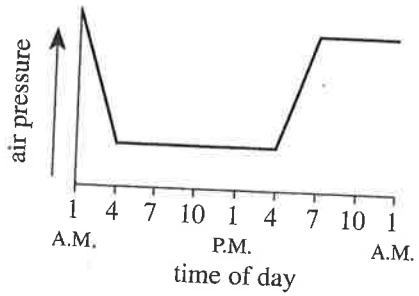
A. Boiling point
B. Air temperature
C. Air pressure
D. Elevation

14. The studies were performed in a mountainous region most likely because:

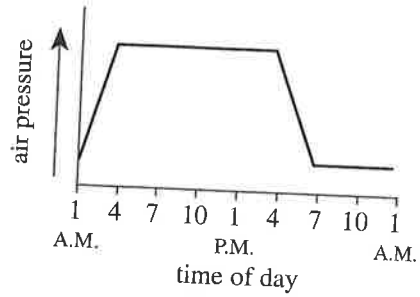
F. the area had to have temperatures that changed significantly during a 24-hour period.
G. a wide range of elevations could be found within a relatively small area.
H. strong mountain winds are necessary for accurate readings of air pressure.
J. barometers can only function above an elevation of 1,000 m.

15. Which of the following graphs best fits the description of the changes in air pressure in Study 3 ?

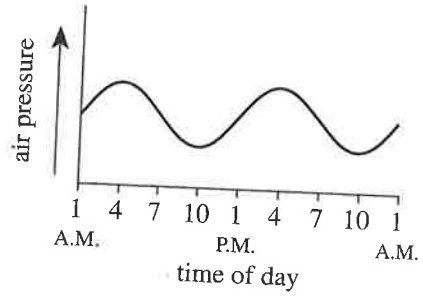
A.



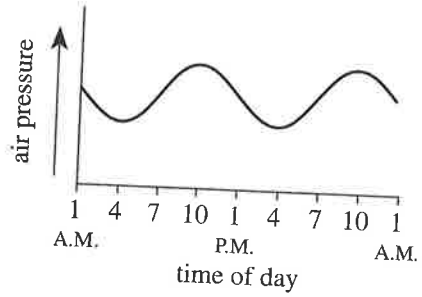
B.



C.



D.



16. Suppose an additional trial had been performed in Study 1 in a chamber that replicated the conditions at 2,000 m *below* sea level. The boiling point of distilled water would most likely have been:

F. less than 90°C.
G. between 90°C and 95°C.
H. between 95°C and 100°C.
J. greater than 100°C.

17. Were Study 1 and Study 2, taken together, designed to show that air temperature varies with elevation?

A. Yes, because boiling point increased with elevation in both studies.
B. Yes, because air temperature was higher at higher elevations in both studies.
C. No, because air temperature readings were not taken in either study.
D. No, because barometer readings were not taken in either study.

18. Assuming that the air pressure was the same at a given elevation and time of day in Studies 1 and 2, which of the following statements about the relationship between the boiling points of distilled water and rainwater is supported by the data?

F. Distilled water and rainwater have the same boiling point at any given elevation.
G. Distilled water and rainwater have the same boiling point only at sea level.
H. Distilled water has a higher boiling point than rainwater at a given elevation.
J. Distilled water has a lower boiling point than rainwater at a given elevation.

4

Passage IV

The *amount of momentum*, P, of an object equals the object's mass multiplied by its speed. Some physics students found P for 2 carts, C1 and C2, under a variety of conditions. (Assume that frictional forces were insignificant.)

Study 1

For all 3 trials of Study 1, C1 had a mass of 1.0 kg. However, the mass of C2 was varied from trial to trial. At the start of each trial, C1 and C2 were at rest, separated only by a spring that was compressed. The amount of compression was the same for each trial. When the spring was released, the expanding spring caused the carts to move in opposite directions (see Figure 1).

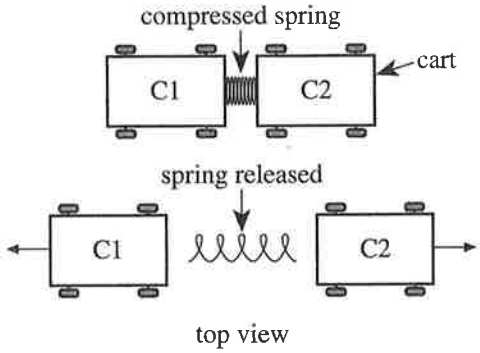


Figure 1

The students measured the speed, in m/sec, of each cart, and then calculated P of each cart (see Table 1).

Table 1

Trial	Mass of C2 (kg)	Speed (m/sec)		P (kg m/sec)	
		C1	C2	C1	C2
1	1.0	0.104	0.104	0.10	0.10
2	2.0	0.116	0.062	0.12	0.12
3	3.0	0.120	0.041	0.12	0.12

Study 2

For all 3 trials of Study 2, C1 had a mass of 1.0 kg. However, the mass of C2 was varied from trial to trial. At the start of each trial, C1 was at rest. The students launched C2 toward C1 at a speed of 0.300 m/sec, and the carts collided. Small lumps of clay attached to the end of C2 caused the 2 carts to join together. The joined carts then moved together, as shown in Figure 2.

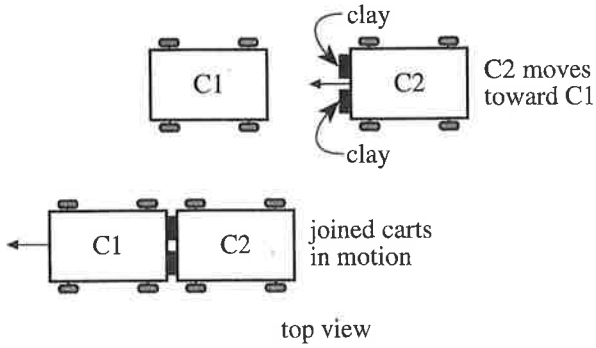


Figure 2

The students measured the speed of the joined carts and then calculated P of the joined carts. They also calculated P of C2 before the collision (see Table 2).

Table 2

Trial	C2		Joined carts		
	Mass (kg)	P before collision (kg m/sec)	Mass (kg)	Speed (m/sec)	P (kg m/sec)
4	1.0	0.30	2.0	0.152	0.30
5	2.0	0.60	3.0	0.201	0.60
6	3.0	0.90	4.0	0.225	0.90

19. In Study 1, when did C1 and C2 each have an amount of momentum equal to zero?

- **A.** Before the spring was released, because both C1 and C2 were at rest.
- **B.** Before the spring was released, because both C1 and C2 were in motion.
- **C.** When the spring was expanding, because both C1 and C2 were at rest.
- **D.** When the spring was expanding, because both C1 and C2 were in motion.

20. In Study 1, under what conditions, if any, did C1 and C2 have the same speed when the spring was expanding?

F. When the mass of C2 was equal to the mass of C1
G. When the mass of C2 was 2 times as great as the mass of C1
H. When the mass of C2 was 3 times as great as the mass of C1
J. C1 and C2 never had the same speed when the spring was expanding.

21. In Study 2, P of the joined carts equaled 0.60 kg m/sec when the mass of the joined carts equaled which of the following?

A. 1.0 kg
B. 2.0 kg
C. 3.0 kg
D. 4.0 kg

22. Suppose that Sphere A, a 2 kg sphere, and Sphere B, a 1 kg sphere, are separated by an explosive device. Both spheres are at rest. The explosive device is detonated, providing equal amounts of momentum to the 2 spheres and sending them flying in opposite directions along the same horizontal line. Based on the results of Study 1, which of the spheres is most likely flying faster?

(Note: Assume that air resistance is insignificant.)

F. Sphere A, because it is less massive than Sphere B.
G. Sphere A, because it is more massive than Sphere B.
H. Sphere B, because it is less massive than Sphere A.
J. Sphere B, because it is more massive than Sphere A.

23. Consider 2 identical toy cars, Car A and Car B. Car A is at rest. A child gives Car B a shove, so that the 2 toys collide head-on, stick together, and continue rolling in the same direction as that of Car B before the collision. Based on Study 2, compared to the speed of Car B before the collision, the speed of the joined cars is most likely:

A. less, because the mass of the joined cars is less than the mass of Car B.
B. less, because the mass of the joined cars is greater than the mass of Car B.
C. greater, because the mass of the joined cars is less than the mass of Car B.
D. greater, because the mass of the joined cars is greater than the mass of Car B.

24. In each of Trials 4–6, how did the amount of momentum of C2 before its collision with C1 compare to the amount of momentum of the joined carts?

F. The amount of momentum of C2 before its collision with C1 was equal to the amount of momentum of the joined carts.
G. The amount of momentum of C2 before its collision with C1 was less than the amount of momentum of the joined carts.
H. The amount of momentum of C2 before its collision with C1 was greater than the amount of momentum of the joined carts.
J. Cannot be determined from the given information

25. In each trial of Study 1, the source of the kinetic energy of C1 was which of the following?

A. The kinetic energy stored in C2 before the spring was released
B. The potential energy stored in C2 before the spring was released
C. The kinetic energy stored in the spring before the spring was released
D. The potential energy stored in the spring before the spring was released

Passage V

An *antifreeze* is a substance that is added to a liquid to keep the liquid from freezing under cold conditions. Figures 1 and 2 show data for 2 liquids—ethanol and ethylene glycol. Each liquid acts as an antifreeze when added to H_2O. Figure 1 shows how freezing point varies with the concentration of antifreeze in H_2O. Antifreeze concentration is measured as *% AF*, the percent antifreeze by mass in H_2O:

$$\%\ \text{AF} = \frac{\text{mass of antifreeze}}{\text{mass of antifreeze} + \text{mass of } H_2O} \times 100$$

Figure 2 shows how density varies with % AF at 20°C for solutions of ethanol in H_2O and of ethylene glycol in H_2O.

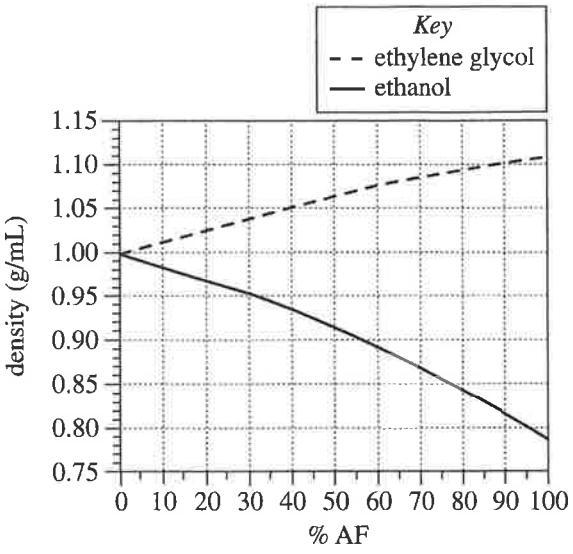


Figure 2

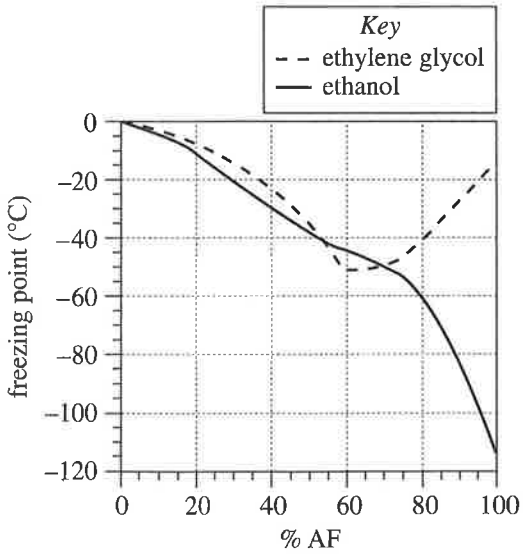
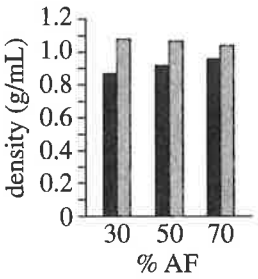


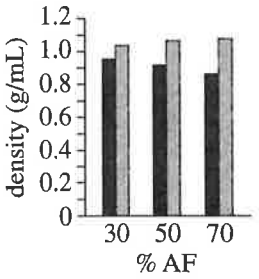
Figure 1

26. Which of the following graphs best shows the data in Figure 2 for % AF values of 30%, 50%, and 70% ?

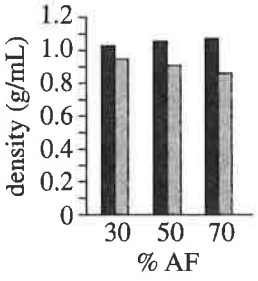
F.



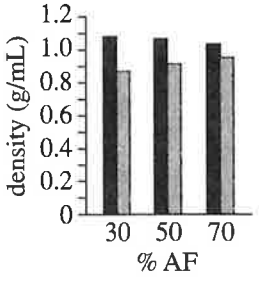
H.



G.



J.



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27. According to Figure 1, a solution that is 80% ethanol by mass in H_2O will have a freezing point closest to which of the following?

A. −60°C
B. −40°C
C. 0°C
D. 0.85°C

28. Consider a solution of ethanol in H_2O and a solution of ethylene glycol in H_2O that are each 50% AF. Based on Figure 2, which will have a greater mass at 20°C, 20 mL of the ethanol solution or 20 mL of the ethylene glycol solution?

F. The ethanol solution, because it is less dense than the ethylene glycol solution.
G. The ethanol solution, because it is more dense than the ethylene glycol solution.
H. The ethylene glycol solution, because it is less dense than the ethanol solution.
J. The ethylene glycol solution, because it is more dense than the ethanol solution.

29. Consider a solution composed of 20 g of ethanol and 80 g of H_2O. According to Figure 1, the freezing point of the solution would be closest to which of the following?

A. −60°C
B. −50°C
C. −10°C
D. 0°C

30. At 20°C, a sphere having a density of 1.05 g/mL will most likely float in which of the liquids listed below?

I. Pure H_2O
II. 55% AF ethanol in H_2O
III. 55% AF ethylene glycol in H_2O

F. I only
G. III only
H. I and II only
J. II and III only

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

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 the ACT®. *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 folder, 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 folder 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 folder 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 your room supervisor 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.

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