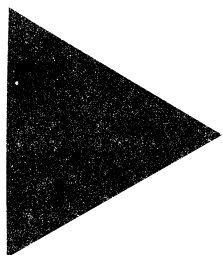# Form 73G

(April 2015)

▶ The **ACT**®

2014 | 2015

In response to your request for Test Information Release materials, this booklet contains the test questions and conversion tables used in determining your ACT scores. Enclosed with this booklet is a report that lists each of your answers, shows whether your answer was correct, and, if your answer was not correct, gives the correct answer.

If you wish to order a photocopy of your answer document—including, if you took the Writing Test, a copy of your written essay—please use the order form on the inside back cover of this booklet.

ENGLISH TEST
45 Minutes—75 Questions

DIRECTIONS: In the five 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 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

The Kam Wah Chung & Co. Museum

To the casual observer, the Kam Wah Chung & Co. building, located in the eastern Oregon community of John Day, that is, simply a small,
___
1
unassuming structure made of rock and wood. To those with an interest in history, however, it's a unique building that preserves a part of the legacy of the Chinese
___
2
community in the nineteenth-century American West.
___
2

1. **A.** NO CHANGE
   B. is
   C. it's
   D. DELETE the underlined portion.

2. Given that all the choices are true, which one most effectively introduces the historical and cultural significance of the Kam Wah Chung & Co. building?
   F. NO CHANGE
   G. has seven rooms: a front room, an herb shop, two bedrooms, a stockroom, a general store, and a kitchen and bunk room.
   H. is cooperatively preserved and operated by the Oregon Parks and Recreation Department and the City of John Day.
   J. has a kitchen that holds antique tables, a large woodstove, and a variety of Chinese teas and cooking utensils.

Built in the 1860s, the Kam Wah Chung building first served as a trading post for travelers who attract to the land east of the Cascade
___
3
Mountains by news of gold strikes there.

3. **A.** NO CHANGE
   B. will be attracted
   C. were attracted
   D. are attracted

[1] Hay and On's businesses prospered through the turn of the century, during the Great Depression, and beginning the 1940s. [2] Because the climate in eastern Oregon is semi-arid, the artifacts left inside—including gold-mining tools, rare antique furniture, financial documents, and a thousand different herbs—were preserved. [3] Although On died in 1940, Hay continued to run Kam Wah Chung & Co. until 1948. [4] After Hay's death, his nephew inherited the building and donated it to the city of John Day. [5] For almost twenty years, it remained locked. [6] The building was restored by the state of Oregon in the 1970s and has became the Kam Wah Chung & Co. Museum. [7] Designated as being called a National Historic Landmark in 2005, besides, it encapsulates an era. [14]

10. **F.** NO CHANGE
    G. as it entered
    H. becoming
    J. into

11. **A.** NO CHANGE
    B. have become
    C. became
    D. become

12. **F.** NO CHANGE
    G. with the appropriation of
    H. in being identified as a
    J. a

13. **A.** NO CHANGE
    B. in conclusion,
    C. in time,
    D. DELETE the underlined portion.

14. For the sake of the logic and coherence of this paragraph, Sentence 2 should be placed:
    F. where it is now.
    G. before Sentence 1.
    H. after Sentence 3.
    J. after Sentence 5.

> Question 15 asks about the preceding passage as a whole.

15. Suppose the writer's goal had been to write a brief essay that outlined the steps the state of Oregon took to restore the Kam Wah Chung & Co. building. Would this essay accomplish that goal?
    A. Yes, because it makes clear that the Kam Wah Chung & Co. building was renovated in the 1970s.
    B. Yes, because it explains why the artifacts that were inside the Kam Wah Chung & Co. building were preserved.
    C. No, because it instead focuses on describing the history of the Kam Wah Chung & Co. building and the building's uses.
    D. No, because it instead focuses on critiquing both On's business philosophies and Hay's medical diagnoses and treatments.

PASSAGE II

One Fair Season

At first glance a Renaissance fair, looks a lot like
<u>   16   </u>
a theme park. Crowds of people mill about, moseying

<u>they're way past</u> costumed characters and colorful
<u>   17   </u>

booths. <u>Being that</u> roller coasters and Ferris wheels,
<u>   18   </u>
the fair's attractions are the sights, sounds, and tastes

inspired by sixteenth-century England. Musicians,

magicians, and archers demonstrate their talents

to curious fairgoers. <u>Horses carrying knights</u>
<u>   19   </u>

to a jousting match <u>walk</u> along the streets.
<u>   20 </u>

<u>Vendors, ranging from king-sized turkey</u>
<u>   21   </u>
<u>legs to suits of armor, peddle wares.</u>
<u>   21   </u>

I've always enjoyed attending Renaissance fairs,

<u>and I found out just how interesting they are.</u> Those
<u>   22   </u>
of us working at the fair spent weeks perfecting

our characters' accents and mannerisms. We also

incorporated sixteenth-century English vocabulary

into our <u>speech. Substituting</u> *good morrow* for "good
<u>   23   </u>
morning" and *gramercy* for "thank you." In my role

16. **F.** NO CHANGE
    G. glance, a Renaissance fair,
    H. glance, a Renaissance fair
    J. glance a Renaissance fair;

17. **A.** NO CHANGE
    B. they're way passed
    C. their way passed
    D. their way past

18. **F.** NO CHANGE
    G. Yet instead of
    H. Because of
    J. Given that

19. **A.** NO CHANGE
    B. Horses, carrying knights,
    C. Horses carrying knights,
    D. Horses, carrying knights

20. Which choice best conveys the horses' movement in a
    way that adds a sensory detail to the description of the
    fair?
    F. NO CHANGE
    G. clip-clop
    H. move
    J. travel

21. **A.** NO CHANGE
    B. Peddling wares, ranging from king-sized turkey
        legs to suits of armor are vendors.
    C. Ranging from king-sized turkey legs to suits of
        armor, vendors peddle wares.
    D. Vendors peddle wares ranging from king-sized
        turkey legs to suits of armor.

22. Which choice best introduces the subject of the para-
    graph and the rest of the essay?
    F. NO CHANGE
    G. but it wasn't until I spent a summer working at one
        that I understood how much effort went into
        re-creating the past.
    H. and I knew that getting a job at one would be the
        easiest way to experience one and have fun at the
        same time.
    J. so one summer's day, some friends and I decided
        to attend a nearby fair.

23. **A.** NO CHANGE
    B. speech, we substituted
    C. speech, substituting
    D. speech; substituting

as a lady-in-waiting, I often used the sixteenth-century

expressions while I served the queen's meals or

introduced her to guests.
24

It was exhausting to spend every day in the hot

summer temperatures while pretending to be a person

whom had lived in a different country and century. The
25

physical demands were especially strenuous for the queen

and us ladies-in-waiting because our costumes, they
26

consisted of confining corsets, several scratchy

petticoats, and heavy velvet gowns. [27]

We strove to make the fairgoers' experience

as authentic as possible. Things that had come into
28

existence more recently after the sixteenth century
28

had to be explained in Renaissance terms. However,
29

when a guest wished to take a photograph, we would

marvel at the camera and ask how such lifelike

paintings were created inside the tiny box.

After three tiring months of rehearsals and

performances, the fair closed for the season, and

I bade *fare thee well* to my Renaissance character

when the summer months were over. Although it had
30

been a wonderful trip back in time, it was a relief to

return to the comforts of my own century.

24. **F.** NO CHANGE
    G. to introduce
    H. introducing
    J. introduce

25. **A.** NO CHANGE
    B. who were to live
    C. whom lived
    D. who lived

26. **F.** NO CHANGE
    G. of our costumes, they
    H. of our costumes
    J. our costumes

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

    > Many theme park characters have to wear uncomfortable costumes.

    Should the writer make this addition here?

    A. Yes, because it develops the essay's earlier comparison between Renaissance fairs and theme parks.
    B. Yes, because it elaborates on the preceding sentence's point about costumes.
    C. No, because it adds a comment that's only loosely related at this point in the essay.
    D. No, because it repeats information stated elsewhere in the essay.

28. **F.** NO CHANGE
    G. Any kind of object or type of item created and introduced for use
    H. Anything invented
    J. Stuff from

29. **A.** NO CHANGE
    B. For example,
    C. One time,
    D. Instead,

30. **F.** NO CHANGE
    G. when the fair closed down.
    H. at the end of the summer.
    J. DELETE the underlined portion and end the sentence with a period.

PASSAGE III

Uncovered at Johnson's Shut-Ins

In Reynolds County, Missouri, a one-billion-gallon

blast of water caused by a breach of the Taum Sauk
 ___
 31

reservoir roared down Proffit Mountain into the east fork

of the Black River on December 14, 2005. They ripped a
 ___
 32

channel through Johnson's Shut-Ins, one of Missouri's

most popular state parks. Though flood damage marred

the parks beauty for a time, the scar the raging water left
 ___
 33

in its wake specifically revealed over a billion years'
 ___
 34

worth of Earth's geologic history.

The area known today as Johnson's Shut-Ins

State Park had began to develop 1.5 billion years
 ___
 35

ago. When the volcanoes that created the St. Francois
 ___
 36

Mountains exploded. Slow-moving magma

cooled down its temperature and crystallized
 ___
 37

to form silica-rich rhyolite rock. Over time
 ___
 38

sedimentary rock such as limestone and shale,

formed from material deposited by shallow inland

seas, buried the rhyolite. After the seas had receded,

gravel-rich rivers and streams eventually chipped

away the soft sedimentary rock in some areas,

31. A. NO CHANGE
B. water caused by,
C. water caused, by
D. water, caused by

32. F. NO CHANGE
G. That they
H. Which
J. It

33. A. NO CHANGE
B. park's beauty for a time,
C. parks' beauty for a time,
D. park's beauty for a time

34. F. NO CHANGE
G. ultimately
H. instead
J. thus

35. A. NO CHANGE
B. begun developing
C. began to develop
D. begun to develop

36. F. NO CHANGE
G. ago; when
H. ago when
J. ago

37. A. NO CHANGE
B. cooled down to a lower temperature
C. lowered its temperature to cool
D. cooled

38. F. NO CHANGE
G. form silica-rich, rhyolite,
H. form silica-rich rhyolite,
J. form, silica-rich rhyolite

GO ON TO THE NEXT PAGE.

exposing the erosion-resistant rhyolite rock and

creating pockets and pits. In low places, the

Black River was confined (or "shut in") by the
39

rhyolite and creating the natural waterslides and
40
canyon-like gorges that have become a summer

playground for thousands of visitors.

Although the flood left the shut-ins unscathed, the

surge of water that tore through the park in 2005 stripped

away all trees, soil, and sedimentary rock in its path. Left
41
behind is a channel that is composed of granite—and

previously unexposed rhyolite rock—and contain rocks
42
from at least three other geological eras. The menacing

floodwaters also revealed a half-billion-year-old beach

made of both sand and gravel.

Five years of work has restored most of the

park surrounding the shut-ins. Some have returned
43

back. Geologists from around the world visit to get
44
a close look at the ancient volcanic rock along what has

been named the "Scour Channel." The "Scour Channel"

now rivals the park's other geologic curiosities for most

frequently visited site.

39. The writer is considering deleting the underlined portion. Should the underlined portion be kept or deleted?
   A. Kept, because it describes how people feel when they visit the park.
   B. Kept, because it suggests the inspiration for the park's name.
   C. Deleted, because it makes an informal observation that is not consistent with the essay's tone.
   D. Deleted, because it interrupts the sentence's description of the Black River.

40. F. NO CHANGE
   G. rhyolite; creating
   H. rhyolite, creating
   J. rhyolite, created

41. A. NO CHANGE
   B. on their
   C. in their
   D. on its

42. F. NO CHANGE
   G. have contained
   H. are containing
   J. contains

43. A. NO CHANGE
   B. Those who are nuts about the outdoors
   C. Swimmers, hikers, and campers
   D. All types of outdoorsy people

44. F. NO CHANGE
   G. by coming back to the park.
   H. to revisit the park.
   J. DELETE the underlined portion and end the sentence with a period.

8

PASSAGE IV

A Birthplace of Stars

The winter night I attempted to see the famed Orion Nebula, I didn't expect to succeed. I was an inexperienced astronomer peering through light-polluted skies. But I was eager to test my new telescope's capabilities, and the nebula being one of the greatest sights in the night sky. So I bundled up, set out my scope to cool down (its mirrors must adjust to the cold air for optimal viewing), and scanned for the constellation Orion.

I had prepared for this night by studying constellations in my astronomy books. Orion appears as a hunter who, in some mythologies, is fighting Taurus the Bull, another constellation. [A] Even in bright skies, the telltale three stars marking Orion's belt has been easy to spot. [B] I knew to follow the belt to Orion's sword, a dim line of stars extending south. [C] The middle of these is actually not a star but a nebula, the Great Orion Nebula, a birthplace of stars. [D] When gravity causes the gas and dust to collapse, forming stars.

The nebula, is home to thousands of young stars, is often called a galactic "nursery." [51]

45. A. NO CHANGE
    B. astronomer, peering through,
    C. astronomer: peering through
    D. astronomer peering through,

46. F. NO CHANGE
    G. is by them said to be
    H. is said to be
    J. having been

47. A. NO CHANGE
    B. hunter, who in some mythologies,
    C. hunter who, in some mythologies
    D. hunter who in, some mythologies,

48. F. NO CHANGE
    G. were being
    H. are
    J. is

49. A. NO CHANGE
    B. collapse to form stars.
    C. collapse, stars form.
    D. collapse and form stars.

50. F. NO CHANGE
    G. nebula is home to thousands of young stars, and
    H. nebula, home to thousands of young stars, and
    J. nebula, home to thousands of young stars,

51. The writer wants to add the following sentence to the preceding paragraph:

    > Located 1,300 light-years from Earth, the nebula is a massive cloud of gas and dust.

    This sentence would most logically be placed at:
    A. Point A.
    B. Point B.
    C. Point C.
    D. Point D.

I centered my scope where the nebula should be, inserted my lowest-powered eyepiece, and leaned in to look. I just made out a dull smudge. I couldn't get much improvement even when I adjusted the focuser. Coincidentally, I switched to a higher-powered eyepiece

and tried a trick I'd read about for viewing faint objects: using averted vision.

The principle of averted vision states that the eye can often see distant objects better by looking to their one side

rather than directly at them. [55] I focused my eye on an area beside the smudge, and, sure enough,

my peripheral vision yielded far more of a better view of the nebula's swirling clouds. I even saw the

Trapezium star cluster, illuminated by four bright

young stars nestled in the nebula like birds' eggs

52. **F.** NO CHANGE
G. Similarly,
H. Besides,
J. So,

53. **A.** NO CHANGE
B. tried a trick I'd have
C. try a trick I'd
D. try a trick I

54. **F.** NO CHANGE
G. one side of them
H. they're side
J. one's side

55. The writer is considering deleting the preceding sentence. Should the sentence be kept or deleted?
A. Kept, because it elaborates on why the narrator is capable of using averted vision when looking at the night sky.
B. Kept, because it explains the principle that allowed the narrator to see the nebula more clearly.
C. Deleted, because it adds a level of technical detail that is inappropriate for the tone of the essay.
D. Deleted, because it digresses from the main point of the paragraph.

56. **F.** NO CHANGE
G. a farther,
H. a far
J. a far,

57. **A.** NO CHANGE
B. emanated
C. emulated
D. eliminated

58. **F.** NO CHANGE
G. bird's eggs
H. birds eggs
J. bird eggs'

in a nest. [59]

59. Given that all the following statements are true, which one, if added here, would best conclude the paragraph and the essay by referring back to the opening paragraph?

A. Observing these features made my winter trek outdoors worthwhile, teaching me that a change in focus is sometimes helpful to see more clearly.
B. In addition to averted vision, it is also important to eliminate stray light and use the correct magnification when observing the night sky.
C. Although my initial goal was to observe Orion's belt and sword, the constellation is also very useful as an aid to locating other constellations such as Taurus and Gemini.
D. The Trapezium star cluster was originally discovered in 1617 by Galileo, whom I'd read about extensively in my astronomy books.

> Question 60 asks about the preceding passage as a whole.

60. Suppose the writer's goal had been to write an essay about a personal experience with astronomy. Would this essay accomplish that goal?

F. Yes, because the narrator recounts several past adventures and challenges of using the telescope to view the night sky.
G. Yes, because the narrator describes a stargazing session from start to finish, from setting up the telescope to observing an actual constellation.
H. No, because it primarily focuses on the Orion Nebula and its process of star formation.
J. No, because it describes a universally used technique for viewing distant objects in the night sky.

PASSAGE V

Chords of Color

Some viewers see the paintings of abstract artist James Little as impersonal, discordant rainbows. Others see them as minimalistic distillations of emotion, in other words, they are metaphors for Little's [61] feelings about social issues and historical events. He paints large-scale patterns of shapes—mostly triangles [62] and narrow rectangles in vibrant contrasting hues. [62]

61. A. NO CHANGE
B. emotion, they see the paintings as
C. emotion the works offer
D. emotion,

62. Which choice is correctly punctuated and makes clear that all the shapes that Little paints are painted in vibrant and contrasting hues?
F. NO CHANGE
G. shapes—mostly triangles and narrow rectangles—in vibrant,
H. shapes—mostly triangles—and narrow rectangles in vibrant,
J. shapes, mostly triangles and narrow rectangles in vibrant

11

GO ON TO THE NEXT PAGE.

His paintings explore the ambiguity of space, the

energy of movement, and the coming together of

unlikely elements. But his subject he says is
                   _____
                          63

color. 64

In 2011, working out of his studio in Brooklyn,

New York, Little is painting on canvas using his own

blends of beeswax and oil paint. He applies at least fifteen

layers of these paints that he blended himself to achieve a
       _____
                          65

thick, smooth, color-soaked, luminescent surface. Most of

his paintings are voluminous, about six feet by eight feet.
                   _____
                       66

To create sharp visual breaks and clean edges of color in

these expansive works, he paints slashing diagonal lines

and rays.

In his 2005 painting *Bittersweet Victory*, by all means,
                                            _____
                                                 67

the canvas is bisected by a vertical, beige line. On the left
              _____
                          68

half, three orange triangles in a row, each one

which stretched from the bottom to the top of the
_____
      69

canvas's left half, angle slightly to the right on a purple
_____
      70

63. **A.** NO CHANGE
    B. But his subject, he says,
    C. But, his subject, he says
    D. But his subject, he says

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

> Little also says that Syracuse University, where he earned his MFA in 1976, was a "beacon for abstract painting."

Should the writer make this addition here?

    F. Yes, because it provides a smooth transition to the biographical focus of the paragraph that follows.
    G. Yes, because it indicates where Little first became focused on working with color.
    H. No, because it adds information that is tangentially related to the essay but blurs the focus of the first paragraph.
    J. No, because it causes unnecessary confusion concerning the essay's assertion that Little works with geometric figures.

65. **A.** NO CHANGE
    B. paint, which is of his own making, and does so
    C. his own blends that he made
    D. these blends

66. **F.** NO CHANGE
    G. immeasurable,
    H. mountainous,
    J. large,

67. **A.** NO CHANGE
    B. for example,
    C. in contrast,
    D. thereafter,

68. Which of the following alternatives to the underlined portion would NOT be acceptable?
    F. vertically bisected by a beige
    G. bisected by a vertically beige
    H. bisected vertically by a beige
    J. bisected by a beige, vertical

69. **A.** NO CHANGE
    B. which by stretching
    C. stretching
    D. stretches

70. **F.** NO CHANGE
    G. canvas, on the left half,
    H. left half of the canvas,
    J. canvas,
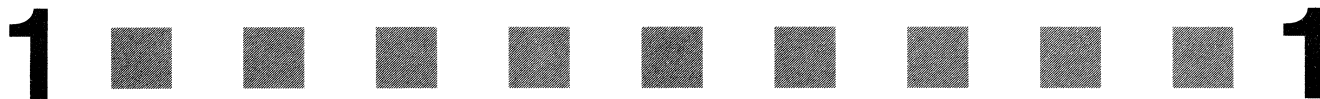
background. On the right half, three vertical bands of dark

green, one edge of each band slanting to create a point that

touches the top of the canvas, cuts through a lime-green
                                 ‾‾‾‾‾‾‾‾‾‾‾‾
                                      71
background. Little explains that the internal spaces in

his paintings (created by lines and blocks of color)

need to play off of each other in a way that lends

rhythm and unity to the whole work. The effect is
                        ‾‾‾‾‾‾‾‾‾
                           72

much like something that would remind you of
‾‾‾
                      73

a perfect jazz collaboration. ⬚74⬚

    One of Little's favorite assessments of his work

came from a woman who told him that his paintings

are optimistic. Little believes the bold, positive energy

infusing his work comes from what he observes around

him. His paintings reflect what he considers the essence

of our experiences as human beings. The malleable nature

of space, the surprising shifts, but, in the end, a balance.

71. A. NO CHANGE
    B. cuts crossed
    C. cut through
    D. cut crossed

72. F. NO CHANGE
    G. on the entirety of the
    H. into the whole
    J. with the entire

73. A. NO CHANGE
    B. reminiscent of something that echoes
    C. much like that of
    D. being like

74. If the writer were to delete the preceding sentence, the paragraph would primarily lose a description of Little's work that:
    F. builds on the subtle musical reference in the paragraph to create a comparison between Little's paintings and jazz.
    G. indicates the popularity of Little's paintings by drawing a comparison between his work and jazz collaborations.
    H. provides a transition to the following paragraph's focus on several assessments of Little's work by art critics.
    J. emphasizes the idea that Little's methods allowed him to reach the goals he uniquely set for his piece *Bittersweet Victory*.

┌───┐
│ Question 75 asks about the preceding passage │
│ as a whole.   │
└───┘

75. Suppose the writer's primary purpose had been to describe how an artist uses simple elements to convey large ideas. Would this essay accomplish that purpose?
    A. Yes, because it focuses primarily on one viewer's conclusion that the lines of color in Little's *Bittersweet Victory* communicate the idea of optimism.
    B. Yes, because it conveys that Little uses shapes and color to capture what he sees as the movement and rhythm of the human experience.
    C. No, because it focuses too heavily on describing the metaphor that Little hoped to create with *Bittersweet Victory* but does not explain what that painting looked like.
    D. No, because it indicates that Little focuses on color in his work but does not suggest the effect that his work achieves.

END OF TEST 1

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

MATHEMATICS TEST
60 Minutes—60 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.

---

1. $|3(-2) + 4| = ?$

A. -2
B. 2
C. 5
D. 9
E. 10

DO YOUR FIGURING HERE.

2. The table below shows the income earned by 5 students from selling tickets for a school fund-raiser. Each student earned the same amount for each ticket sold.

Student	Number of tickets sold	Income earned
Aida	13	$55.25
Beth	5	$21.25
Charles	22	$93.50
Darius	16	$68.00
Ellie	8	$34.00

Another student, Francis, also earned that same amount for each ticket sold, for an income earned of $123.25 from selling tickets. How many tickets did Francis sell?

F. 26
G. 29
H. 33
J. 35
K. 38

3. What is the value of the expression $\sqrt{\dfrac{m}{x-3}}$ when $x = -1$ and $m = -16$?

A. -2
B. 2
C. $2\sqrt{2}$
D. $2i$
E. $2i\sqrt{2}$

ACT-73G

14

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

4. For all real numbers a, b, and c, the expression $ax - bx + cx$ can be written as the product of x and which of the following?

F. $-a + b - c$
G. $a - b - c$
H. $a - b + c$
J. $a + b - c$
K. $a + b + c$

5. Hai has $100 available to buy USB drives to back up data for his business computers. Each USB drive has a price of $8, and Hai will pay a sales tax of 7% of the total price of the USB drives. What is the maximum number of USB drives Hai can buy?

A. 11
B. 12
C. 13
D. 14
E. 15

6. The lengths of the legs of a right triangle are 4 miles and 5 miles, respectively. Which of the following lengths, in miles, is closest to that of the hypotenuse of the right triangle?

F. 3.0
G. 4.5
H. 6.4
J. 8.0
K. 8.7

7. What is the least common multiple of 50, 70, and 90 ?

A. 70
B. 210
C. 315
D. 3,150
E. 315,000

8. Susan makes holiday wreaths for 4 hours every Saturday. It takes her 20 minutes to make a small wreath and 30 minutes to make a large wreath. This Saturday, Susan will make twice as many large wreaths as small wreaths. How many of the large wreaths will she make this Saturday?

F. 2
G. 3
H. 5
J. 6
K. 7

9. In $\triangle ABC$ below, D is on $\overline{AB}$, E is on $\overline{AC}$, and $\overline{ED} \parallel \overline{CB}$. If it can be determined, what is the ratio of the area of $\triangle ABC$ to the area of $\triangle ADE$?
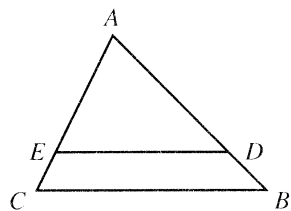
A. 2:1
B. 3:1
C. 4:1
D. 4:3
E. Cannot be determined from the given information

10. On the real number line, point J is at -7 and point K is at -14. What is the distance between J and K ?

F. -21

G. -7

H. 7

J. $10\frac{1}{2}$

K. 21

11. A system of equations is given below. What is the value of b in the (a,b) solution to the system?

$$a = 3b - 7$$
$$a = b + 1$$

A. -4
B. -3
C. -2
D. 2
E. 4

12. The table below gives the total charge to rent a moving truck from each of 2 movers for various numbers of miles. For what number of miles would the total charge for renting a moving truck from Ben's be the same as the total charge for renting a moving truck from Ronnie's?

(Note: There is a linear relationship between the number of miles and the total charge for both Ben's and Ronnie's.)

Number of miles	Total charge	
	Ben's	Ronnie's
10	$10	$45
20	$20	$50
30	$30	$55
40	$40	$60
50	$50	$65

F. 50
G. 60
H. 70
J. 80
K. 90

13. In the figure below, G is the center of the circle, $\overline{LK}$ is a diameter, H lies on the circle, J lies outside the circle on $\overleftrightarrow{LK}$, and $\overleftrightarrow{JM}$ is tangent to the circle at M. Which of the following angles or minor arcs has the greatest degree measure?
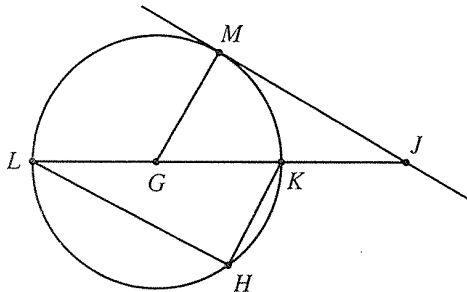
- **A.** $\overparen{LM}$
- **B.** $\overparen{MK}$
- **C.** $\angle JMG$
- **D.** $\angle LHK$
- **E.** $\angle MJL$

14. A bowl contains 6 red beads, 8 black beads, and a number of green beads. There are no other beads in the bowl. The probability of randomly choosing a black bead from the bowl is $\frac{1}{3}$. How many green beads are in the bowl?

- **F.** 4
- **G.** 7
- **H.** 10
- **J.** 24
- **K.** 28

15. In the figure below, the border of a pool and the border of a patio surrounding that pool are similar rectangles. The given dimensions are in feet. What is the length of the pool, in feet?
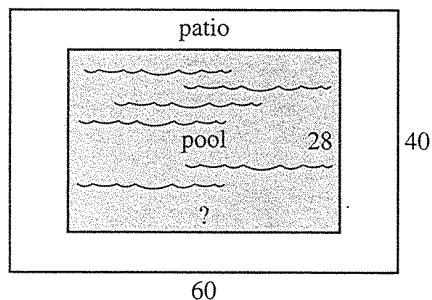
- **A.** 30
- **B.** 40
- **C.** 42
- **D.** 48
- **E.** 52

DO YOUR FIGURING HERE.

16. Marcie will paint the shaded region (1 pentagonal wall) of the outside of the playhouse shown below. All given dimensions are in feet. Each 1-quart container of paint will cover 50 square feet, and only 1 coat of paint will be applied. How many 1-quart containers of paint will Marcie need in order to cover the 1 pentagonal wall of the playhouse?
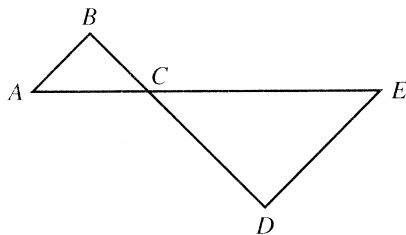
F. 1
G. 2
H. 3
J. 4
K. 5
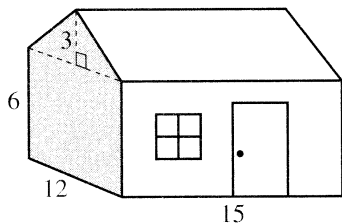
17. A certain computer performs 1.5×10^8 calculations per second. How many seconds would it take this computer to perform 6.0×10^{16} calculations?

A. 2.5×10^{-9}
B. 9.0×10^0
C. 4.0×10^2
D. 4.0×10^8
E. 9.0×10^{24}

18. In the figure below, $\overline{AE}$ and $\overline{BD}$ intersect at C, and $\overline{AB} \parallel \overline{DE}$. Which of the following angles *must* have the same measure as $\angle BAC$?

F. $\angle ACB$
G. $\angle ACD$
H. $\angle BCE$
J. $\angle CDE$
K. $\angle CED$

19. In the standard (x,y) coordinate plane, the point $(2,-4)$ is the midpoint of the line segment with endpoints $(8,-8)$ and:

A. $(-4, \ 0)$
B. $(-4,-16)$
C. $(\ 3, \ -2)$
D. $(\ 4, \ \ 0)$
E. $(\ 5, \ -6)$

20. The product of 2 positive integers is 78. The greater integer is 1 more than twice the lesser integer. What is the greater integer?

F. \ \ 6
G. \ \ 7
H. 12
J. 13
K. 19

21. A set of numbers consists of all the odd integers that are greater than 1 and less than 21. What is the probability that a number picked at random from the set will be divisible by 3 ?

A. $\frac{1}{3}$

B. $\frac{2}{3}$

C. $\frac{2}{9}$

D. $\frac{4}{9}$

E. $\frac{5}{9}$

22. Noah bowled 3 games for his bowling team. In the second game, he scored 10 points more than in the first game; in the third game, he scored 10 points more than in the second game. His average score was 230 points for the 3 games. How many points did Noah score in the *third* game?

F. 210
G. 220
H. 230
J. 240
K. 250

23. For what 2 values of x is the equation $x^2 - 5x + 6 = 0$ true?

A. −6 and 1
B. −3 and 2
C. −2 and 3
D. −1 and 6
E. 2 and 3

24. Observation of a certain bacteria colony has shown that its population of cells doubles every 3 hours. Given that the initial population of cells in this colony is about 8 million, which of the following values, in millions, would be closest to the number of cells in the bacteria colony after 15 hours?

F. 32
G. 40
H. 120
J. 128
K. 256

25. Audrey will take biology, algebra, and Spanish next year. Audrey will have 1 of the 3 teachers who teach biology, 1 of the 4 teachers who teach algebra, and 1 of the 2 teachers who teach Spanish. From among these 9 teachers, how many possibilities are there for Audrey's 3 teachers for the 3 classes?

A. 9
B. 18
C. 24
D. 72
E. 84

DO YOUR FIGURING HERE.

26. What value of x satisfies the matrix equation below?

$$2\begin{bmatrix} 4 & -1 \\ x & 3 \end{bmatrix} + \begin{bmatrix} 3 & 3 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 11 & 1 \\ 9 & 6 \end{bmatrix}$$

F. 3.5
G. 4
H. 4.5
J. 5.5
K. 8

DO YOUR FIGURING HERE.

27. Sophia's goal this past summer was to save an average of $5.00 per week for 10 weeks. She saved an average of $4.00 per week for the first 9 weeks and saved $12.00 for the 10th week. On average, how much more should Sophia have saved each week to reach her goal?

A. $0.10
B. $0.20
C. $0.30
D. $0.50
E. $0.90

28. The rectangular deck on Sachi's house has a width of 4 yards and a length of 6 yards. Sachi remodels the deck by increasing both the length and width by the same amount. The area of her new deck is twice the area of her original deck. What is the length, in yards, of Sachi's new deck?

F. 2
G. 6
H. 8
J. 12
K. 18

29. Nestor will bury one end of a cable 3 feet from the base of an antenna and attach the other end of the cable at a point on the antenna 8 feet above the ground, as shown below. When taut, the length of the exposed cable will be $\sqrt{73}$ feet. Which of the following expressions represents the measure of the angle the taut cable will make with the level ground?

A. $\tan^{-1}\left(\dfrac{3}{8}\right)$

B. $\tan^{-1}\left(\dfrac{3}{\sqrt{73}}\right)$

C. $\tan^{-1}\left(\dfrac{8}{3}\right)$

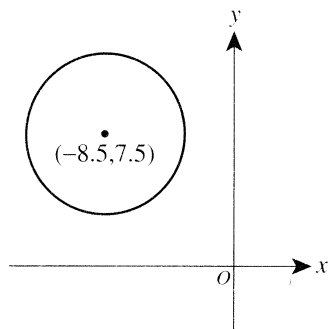**D.** $\tan^{-1}\left(\dfrac{8}{\sqrt{73}}\right)$

E. $\tan^{-1}\left(\dfrac{\sqrt{73}}{8}\right)$
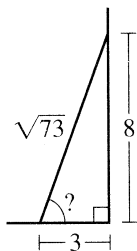
Use the following information to answer questions 30–32.

The circle in the standard (x,y) coordinate plane below has center $(-8.5, 7.5)$ and has radius 5 coordinate units.

30. Which of the following is an equation of this circle?

F. $(x - 8.5)^2 + (y + 7.5)^2 = 10$

G. $(x + 8.5)^2 + (y - 7.5)^2 = 10$

H. $(x - 8.5)^2 + (y + 7.5)^2 = 25$

J. $(x + 8.5)^2 + (y - 7.5)^2 = 25$

K. $(x + 8.5)^2 + (y + 7.5)^2 = 25$

31. What is the area, in square coordinate units, of this circle?

A. $\dfrac{5}{2}\pi$

B. $\dfrac{25}{2}\pi$

C. 10π

D. 25π

E. 100π

32. The circle will be reflected across the y-axis. What will be the coordinates of the image of the center of the circle?

F. $(-8.5, -7.5)$

G. $(-3.5, 2.5)$

H. $(3.5, -2.5)$

J. $(8.5, -7.5)$

K. $(8.5, 7.5)$

33. In a plane, the distinct lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at A, where A is between C and D. The measure of $\angle BAC$ is $54°$. What is the measure of $\angle BAD$?

A. $54°$
B. $(54 + 54)°$
C. $(90 - 54)°$
D. $(90 + 54)°$
E. $(180 - 54)°$

DO YOUR FIGURING HERE.

34. For an angle with measure α in a right triangle, $\sin \alpha = \frac{180}{181}$ and $\tan \alpha = \frac{180}{19}$. What is the value of $\cos \alpha$?

F. $\dfrac{19}{181}$

G. $\dfrac{19}{180}$

H. $\dfrac{19}{\sqrt{65,161}}$

J. $\dfrac{19}{\sqrt{32,039}}$

K. $\dfrac{181}{19}$

35. For which of the equations below is its solution an integer?

    I. $3n + 5 = 24$
    II. $5n + 3 = 23$
    III. $5(n + 3) = 25$

A. I only
B. II only
C. III only
D. I and II only
E. II and III only

36. Whenever x and y are nonzero, $\dfrac{(8x^5y^4)(6x^{13}y^3)}{16x^6y^{14}} = ?$

F. $3x^3y^2$

G. $\dfrac{3x^3}{y^2}$

H. $\dfrac{3x^6}{16y^{21}}$
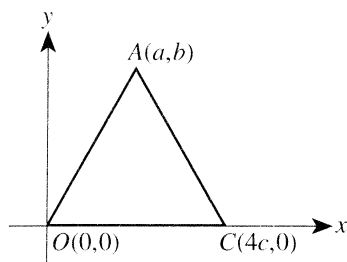
J. $\dfrac{3x^{12}}{y^7}$

K. $\dfrac{3x^{59}}{y^2}$

37. Consider all products xy such that x is divisible by 8 and y is divisible by 14. Which of the following whole numbers is NOT a factor of each product xy ?

A. 2
B. 8
C. 12
D. 56
E. 112

38. Shown in the standard (x,y) coordinate plane below is equilateral triangle $\triangle AOC$ with coordinates $A(a,b)$, $C(4c,0)$, and $O(0,0)$. In terms of c, what is a ?

F. c
G. $2c$
H. $3c$
J. $4c$
K. $6c$

39. On Monday, Jan and Diego opened separate bank accounts with initial deposits of \$28.00 and \$161.00, respectively. Every Monday after opening the accounts, Jan will add \$18.25 to her account and Diego will withdraw \$15.00 from his account. Which of the following equations, when solved, gives the number of weeks (w) after opening the accounts that Jan and Diego will have the same amount of money in their respective accounts?

(Note: They make no other deposits or withdrawals, and no interest is applied to the money in the accounts.)

A. $-18.25w + 28 = -15w + 161$
B. $18.25w + 28 = 15w + 161$
C. $18.25w + 28 = 15w - 161$
D. $18.25w + 28 = -15w + 161$
E. $28w + 18.25 = 161w - 15$

40. Let p and q be real numbers such that $p + q = 4$, $-pq = 12$, and $p > q$. What is p ?

F. 2
G. 3
H. 4
J. 6
K. 8

41. The table below gives the weights, rounded to the nearest pound, at birth and at 1 year for 5 boys. A researcher models these weights as a linear function where the weight at 1 year is dependent on the weight at birth. Among the following models, which is best?

Name	Weight at birth (x pounds)	Weight at 1 year (y pounds)
Aiden	6	17
Clark	5	16
Graham	8	24
Johan	10	30
Owen	9	26

- **A.** $y = 3x$
- **B.** $y = 4x$
- **C.** $y = x + 11$
- **D.** $y = x + 16$
- **E.** $y = 2x + 10$

42. In the standard (x,y) coordinate plane, what is the slope of the line that is perpendicular to the line $8x + 7y = 112$?

- **F.** $-\dfrac{8}{7}$
- **G.** $-\dfrac{7}{8}$
- **H.** $-\dfrac{1}{8}$
- **J.** $\dfrac{7}{8}$
- **K.** 8

43. The circle below has a diameter of 8 centimeters. Which of the following is closest to the area, in square centimeters, of the square inscribed in the circle?
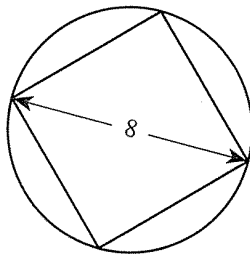
- **A.** 25
- **B.** 32
- **C.** 50
- **D.** 64
- **E.** 201

ACT-73G

24

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44. Points $O(0,0)$ and $B(0,3)$ below lie in the standard (x,y) coordinate plane. The collection of all points such that each is twice as far from B as from O forms a circle. The point $(\sqrt{3},0)$ is 1 point on the circle. What are the coordinates of the center of that circle?
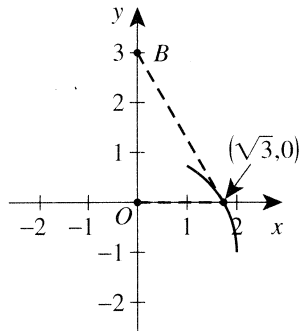
F. $\left(\dfrac{\sqrt{3}}{2}, \dfrac{3}{2}\right)$

G. $\left(0, \dfrac{3}{2}\right)$

H. $(0, 1)$

J. $(0,-1)$

K. $(0,-3)$

45. Given $\dfrac{3}{x} = 12$ and $\dfrac{x}{y} = 2$, what is the value of y ?

A. $\dfrac{1}{8}$

B. $\dfrac{1}{4}$

C. $\dfrac{1}{2}$

D. 8

E. 18

46. Temperatures measured in degrees Fahrenheit (F) are related to temperatures measured in degrees Celsius (C) by the formula $F = \dfrac{9}{5}C + 32$. There is 1 value of x for which x degrees Fahrenheit equals x degrees Celsius. What is that value?

**F.** -72
G. -40
H. -32
J. 0
K. 32

47. The domain of $f(x) = \dfrac{2}{x^3 - 9x}$ is the set of all real numbers EXCEPT:

A. $-\dfrac{2}{9}$

B. 3

C. -3 and 3

D. 0 and 3

E. $-3, 0,$ and 3

48. The figure shown below is composed of a rectangle and a semicircle. Points A and B are endpoints of both a side of the rectangle and a diameter of the semicircle. What is the perimeter, in feet, of the figure?
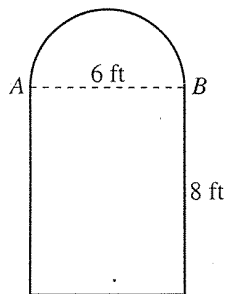
F. $3\pi + 20$
G. $3\pi + 22$
H. $6\pi + 14$
J. $6\pi + 28$
K. $9\pi + 48$

49. What is the area, in square inches, of the parallelogram shown below?
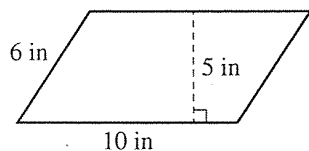
A. 42
B. 50
C. 55
D. 60
E. 75

50. What is the sixth term of the geometric sequence whose second term is -4 and whose fifth term is 32 ?

F. -128
G. -64
H. 44
J. 128
K. 256

51. What are the values of θ, between 0 and 2π, when $\tan \theta = -1$?

DO YOUR FIGURING HERE.

  A. $\frac{\pi}{4}$ and $\frac{3\pi}{4}$ only

  B. $\frac{3\pi}{4}$ and $\frac{5\pi}{4}$ only

  C. $\frac{3\pi}{4}$ and $\frac{7\pi}{4}$ only

  D. $\frac{5\pi}{4}$ and $\frac{7\pi}{4}$ only

 E. $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}$, and $\frac{7\pi}{4}$

52. A can of soda pop has the shape of a right circular cylinder with an inside height of 6 inches and an inside diameter of 2 inches. When you pour the soda pop from the full can into a cylindrical glass with an inside diameter of 3 inches, about how many inches high is the soda pop in the glass?

(Note: The volume of a right circular cylinder is $\pi r^2 h$.)

  F. $2\frac{2}{3}$

  G. 4

  H. 5

  J. $6\frac{2}{3}$

  K. 8

53. Suppose that equally spaced dots are marked on each side of a regular polygon, with a dot at each vertex, and that the distance between consecutive dots is the same for all sides. The figure below shows 4 equally spaced dots per side, including a dot at each vertex, for an equilateral triangle. Which of the following expressions represents the number of dots for a regular polygon with n equally spaced dots, including one at each vertex, marked on each of its s sides?
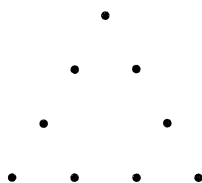
  A. ns
  B. $ns - 1$
  C. $ns - s$
  D. $ns + s$
  E. $ns - n$

Use the following information to answer questions 54–56.

A storage facility is currently offering a special rate to customers who sign contracts for 6 months or more. According to this special rate, the first month's rent is $1, and for each month after the first month, customers pay the regular monthly rental rate. The table below shows the storage unit sizes available, the floor dimensions, and the regular monthly rental rate. All the units have the same height.

Size	Floor dimensions, in meters	Regular monthly rental rate
1	2×4	$ 30
2	4×4	$ 60
3	4×8	$100
4	8×8	$150
5	8×16	$200

54. Daria will sign a contract to rent a Size 3 unit for 12 months at the current special rate. The amount Daria will pay for 12 months at the current special rate represents what percent decrease from the regular rental rate for 12 months?

F. 8.25%
G. 8.33%
H. 8.42%
J. 9.00%
K. 9.09%

55. Size 5 units can be subdivided to form other sizes of units. What is the greatest number of Size 1 units that can be formed from a single Size 5 unit?

A. 2
B. 4
C. 8
D. 10
E. 16

56. Janelle, the owner of the storage facility, is considering building new units that have floor dimensions larger than Size 5 units. She will use the floor area to determine the heating requirements of these larger units. For this calculation, Janelle will use the same relationship between the unit size number and the respective floor area for Sizes 1 through 5. Which of the following expressions gives the floor area, in square meters, of a Size x storage unit?

F. $2^3 \cdot x$

G. 2^{3x}

H. $2^{(2+x)}$

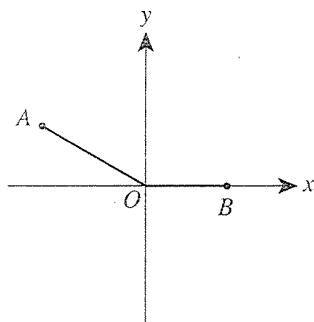J. $2(x+1)^2$

K. $(x+2)^2$

57. For how many integers x is the equation $3^{x+1} = 9^{x-2}$ true?

   A. 0
   B. 1
   C. 2
   D. 3
   E. An infinite number

DO YOUR FIGURING HERE.

58. In the standard (x,y) coordinate plane below, B is on the positive x-axis, the measure of $\angle AOB$ is $150°$, and the length of $\overline{AO}$ is 1 coordinate unit. What are the coordinates of A ?

   F. $\left(-\dfrac{\sqrt{3}}{2}, \ \dfrac{1}{2} \right)$
   G. $\left(-\dfrac{\sqrt{2}}{2}, \ \dfrac{\sqrt{2}}{2} \right)$
   H. $\left(-\dfrac{1}{2}, \ \dfrac{\sqrt{3}}{2} \right)$
   J. $\left(\dfrac{\sqrt{3}}{2}, \ -\dfrac{1}{2} \right)$
   K. $\left(\dfrac{\sqrt{2}}{2}, \ -\dfrac{\sqrt{2}}{2} \right)$

59. Which of the following polar coordinates represents the same location as $(3, 45°)$?

   A. $(3, -315°)$
   B. $(3, -225°)$
   C. $(3, -45°)$
   D. $(3, 135°)$
   E. $(3, 315°)$

60. The equation $y = \dfrac{2x^2 - 18}{x^2 - 5x}$ has 2 vertical asymptotes and 1 horizontal asymptote. What is the horizontal asymptote?

   F. $x = 0$
   G. $x = 3$
   H. $x = 9$
   J. $y = 0$
   K. $y = 2$

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.

READING TEST

35 Minutes — 40 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 novel *Homeland* by John Jakes (©1993 by John Jakes).

Joseph Emanuel Crown, owner of the Crown Brewery of Chicago, was a worried man. Worried on several counts, the most immediate being a civic responsibility he was scheduled to discuss at an emer-
5 gency meeting this Friday, the fourteenth of October; a meeting he had requested.

Joe Crown seldom revealed inner anxieties, and that was the case as he worked in his office this morning. He was a picture of steadiness, rectitude, prosper-
10 ity. He wore a fine suit of medium gray enlivened by a dark red four-in-hand tied under a high collar. Since the day was not yet too warm, he kept his coat on.

Joe's hair was more silver than white. He washed it daily, kept it shining. His eyes behind spectacles with
15 silver wire frames were dark brown, rather large, and alert. His mustache and imperial showed careful attention; he had an appointment at twelve for the weekly trim. His hands were small but strong. He wasn't handsome, but he was commanding.

20 Three principles ruled Joe Crown's business and personal life, of which the most important was order. In German, *Ordnung*. Without order, organization, some rational plan, you had chaos.

The second principle was accuracy. Accuracy was
25 mandatory in brewing, where timing and temperatures were critical. But accuracy was also the keystone of any business that made money instead of losing it. The primary tool for achieving accuracy was mathematics. Joe Crown had a towering belief in the potency of correct
30 information, and the absolute authority of numbers which provided it.

In Germany, he'd learned his numbers before he learned to read. Though a mediocre student in most school subjects, at ciphering he was a prodigy. He
35 could add a column of figures, or do calculations in his head, with astonishing speed. In Cincinnati, his first stop in America, he'd begged the owner of a Chinese laundry to teach him to use an abacus. One of these ancient counting devices could be found in his office,

40 sitting on a low cabinet, within reach. Money measured success; counting measured money.

Questions he asked of his employees often involved numbers. "What is the exact temperature?" "How large is the population in that market?" "How
45 many barrels did we ship last week?" "What's the cost, per square foot, of this expansion?"

As for his third principle, modernity, he believed that, too, was crucial in business. Men who said the old ways were the best ways were fools, doomed to fall
50 behind and fail. Joe was always searching for the newest methods to improve the brewery's product, output, efficiency, cleanliness. He hadn't hesitated to install expensive pasteurization equipment when he opened his first small brewery in Chicago. He'd been
55 among the first to invest heavily in refrigerated freight cars. He insisted that modern machines be used in the office. From his desk he could hear the pleasing ratchet noise of a mechanical adding machine. This blended with the clicking keys and pinging bell on the black
60 iron typewriter used for correspondence by his chief clerk, Stefan Zwick.

Originally Stefan had resisted Joe's suggestion that he learn to operate a typewriter. "Sir, I respectfully decline, a quill pen suits me perfectly."

65 "But Stefan," Joe said to him in a friendly but firm way, "I'm afraid it doesn't suit me, because it makes Crown's look old-fashioned. However, I'll respect your feelings. Please place a help wanted advertisement. We'll hire one of those young women who specialize
70 in using the machines. I believe they too are called typewriters."

Zwick blanched. "A woman? In my office?"

"I'm sorry, Stefan, but you leave me no choice if you won't learn to typewrite."

75 Stefan Zwick learned to typewrite.

Every solid house or building was supported by a strong foundation; and so there was a foundation on which Joe Crown's three principles rested. It was not unusual, or peculiar to him. It was the cheerful accep-
80 tance, not to say worship, of hard work. Among other

GO ON TO THE NEXT PAGE.

artifacts, advertising sheets, flags and fading brown
photographs of annual brewery picnics decorating his
office there was a small framed motto which his wife
had done colorfully in cross-stitch and put into a frame
85 of gilded wood. *Ohne Fleiss, kein Preis,* it said. In
rough translation, this reminded you that without indus-
try there was no reward. From his desk Joe Crown
couldn't see the gold-framed motto; it hung on the wall
behind him, slightly to his right. But he didn't need to
90 see it. Its truth was in him deeper than the marrow of
his bones. He was a German.

1. If a stereotype of Germans is that they are tidy, meticu-
   lous, and industrious, does the characterization of
   Crown in this passage reinforce or weaken this
   stereotype?
   A. It firmly reinforces the stereotype.
   B. It initially reinforces and subsequently weakens
      the stereotype.
   C. It reinforces the meticulous aspect of the stereo-
      type but weakens the industrious aspect.
   D. It weakens the stereotype in that Crown likes his
      surroundings tidy but expects others to do the tidy-
      ing up.

2. It can reasonably be inferred that in relation to the
   appointment referred to in the third paragraph (lines
   13–19), the meeting referred to in the first paragraph
   occurs:
   F. on the same day.
   G. several days earlier.
   H. several days later.
   J. several years later.

3. The passage's description of Zwick reveals that com-
   pared to Crown, he is:
   A. equally fastidious about meeting a deadline.
   B. less inclined to embrace new technology.
   C. less afraid to state his preferences to his superiors.
   D. more concerned with the company's public image.

4. The dialogue in line 72 reveals Zwick's:
   F. indignation over Crown's proposed solution to the
      problem the two men are discussing.
   G. panic over having a surprise visitor to his office.
   H. excitement over meeting a new employee of
      Crown Brewery.
   J. insensitivity to his recently hired female coworker.

5. At the time described in the passage's opening, what is
   Crown's most immediate preoccupation?
   A. Whether he will be on time for his weekly trim
   B. Whether to install expensive pasteurization equip-
      ment at his brewery
   C. Zwick's impertinent behavior
   D. A civic responsibility

6. The passage states that Crown was what kind of
   student?
   F. Exceptionally gifted, especially in ciphering
   G. Mediocre, except in ciphering
   H. Successful when he applied himself, otherwise
      poor
   J. Increasingly successful as he gained the use of
      counting aids

7. Based on the passage, which of the following ques-
   tions would be most characteristic of the kind Crown
   typically asked his employees?
   A. "Was your weekend a most pleasant one?"
   B. "Have you had a chance to repair that old
      typewriter?"
   C. "By what figure will our sales increase if we
      advertise in that publication?"
   D. "Who among you has a better idea for how we can
      work well as a team?"

8. At the time in which the passage is set, which of the
   following devices are still apparently being used in
   offices in the United States even as those same devices
   are, in Crown's view, becoming increasingly obsolete?
   F. Typewriters
   G. Mechanical adding machines
   H. Quill pens
   J. Abacuses

9. The metaphor the author uses to help describe Crown's
   three principles primarily draws upon imagery from
   what discipline?
   A. Architecture
   B. Business
   C. Astronomy
   D. Education

10. Which of the following is a detail from the passage
    that indicates the length of time Crown has been in the
    brewery business?
    F. Some outdated refrigerators from when he first
       opened his business
    G. A newly hung cross-stitched phrase framed and
       placed on his office wall
    H. Photographs of annual company picnics decorating
       his office
    J. A bell, the ringing of which has marked the start
       of his workday for the last twenty years

Passage II

In the summer of 1785 astronomer William Herschel embarked on his revolutionary new project to observe and resolve the heavens with a telescope more powerful than ever previously attempted.

5 What he intended to build was a telescope 'of the Newtonian form, with an octagon tube 40 foot long and five feet in diameter; the specula [mirrors] of which it would be necessary to have at least two, or perhaps three'. The telescope would have to be mounted in an 10 enormous wooden gantry, capable of being turned safely on its axis by just two workmen, but also susceptible to the finest fingertip adjustments by the observing astronomer.

The forty-foot would be higher than a house. The 15 astronomer (William) would be required to climb a series of ladders to a special viewing platform perched at the mouth of the telescope. The assistant (William's sister, Caroline) would have to be shut in a special booth below to avoid light pollution, where she would 20 have her desk and lamp, celestial clocks, and observation journals. Astronomer and assistant would be invisible to each other for hours on end, shouting commands and replies, although eventually connected by a metal speaking-tube.

25 William had decided that his grand project required a new house with larger grounds for constructing and erecting the telescope. On 3 April 1786 they moved to 'The Grove', a quite small and rather dilapidated country house on the edge of the tiny village of 30 Slough, England.

The house itself was not large, but it had sheds and stables which were gradually converted into workshops and laboratories. Above the stables were a series of haylofts which could be converted into a separate apart-35 ment. Caroline claimed these for her own. A small outside staircase led up to a flat roof from which she hoped to carry out her comet 'sweeps' in security and independently. She would check over the calculations of William's nebulae by day, and make her own sweeps 40 up on the roof by night.

William had built Caroline a special two-foot Newtonian reflector. Because of its large aperture, its tube appeared much fatter, heavier and stubbier than normal reflectors of this type. Suspended from a pivot 45 at the top of the box-frame, the telescope could be precisely raised or lowered by a system of pulleys operated by a winding handle. These adjustments were easy to make, and extremely fine.

This beautiful instrument was designed specifi-50 cally for its huge light-gathering power and its wide angle of vision. The magnification was comparatively low at twenty-four times. As with modern binoculars, this combination of low power with a large viewing field allowed the observer to see faint stellar objects 55 very brightly, while placing them within a comparatively wide context of surrounding stars. The telescope was perfectly designed to spot any strange or unknown object moving through the familiar field of 'fixed stars'. In other words, to catch new planets or new 60 comets.

On 1 August 1786, only two nights after starting her new sweeps, Caroline thought she had spotted an unknown stellar object moving through Ursa Major (the Great Bear constellation). It appeared to be descending, 65 but barely perceptibly, towards a triangulation of stars in the beautifully named constellation Coma Berenices. To find something so quickly, and in such a familiar place (the Great Bear or Big Dipper being the first stop of every amateur stargazer wanting to locate the Pole 70 Star), seemed wildly unlikely. Caroline's Observation Book conveys meticulous caution, but also remarkable certainty.

Unable to calculate the mathematical coordinates of the object, she accompanied her observations with a 75 series of three neat drawings or 'figures', over an eighty-minute time lapse. These showed the circular viewing field of her telescope, with an asterisk shape very slightly changing position relative to three known fixed stars. The account written into her 'Book of Work 80 Done' catches something of her growing excitement.

August 1st. I have calculated 100 nebulae today, and this evening I saw an object which I believe will prove tomorrow night to be a Comet. August 2nd. 1 o'clock. the object of 85 last night IS A COMET. August 3rd. I did not go to rest till I had written to Dr Blagden [at the Royal Society] and Mr Aubert to announce the Comet.

The verification of Caroline's comet was achieved 90 much more rapidly than William's discovery of the planet Uranus had been. Its movement through Coma Berenices was relatively easy to ascertain, and its fine hazy tail or coma was unmistakable.

11. Which of the following statements best describes how the passage characterizes William's response to Caroline's discovery of a comet?

A. The passage makes it clear that although William applauded Caroline's discovery, he was disappointed that Caroline wasn't looking for nebulae.

B. The passage claims that William supported Caroline's discovery by verifying the comet himself.

C. The passage suggests that William resented the fact that Caroline's comet was recognized so quickly.

D. The passage does not give a clear indication of how William felt about Caroline's discovery.

12. In the passage, the author emphasizes the large size of William's powerful telescope's octagon tube by comparing the tube's height to that of a:
   F. series of ladders.
   G. wooden gantry.
   H. hayloft.
   J. house.

13. The primary function of the fifth paragraph (lines 31–40) is to:
   A. explain the methods Caroline used to perform her comet sweeps.
   B. shift the passage's focus from William's project to Caroline's own astronomical work.
   C. describe the renovations Caroline made to the stables in order to accommodate William's telescope.
   D. introduce the passage's discussion of how Caroline's observation techniques compared to William's.

14. In the context of the passage, the excerpt from Caroline's "Book of Work Done" primarily serves to:
   F. outline the process by which Caroline determined her finding was a comet.
   G. provide an example of the types of observation notes Caroline made for William.
   H. illustrate Caroline's growing sense of excitement about her discovery.
   J. explain Dr. Blagden's and Mr. Aubert's role in verifying Caroline's discovery.

15. As it is used in line 12, the word *finest* most nearly means:
   A. slightest.
   B. fairest.
   C. thinnest.
   D. greatest.

16. The passage most strongly suggests that while William operated his telescope, Caroline would have to work below in a special booth because:
   F. she would be relaying William's instructions to the workmen who turned the telescope.
   G. she preferred seclusion when working on calculations.
   H. the telescope's viewing platform would not be large enough to hold both William and Caroline.
   J. the light from her lamp would interfere with William's view of the night sky.

17. Which of the following questions is most directly answered by the passage?
   A. What inspired William to embark on his project to observe and resolve the heavens?
   B. Why did Caroline and William move to "The Grove"?
   C. Why couldn't Caroline calculate the coordinates of the comet she discovered?
   D. How long did it take the Royal Society to confirm Caroline's discovery was a new comet?

18. It can most reasonably be inferred from the passage that compared to normal telescopes of its type, the two-foot Newtonian reflector William built had:
   F. a larger aperture.
   G. a smaller box-frame.
   H. more magnifying power.
   J. less light-gathering power.

19. According to the passage, when Caroline first saw her comet, it appeared to be moving through:
   A. Coma Berenices and descending toward the Pole Star.
   B. Coma Berenices and descending toward stars in the Big Dipper.
   C. Ursa Major and descending toward stars in Coma Berenices.
   D. a triangulation of stars, which included the Pole Star, and descending toward Coma Berenices.

20. The passage indicates that Caroline's discovery of a new comet was unlikely because Caroline:
   F. found the comet quickly in a part of the sky that was familiar to astronomers and stargazers.
   G. knew more about nebulae than she knew about comets.
   H. had already discovered a planet while performing observations with William.
   J. had little experience calculating the mathematical coordinates of stellar objects.

Passage III

HUMANITIES: Passage A is adapted from the essay "Truth in Personal Narrative" by Vivian Gornick (©2008 by University of Iowa Press). Passage B is adapted from the article "Fact and Fiction in *A Moveable Feast*" by Jacqueline Tavernier-Courbin (©1984 by Hemingway Review).

Passage A by Vivian Gornick

Once, in Texas, I gave a reading from my memoir *Fierce Attachments*. No sooner had I finished speaking than a woman in the audience asked a question: "If I come to New York, can I take a walk with your mama?"
5 I told her that, actually, she wouldn't want to take a walk with my mother, it was the woman in the book she wanted to walk with. They were not exactly the same.

Shortly afterwards, I attended a party in New York where, an hour into the evening, one of the guests
10 blurted out in a voice filled with disappointment, "Why, you're nothing like the woman who wrote *Fierce Attachments*!" At the end of the evening she cocked her head at me and said, "Well, you're *something* like her." I understood perfectly. She had come expecting to have
15 dinner with the narrator of the book, not with me; again, not exactly the same.

On both occasions, what was desired was the presence of two people who existed only between the pages of a book. In our actual persons, neither Mama nor I
20 could give satisfaction. We ourselves were just a rough draft of the written characters. Moreover, these characters could not live independent of the story which had called them into life, as they existed for the sole purpose of serving that story. In the flesh, neither Mama
25 nor I were serving anything but the unaesthetic spill of everyday thought and feeling that routinely floods us all, only a select part of which, in this case, invoked the principals in a tale of psychological embroilment that had as its protagonist neither me nor my mother but
30 rather our "fierce attachment."

At the heart of my memoir lay a revelation: I could not leave my mother because I had become my mother. This complicated insight was my bit of wisdom, the history I wanted badly to trace out. The context in
35 which the book is set—our life in the Bronx in the 1950s, alternating with walks taken in Manhattan in the 1980s—was the situation; the story was the insight. What mattered most to me was not the literalness of the situation, but the emotional truth of the story. What
40 actually happened is only raw material; what matters is what the memoirist makes of what happened.

Memoirs belong to the category of literature, not of journalism. It is a misunderstanding to read a memoir as though the writer owes the reader the same
45 record of literal accuracy that is owed in newspaper reporting or historical narrative. What is owed the reader is the ability to persuade that the narrator is trying, as honestly as possible, to get to the bottom of the tale at hand.

Passage B by Jacqueline Tavernier-Courbin

50 The dividing line between fiction and autobiography is often a very fine and shaky one, and Ernest Hemingway's autobiography of the artist as a young man is a case in point. As nearly all readers know, Hemingway's fiction contains numerous autobiographi-
55 cal elements, and his protagonists are often conscious projections and explorations of the self. At the same time, Hemingway's openly autobiographical writings, *Green Hills of Africa* and *A Moveable Feast*, are barely more autobiographical than his fiction, and, in many
60 ways, just as fictional.

A Moveable Feast is particularly complex because Hemingway was clearly conscious that it would be his literary testament. Thus, in writing it, he dealt with issues which had been important to him and he settled
65 old scores. Among the reasons which motivated his portrayal of self and others were the need to justify himself, for he felt that he had been unfairly portrayed by some of his contemporaries, the desire to present his own version of personal relationships as well as the
70 desire to get back at people against whom he held a grudge, the need to relive his youth in an idealized fashion, and the wish to leave to the world a flattering self-portrait. Thus, *A Moveable Feast* could hardly be an objective portrayal of its author and his contempo-
75 raries, and the accuracy of the anecdotes becomes an issue that can never be entirely resolved.

While it is impossible to verify everything Hemingway wrote in *A Moveable Feast*, one might conclude that he invented and lied relatively seldom about
80 pure facts. When he did so, it was usually in order to reinforce the pattern he had created—i.e., a negative portrayal of literary competitors and an idealized self-portrayal. He clearly overlooked a great deal of material, distorted some, and generally selected the episodes
85 so that they would show him as innocent, honest, dedicated, and thoroughly enjoying life. *A Moveable Feast*, in fact, appears as a fascinating composite of relative factual accuracy and clear dishonesty of intent.

Questions 21–24 ask about Passage A.

21. The main purpose of the first two paragraphs of Passage A (lines 1–16) is to:

A. establish the popularity of Gornick's book by indicating that people wanted to meet her after reading the book.

B. introduce the idea that the characters in Gornick's memoir are not exactly like their real-life counterparts.

C. illustrate Gornick's frustration with some of her readers.

D. suggest that Gornick's memoir should be classified as fiction, not as nonfiction.

GO ON TO THE NEXT PAGE.

22. Which of the following quotations from Passage A most directly relates to the party guest's disappointment upon meeting the author of *Fierce Attachments* ?

   F. "We ourselves were just a rough draft of the written characters" (lines 20–21).
   G. "I had become my mother" (line 32).
   H. "This complicated insight was my bit of wisdom" (line 33).
   J. "The story was the insight" (line 37).

23. According to Passage A, Gornick believes the heart of her memoir to be:

   A. the walks she took with her mother in Manhattan.
   B. the revelation that she had become her mother.
   C. her childhood experiences in the Bronx.
   D. her shared history with her mother.

24. According to Passage A, Gornick believes that memoirs belong to the category of:

   F. journalism.
   G. personal diaries.
   H. historical narratives.
   J. literature.

Questions 25–27 ask about Passage B.

25. According to Passage B, the protagonists in Hemingway's fiction are often:

   A. composites of Hemingway's friends.
   B. based on Hemingway's family members.
   C. projections of Hemingway himself.
   D. completely made-up characters.

26. Based on Passage B, the question of accuracy in *A Moveable Feast* is particularly difficult because:

   F. Hemingway used the book to create a particular portrait of himself and his contemporaries.
   G. Hemingway's contemporaries were writing conflicting memoirs during the same time period.
   H. Hemingway could not produce any documents to support his stories.
   J. Hemingway said his memory was excellent, but others doubt this.

27. Which of the following statements best expresses the opinion the author of Passage B seems to have about *A Moveable Feast* ?

   A. It stands alongside Hemingway's fiction as one of his best works.
   B. It is a complex example of a book that combines fact and fiction.
   C. It provides an accurate look at a specific time in Hemingway's life.
   D. It should be read with other books from the same time period.

Questions 28–30 ask about both passages.

28. Based on the passages, Gornick's and Hemingway's approaches to writing their memoirs are similar in that both writers:

   F. put real characters into wholly fictional situations.
   G. wanted to portray themselves in a flattering way.
   H. were motivated to settle old scores and present their own versions of personal relationships.
   J. used only material from their lives that served the story they each wanted to tell.

29. Based on the passages, it can most reasonably be inferred that Gornick and Hemingway would agree that when it comes to a writer's responsibility to be truthful in a memoir:

   A. the degree of truthfulness should be the same as that for fiction.
   B. if a writer can't remember the exact details of a certain event, that event should be left out of the memoir.
   C. it is more important to create an artistic whole than to relate only facts.
   D. the writer should only include incidents that have documented evidence to support them.

30. Another author wrote the following about the role of truth in memoir:

   A memoir is a story, not a history, and real life doesn't play out as a story.

   Which passage most closely echoes the view presented in this quotation?

   F. Passage A, because it offers a story about what happens when you meet someone who doesn't live up to your expectations.
   G. Passage A, because it stresses that what happens in life is only raw material for a memoirist.
   H. Passage B, because it states that Hemingway viewed *A Moveable Feast* as his literary testament.
   J. Passage B, because it states that Hemingway seldom lied about pure facts.

Passage IV

NATURAL SCIENCE: This passage is adapted from the article "The Next Wave: What Makes an Invasive Species Stick?" by Robert R. Dunn (©2010 by Natural History Magazine, Inc.).

Like many biologists, Andrew V. Suarez struggled for years with the question of which colonizing organisms fail and which succeed. He studied it the hard way—with fieldwork and lab experiments—until 1999,
5 when he found some brown jars. He had gone to the Smithsonian Institution National Museum of Natural History's National Insect Collection to look for early samples of Argentine ants collected in the United States or at its borders. He hoped to find out how vintage
10 specimens of Argentine ants were related to the existing populations.

At the museum, among many thousands of jars of insects labeled with taxonomic notes, locations, and dates, Suarez ultimately found relatively few samples
15 of Argentine ants. But what he found besides them was, to his mind, far more interesting: some of the ethanol-filled jars were jammed with vials of ants collected at ports of entry in the eastern U.S. from 1927 to 1985. They were ants that border agents had picked from
20 plants being shipped into the U.S. Could those ants be identified as members of species that had failed or succeeded as colonists, and if so, could the specimens be used to compare the two groups?

In the jars and vials were 394 separate samples of
25 ants. Suarez solicited the help of two friends, ant ecologist David A. Holway of the University of California, San Diego, and Philip S. Ward, guru of ant gurus, at the University of California, Davis. Altogether they identified 232 distinct species.

30 Suarez considered the traits possessed by each of the ant species in an attempt to see what might have predisposed some of them to survival. He measured whether they were big or small. He examined whether each lived in the canopy or on the ground, and whether
35 they were from one subfamily or another. He also looked at a simpler possibility: that "survivor species" tended to be those introduced more than once. The evidence in the jars showed, for example, that Argentine ants had arrived at least twice. Were successes just a
40 consequence of the number of tries?

When a pioneering group sets up camp and starts living in a new place, possible futures diverge. One species might be wiped out within a generation or two. A second might survive, but never become common.
45 Yet another species might thrive, eventually spreading across states, continents, and even the world! Even if surviving in a new environment is sometimes a matter of being introduced again and again, thriving is a different story. Relatively few invasive species truly prevail.

50 One curious thing about Argentine ants is that they are, despite their apparent meekness, ecologically dominant. They are squishy, small, stingless wimps, as ants go, yet somehow they have managed to overpower the big, tough native ants.

55 There's another strange thing about Argentine ants. If you take an Argentine ant from what looks like one colony and put it together with one from a distant colony, they accept each other. In fact, you can perform that trick over much of California and very few of the
60 ants will fight. It is as though all of the Argentine ants in California are part of a few huge colonies—"super-colonies," they've come to be called.

Biologist Ted Case joined forces with Holway and Suarez for an experiment to test whether the lack of
65 aggression among those ant colonies somehow helped them to compete with other species. Might it simply be that by not fighting with their neighbors, the Argentine ants wasted less energy on war and could spend more time on the good stuff? It turned out that, yes, aggres-
70 sive ants wasted energy fighting (and dying), and so gathered less food and fared poorly, in general. Peace pays (at least peace with one's kin), and so Argentine ants have made bank everyplace they have moved.

In fact, it isn't just for the Argentine ant that peace
75 seems to pay. Supercolonies and the unicolonial populations they create look to be common among invasive ants.

Ants flash chemical badges identifying their home nest. Without such markers, no one knows who is friend
80 or foe. When the clarity of "us versus them" breaks down, peace breaks out among colonies of an ant species. Different nests swap workers and queens, and the term "colony" becomes fuzzy. Experiments seemed to show that one conglomeration of Argentine ants
85 stretched the length of California, another from Italy to Portugal . . . until, in 2009, workers from those two "colonies" (along with a third from Japan) were put together, and they didn't fight. Thus, across the entire globe, a few peaceful supercolonies could exist and
90 expand.

31. The main purpose of this passage is to:
A. describe events that led to the discovery of Argentine ants in the United States.
B. examine the physical differences between Argentine ants and other insects.
C. highlight the technology that scientists used to determine the size of supercolonies.
D. discuss factors that contribute to a colonizing organism's success as an invasive species.

32. The author makes repeated use of which of the following in order to help establish the passage's somewhat casual tone?
F. Personal anecdotes
G. Idiomatic expressions
H. Humorous quotations
J. Self-critical asides

33. Which of the following events mentioned in the passage occurred first chronologically?

  A. Case joined Holway and Suarez to assist them with an experiment.
  B. Workers from three Argentine ant supercolonies in different parts of the world were brought together.
  C. Suarez found samples of Argentine ants in the Smithsonian insect collection.
  D. Holway and Ward were recruited by Suarez to assist with his research.

34. The main purpose of the fifth paragraph (lines 41–49) is to:

  F. explain how Argentine ants are able to survive in new areas and discuss their spread throughout the world.
  G. describe possible outcomes for a pioneering species and stress the improbability that the species will thrive.
  H. define the concept of invasive species as it relates to ants.
  J. compare the behaviors of Argentine ants to those of other, more successful pioneering species.

35. The author's claim that the Argentine ant behavior described in lines 56–58 is unusual is based upon which of the following assumptions?

  A. Supercolonies are common among several species of ants.
  B. Argentine ants in California are less aggressive than Argentine ants elsewhere.
  C. California's ecosystem is especially suited for Argentine ants.
  D. Ants from different colonies typically fight one another.

36. According to the passage, the question of which colonizing organisms fail and which succeed is one that has been studied by:

  F. many biologists for a number of years.
  G. many biologists beginning in 1999.
  H. the Smithsonian exclusively.
  J. Suarez exclusively.

37. The passage makes clear which of the following about the ant samples Suarez found in the Smithsonian insect collection?

  A. Most of the samples were of Argentine ants.
  B. Ward and Holway had collected the samples as part of a larger study of US insect populations.
  C. Suarez discovered that most of the samples were of previously undiscovered species of ants.
  D. Suarez was most interested in the samples that had been collected at eastern US ports of entry.

38. According to the passage, which of the following is true of Argentine ants?

  F. They are stingless.
  G. They are physically dominant.
  H. They were first discovered in the United States by Suarez.
  J. They have failed to thrive in Japan.

39. The passage indicates that compared to peaceful ants, aggressive ants:

  A. live in larger colonies.
  B. spend less time gathering food.
  C. are less likely to live in a colony.
  D. are more likely to be a "survivor species."

40. The passage most clearly establishes which of the following facts about ants?

  F. In order for ant colonies to combine to form supercolonies, the colonies must have identical chemical badges.
  G. Ants identify their home nests by flashing chemical badges.
  H. Ant colonies from different species commonly swap workers and queens.
  J. The largest supercolony of ants in the world stretches from Italy to Portugal.

END OF TEST 3

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

DO NOT RETURN TO A PREVIOUS TEST.

SCIENCE TEST

35 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

The figure below is a pedigree that shows the inheritance of a trait, Trait G, in a family. The presence of Trait G in an individual is determined entirely by Gene G. Gene G has 2 alleles: *G*, which is dominant, and *g*, which is recessive.

Each individual represented in the pedigree was assigned a number (shown below the symbol for the individual) for reference. Scientists determined that the Gene G genotype of Individual 20 is *gg* and that the Gene G genotype of Individual 21 is *Gg*. Based on this information, the scientists concluded that Trait G is a recessive trait.

Key
male female
□ ◯ without Trait G
■ ● with Trait G
□—◯ mating
□ ◯ offspring
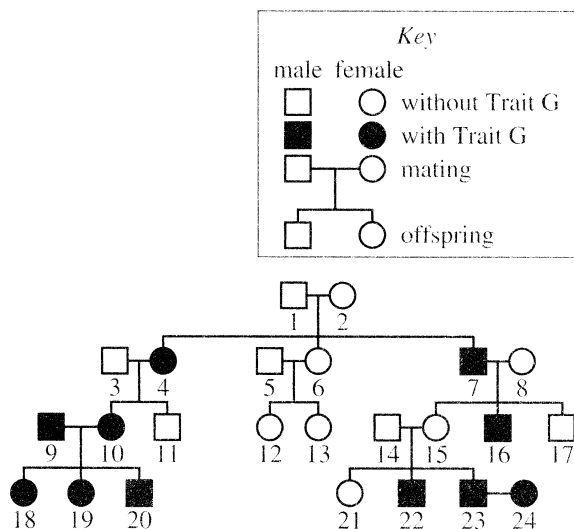
1. How many generations are shown in the figure?
   A. 3
   B. 4
   C. 22
   D. 24

2. Based on the figure, the 2 individuals in which of the following pairs most likely have the greatest genetic similarity across their genomes?
   F. Individual 3 and Individual 4
   G. Individual 12 and Individual 13
   H. Individual 16 and Individual 24
   J. Individual 18 and Individual 21

3. Suppose that Individual 23 and Individual 24 have 4 biological children. Based on the figure, how many of the children, if any, have Trait G ?
   A. 0
   B. 1
   C. 3
   D. 4

4. According to the figure, how many of the grandchildren of Individual 1 and Individual 2, if any, have Trait G ?
   F. 0
   G. 1
   H. 2
   J. 7

5. Based on the figure, is it likely that Trait G is a sex-linked trait?

  A. Yes, because mothers with Trait G always passed Trait G to their sons.
  B. Yes, because mothers with Trait G did not always pass Trait G to their sons.
  C. No, because mothers with Trait G always passed Trait G to their sons.
  D. No, because mothers with Trait G did not always pass Trait G to their sons.

6. Based on the information provided, will an individual with the Gene G genotype *Gg* have Trait G ?

  F. Yes, because Trait G is a dominant trait.
  G. Yes, because Trait G is a recessive trait.
  H. No, because Trait G is a dominant trait.
  J. No, because Trait G is a recessive trait.

Passage II

Heliconia metallica is a plant found in the understory of tropical rain forests. (The *understory* is the area below the forest canopy.) *H. metallica* flowers are normally pollinated by hummingbirds. The flowers can be *self-pollinated* (egg and pollen are from the same *H. metallica* plant) or *cross-pollinated* (egg and pollen are from different *H. metallica* plants). The following study was conducted to investigate the effects of different pollination treatments on fruit production and seed mass in a population of *H. metallica*.

Study

Before pollination could occur, the *anthers* (pollen-producing structures) were removed from each of 400 *H. metallica* flowers. Then, the flowers were covered with nylon bags to prevent the normal pollinators from pollinating the flowers. The covered flowers were divided equally into 4 groups (Groups 1–4), and each group received a different pollination treatment (see Table 1). Four weeks after the pollination treatments, the percent of flowers that produced fruit and the average mass per seed were determined for each group (see Figures 1 and 2, respectively).

Table 1	
Group	Pollination treatment
1	self-pollination*
2	cross-pollination with pollen collected from a single donor *H. metallica* plant
3	cross-pollination with a mixture of pollen collected from 6 donor *H. metallica* plants
4	no pollination

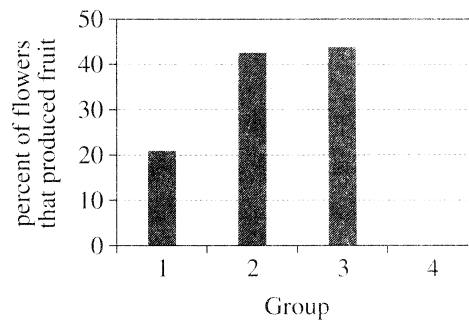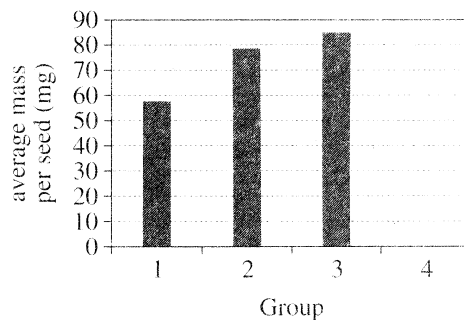*Each flower was pollinated with pollen from its removed anthers.

Figure 1

Figure 2

7. The data that were averaged to produce the results shown in Figure 2 were most likely collected using which of the following pieces of equipment?

   A. Balance
   B. pH meter
   C. Telescope
   D. Thermometer

8. One of the questions about *H. metallica* plants that the study was designed to answer was which of the following?

   F. Does the location of the plants in the understory of tropical rain forests determine whether the flowers are self-pollinated or cross-pollinated?
   G. Are the percent of flowers that produce fruit and the average mass per seed different when flowers are self-pollinated than when flowers are cross-pollinated?
   H. How long after the plants are pollinated does the fruit ripen?
   J. Are the flowers normally pollinated by hummingbirds?

9. The pollination treatments received by Groups 1 and 2 differed in which of the following ways? The pollen received by each Group 1 flower was:

   A. from the same plant as the flower, whereas the pollen received by each Group 2 flower was from a different plant than the flower.
   B. from a different plant than the flower, whereas the pollen received by each Group 2 flower was from the same plant as the flower.
   C. collected from 1 plant, whereas the pollen received by each Group 2 flower was collected from 6 plants.
   D. collected from 6 plants, whereas the pollen received by each Group 2 flower was collected from 1 plant.

10. For any group, the value shown in Figure 1 was most likely calculated using which of the following expressions?

   F. $\dfrac{\text{number of seeds}}{\text{total seed mass}} \times 100$

   G. $\dfrac{\text{total seed mass}}{\text{number of seeds}} \times 100$

   H. $\dfrac{\text{number of flowers producing fruit}}{\text{total number of flowers}} \times 100$

   J. $\dfrac{\text{total number of flowers}}{\text{number of flowers producing fruit}} \times 100$

11. The anthers were most likely removed from the flowers for the purpose of ensuring that the flowers:

   A. would spontaneously self-pollinate.
   B. would not spontaneously self-pollinate.
   C. would be pollinated by hummingbirds.
   D. would not be pollinated by hummingbirds.

12. Do the results of the study indicate that the nylon bags successfully prevented the normal pollinators from pollinating the *H. metallica* flowers?

   F. Yes; only 20% of the flowers receiving the self-pollination treatment produced fruit.
   G. Yes; none of the flowers receiving the no pollination treatment produced fruit.
   H. No; only 20% of the flowers receiving the self-pollination treatment produced fruit.
   J. No; none of the flowers receiving the no pollination treatment produced fruit.

13. What was the total mass of the seeds produced by the Group 3 flowers?

   A. 0 mg
   B. 45 mg
   C. 85 mg
   D. Cannot be determined from the given information

Passage III

When 2 types of bacteria found in the soil of a *wetland* (land having a high water table) break down organic matter, gases are generated. *Aerobic bacteria*, which require O_2, generate CO_2. *Anaerobic bacteria*, which require little or no O_2, generate CH_4.

bog soil

Figure 1

Study

At the beginning of a particular summer, 3 soil sections, each 1.5 m long, 1 m wide, and 0.6 m deep, were removed intact from the surface of each of 2 wetlands—a *bog* and a *fen*—after all live plants had been removed from the sections. Each section was placed in a separate 100 L tank having sides and a lid made entirely of glass. An instrument to measure gas emissions was mounted on the underside of the lid, above the soil. All the tanks were placed at an outdoor site near the wetlands.

Different amounts of water were added to the 3 tanks containing bog soil sections to produce a water table (WT) 1 cm above the surface (+1 cm) of the first soil section, a WT 10 cm below the surface (−10 cm) of the second soil section, and a WT 20 cm below the surface (−20 cm) of the third soil section. This procedure was repeated for the 3 tanks containing fen soil sections. All the lids were then closed.

Over the next 3 months, gas emissions from each soil section were measured, in moles of carbon per square meter (mol C/m^2). Throughout this period, the temperature inside the tanks was kept the same as the outdoor temperature. Figure 1 shows the total emission of CO_2 and the total emission of CH_4 from each bog soil section due to bacterial activity; Figure 2 does the same for each fen soil section.
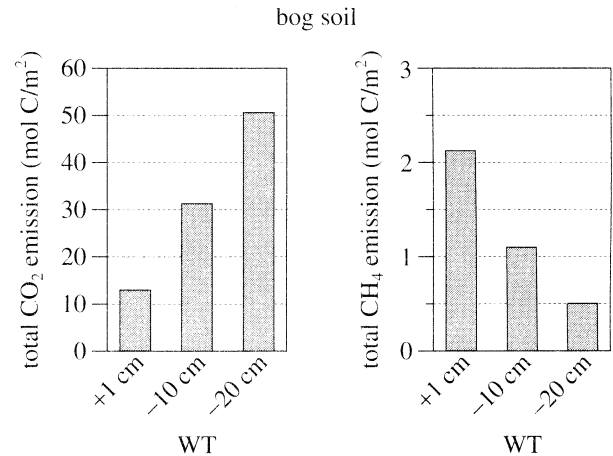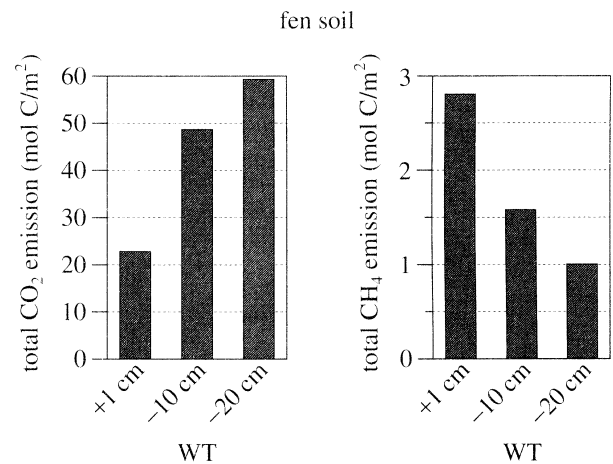
fen soil

Figure 2

Figures adapted from Karen Updegraff et al., "Response of CO_2 and CH_4 Emissions from Peatlands to Warming and Water Table Manipulations." ©2001 by the Ecological Society of America.

14. The researchers who conducted the study most likely chose to conduct it during the summer rather than during the winter because organic matter in soil is broken down:

 F. in the summer by aerobic bacteria only and in the winter by anaerobic bacteria only.
 G. in the summer by anaerobic bacteria only and in the winter by aerobic bacteria only.
 H. by both aerobic and anaerobic bacteria more rapidly in the summer than in the winter.
 J. by both aerobic and anaerobic bacteria less rapidly in the summer than in the winter.

15. According to the results of the study, as the water table for the bog soil sections and the fen soil sections became progressively lower, did the total CO_2 emission increase or decrease, and did the total CH_4 emission increase or decrease?

	total CO_2 emission	total CH_4 emission
A.	increased	decreased
B.	decreased	increased
C.	increased	increased
D.	decreased	decreased

16. One of the reasons that the lid on each tank was kept closed for the 3-month period was to:

 F. minimize the amount of emitted gas that exited the tank.
 G. maximize the amount of atmospheric gas that entered the tank.
 H. prevent bacteria from leaving the tank.
 J. prevent sunlight from entering the tank.

17. The 2 types of wetland investigated in this study—bogs and fens—have different levels of the nutrients that sustain bacterial growth. Do the results of the study suggest that the levels of the nutrients that sustain aerobic bacteria are higher in bogs or in fens, and do the results of the study suggest that the levels of the nutrients that sustain anaerobic bacteria are higher in bogs or in fens?

	higher nutrients for aerobic bacteria	higher nutrients for anaerobic bacteria
A.	bogs	bogs
B.	bogs	fens
C.	fens	bogs
D.	fens	fens

18. Based on the results of the study for the 2 soil sections that were completely submerged in water, were aerobic bacteria present in those sections?

 F. Yes; CO_2 was emitted from those sections.
 G. Yes; CH_4 was emitted from those sections.
 H. No; only CO_2 was emitted from those sections.
 J. No; only CH_4 was emitted from those sections.

19. Consider the total CO_2 emission from the fen soil section having a WT of -10 cm. Based on that result, over the 3 months, the average CO_2 emission from that soil section per month would have been closest to which of the following?

 A. 10 mol C/m^2
 B. 13 mol C/m^2
 C. 16 mol C/m^2
 D. 19 mol C/m^2

20. The study was conducted at an outdoor site near the wetlands to ensure that the tanks would be nearly identical to the wetlands with respect to which of the following conditions?

 F. Amount of precipitation
 G. Types of plants present
 H. Volume of soil
 J. Hours of daylight

Passage IV

Physics students performed 3 studies to determine the forces that several doors exerted on their hinges. The doors had various weights, W, and widths, D. Each door had 2 hinges; the hinges could be moved to vary the distance, S, between them. None of the doors had a doorknob.

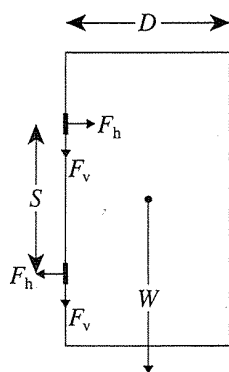The 2 hinges on each door were equidistant from the center of mass of the door (see the diagram).

diagram of door

Each hinge was fitted with 2 force sensors. With the door attached to a door frame, one of the sensors detected the *horizontal force* exerted by the door on the hinge, F_h, and the other sensor detected the *vertical force* exerted by the door on the hinge, F_v. Once F_h and F_v were determined for each hinge, F_h was averaged over the 2 hinges, yielding the average horizontal force per hinge, $F_{h, av}$, and F_v was averaged over the 2 hinges, yielding the average vertical force per hinge, $F_{v, av}$. From $F_{h, av}$ and $F_{v, av}$, the average net force per hinge, $F_{n, av}$, could be calculated.

In the 3 studies, all forces were recorded in pounds (lb) and all lengths were recorded in inches (in).

Study 1

For a door with $W = 61$ lb and $D = 30$ in, the students determined $F_{h, av}$ and $F_{v, av}$ at various S. The results are shown in Figure 1.
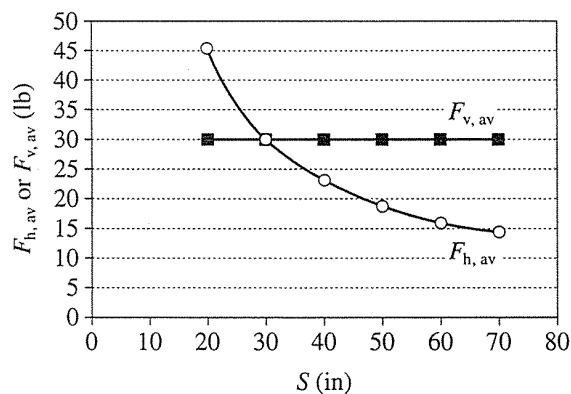

Figure 1

Study 2

For 3 doors, each with $D = 30$ in but a different W, the students determined $F_{n, av}$ at various S. The results are shown in Figure 2.

Figure 2

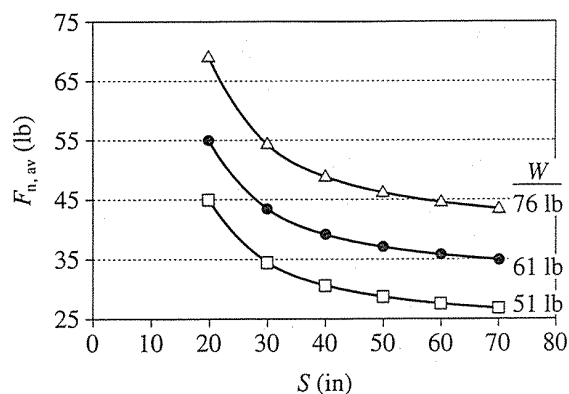*Study 3*

For 3 doors, each with $W = 61$ lb but a different D, the students determined $F_{n, av}$ at various S. The results are shown in Figure 3.
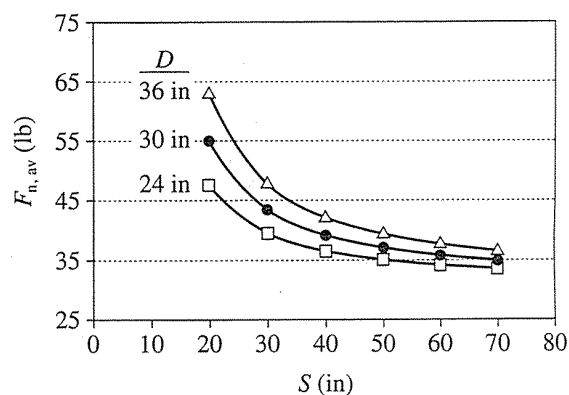

Figure 3

21. In which study, if any, was the door with the greatest mass tested?

   A. Study 1
   B. Study 2
   C. Study 3
   D. None of the studies; all the doors tested in the 3 studies had the same mass.

44

GO ON TO THE NEXT PAGE.

22. Which of the following statements regarding W and D best describes a difference between Study 2 and Study 3 ? In Study 2:

F. W was varied while D was held constant, whereas in Study 3, W was held constant while D was varied.
G. W was held constant while D was varied, whereas in Study 3, W was varied while D was held constant.
H. both W and D were varied, whereas in Study 3, both W and D were held constant.
J. both W and D were held constant, whereas in Study 3, both W and D were varied.

23. If a door having $W = 90$ lb, $D = 30$ in, and $S = 50$ in had been tested in Study 2, $F_{n, av}$ for this door would most likely have been:

A. less than 20 lb.
B. between 20 lb and 30 lb.
C. between 30 lb and 45 lb.
D. greater than 45 lb.

24. For the door tested in Study 1, when S was less than 30 in, was $F_{h, av}$ less than $F_{v, av}$ or greater than $F_{v, av}$, and when S was greater than 30 in, was $F_{h, av}$ less than $F_{v, av}$ or greater than $F_{v, av}$?

	S less than 30 in	S greater than 30 in
F.	less	less
G.	less	greater
H.	greater	less
J.	greater	greater

25. In Studies 2 and 3, which combination of W, D, and S resulted in the *lowest* $F_{n, av}$?

	W (lb)	D (in)	S (in)
A.	51	30	20
B.	51	30	70
C.	61	24	20
D.	61	24	70

26. In Study 1, which average force, $F_{h, av}$ or $F_{v, av}$, was independent of S ?

F. $F_{h, av}$, because as S increased, $F_{h, av}$ decreased.
G. $F_{h, av}$, because as S increased, $F_{h, av}$ remained constant.
H. $F_{v, av}$, because as S increased, $F_{v, av}$ decreased.
J. $F_{v, av}$, because as S increased, $F_{v, av}$ remained constant.

27. Suppose that, due to a manufacturing defect, a particular pair of hinges will break when a net force greater than 57 lb is exerted on each hinge. Based on Study 3, the hinges will most likely break if used on a 61 lb door with which of the following combinations of D and S ?

	D (in)	S (in)
A.	30	20
B.	30	70
C.	36	20
D.	36	70

GO ON TO THE NEXT PAGE.

Passage V

In a chemistry class, the teacher placed 0.5 g of porous steel wool, composed mostly of iron (Fe), inside a small heat-resistant quartz tube. She then used silicone hoses to connect the quartz tube to 2 airtight glass syringes (see figure). Each syringe contained 8 mL of air, and the total volume of air in the closed apparatus was 20 mL.
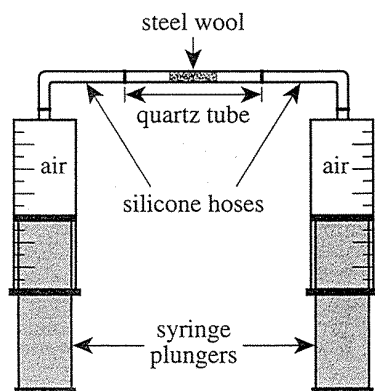

Figure adapted from Francisco Vera, Rodrigo Rivera, and César Núñez, "A Simple Experiment to Measure the Content of Oxygen in the Air Using Heated Steel Wool." ©2011 by Division of Chemical Education, Inc., American Chemical Society.

A Bunsen burner was then used to heat the contents of the quartz tube for 2 min. During heating, the plungers were moved up and down to pass the air back and forth through the steel wool. The total volume of gas in the apparatus steadily declined over the 2 min. Once the apparatus and its contents returned to room temperature, the total volume of gas in the apparatus was 16 mL.

The teacher asked each of 4 students to explain what occurred during the demonstration.

Student 1

During heating, the Fe in the steel wool reacted with all the N_2 in the air to form solid iron nitride (FeN), which was deposited on the steel wool. Air contains about 20% N_2 by volume. As a result of the reaction, the total volume of gas in the apparatus decreased by about 20%, so almost all the gas remaining in the apparatus was O_2.

Student 2

During heating, the Fe in the steel wool reacted with some of the O_2 in the air to form solid iron oxide (Fe_2O_3), which was deposited on the steel wool. Air contains about 80% O_2 by volume. As a result of the reaction, the total volume of gas in the apparatus decreased by about 20%. Almost all the gas remaining in the apparatus was a mixture of about 75% O_2 and 25% N_2 by volume.

Student 3

Student 2 is correct, except that (1) the Fe in the steel wool reacted with all the O_2 in the air and (2) air contains about 20% O_2 by volume. After the reaction, almost all the gas remaining in the apparatus was N_2.

Student 4

During heating, the Fe in the steel wool reacted with all the CO_2 in the air to form solid iron carbonate ($FeCO_3$), which was deposited on the steel wool. Air contains about 20% CO_2 by volume. As a result of the reaction, the total volume of gas in the apparatus decreased by about 20%, so almost all the gas remaining in the apparatus was O_2.

GO ON TO THE NEXT PAGE.

28. Air contains less than 1% argon by volume. This information *weakens* the explanations given by which of the students, if any?

F. Students 1 and 2 only
G. Students 3 and 4 only
H. All of the students
J. None of the students

29. Silicone hoses were most likely used to connect the quartz tube to the syringes because silicone has which of the properties listed below?

    I. Strong resistance to heat
   II. Low chemical reactivity
  III. High solubility in water

A. I and II only
B. I and III only
C. II and III only
D. I, II, and III

30. Based on Student 4's explanation, during the demonstration, did the percent CO_2 by volume in the apparatus increase or decrease, and did the percent O_2 by volume in the apparatus increase or decrease?

	percent CO_2 by volume	percent O_2 by volume
F.	increase	increase
G.	increase	decrease
H.	decrease	decrease
J.	decrease	increase

31. Which of the students would be likely to agree that, by volume, air contains more O_2 than N_2 ?

A. Students 1 and 2 only
B. Students 1 and 3 only
C. Students 1, 2, and 4 only
D. Students 1, 3, and 4 only

32. Based on Student 3's explanation, the reaction that occurred during the demonstration would be represented by which of the following balanced chemical equations?

F. $2Fe_2O_3 \rightarrow 4Fe + 3O_2$
G. $2FeN \rightarrow 2Fe + N_2$
H. $4Fe + 3O_2 \rightarrow 2Fe_2O_3$
J. $2Fe + N_2 \rightarrow 2FeN$

33. Which of the students, if any, would be likely to agree that at the end of the demonstration, the gas remaining in the apparatus was at least 20% N_2 by volume?

A. Student 2 only
B. Students 2 and 3 only
C. All of the students
D. None of the students

34. In a chemical reaction, the *limiting reactant* is the reactant that is in the shortest supply and thus limits the amount of product that can be produced. Which student would be the most likely to agree that the limiting reactant during the demonstration was the iron in the steel wool?

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

Passage VI

Quarks constitute 1 of the 3 classes of elementary particles that form all matter in the universe. Three quarks bound together form a type of particle called a *baryon*. A quark's *effective mass* (mass when bound to other quarks) is greater than its *single-quark mass* (mass when unbound). In addition, all quarks possess a property called *spin*. A quark's spin can be oriented in 1 of 2 directions, *spin-up* (↑) or *spin-down* (↓).

Table 1 lists the symbol, electric charge, and approximate single-quark mass for each of the 6 quarks.

Table 1			
Quark	Symbol	Electric charge	Single-quark mass (MeV*)
Down	d	$-\frac{1}{3}$	5
Up	u	$+\frac{2}{3}$	3
Strange	s	$-\frac{1}{3}$	104
Charm	c	$+\frac{2}{3}$	1,270
Bottom	b	$-\frac{1}{3}$	4,200
Top	t	$+\frac{2}{3}$	171,200
*million electron volts			

Table 2 gives the symbol, mass, quark content, and quark spins for several baryons.

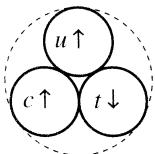| Table 2				
Baryon	Symbol	Mass (MeV)	Quark content	Quark spins
Proton	p	938	*uud*	↑↓↑
Neutron	n	939	*udd*	↑↓↑
Lambda-zero	Λ^0	1,115	*uds*	↑↓↑
Delta-zero	Δ^0	1,233	*udd*	↑↑↑
Delta-minus	Δ^-	1,234	*ddd*	↑↑↑
Omega-minus	Ω^-	1,673	*sss*	↑↑↑

35. For all quarks, the amount of spin is always $\frac{1}{2}\hbar$, where $\hbar$ is a constant. A spin-up quark has spin $+\frac{1}{2}\hbar$, and a spin-down quark has spin $-\frac{1}{2}\hbar$. Given that the spin of a baryon equals the sum of its quark spins, what are the spins of the Λ^0 and Δ^0 baryons listed in Table 2 ?
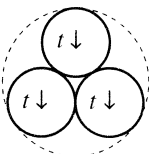
	$\underline{\Lambda^0}$	$\underline{\Delta^0}$
A.	$-\frac{1}{2}\hbar$	$-\frac{3}{2}\hbar$
B.	$-\frac{1}{2}\hbar$	$-\frac{1}{2}\hbar$
C.	$+\frac{1}{2}\hbar$	$+\frac{3}{2}\hbar$
D.	$+\frac{3}{2}\hbar$	$+\frac{3}{2}\hbar$

36. Which of the following diagrams represents the quark content and quark spins for an electrically neutral baryon having only 2 quark spins oriented in the same direction?

F.

H.

G.
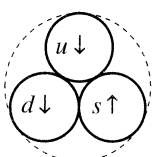
J.
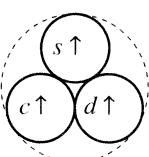
37. Is the information in Tables 1 and 2 consistent with the known electric charge for the proton?

A. No, because Tables 1 and 2 indicate the proton has an electric charge of 0.

B. No, because Tables 1 and 2 indicate the proton has an electric charge of +1.

C. Yes, because Tables 1 and 2 indicate the proton has an electric charge of 0.

D. Yes, because Tables 1 and 2 indicate the proton has an electric charge of +1.

38. Based on Tables 1 and 2, the Ω^- baryon has the same electric charge as a baryon containing which of the following quark combinations?

F. *dsb*

G. *ssc*

H. *sst*

J. *usc*

39. Based on Tables 1 and 2, atomic nuclei are made up of which types of quarks?

A. *u* and *d* only

B. *d* and *s* only

C. *u* and *s* only

D. *u*, *d*, and *s* only

40. The 6 quarks are grouped into 3 generations as shown in the table below.

Generation	Quarks
1	*d, u*
2	*s, c*
3	*b, t*

For which generation, if any, is the statement "Positively charged quarks are more massive than negatively charged quarks" NOT true?

F. Generation 1

G. Generation 2

H. Generation 3

J. None of the generations; the statement is true for all 3 generations.

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

Form 20G
ACT® Writing Test Prompt
(April 2015)

Due to rising obesity rates, some communities have laws that ban building fast-food restaurants. Some lawmakers support such laws because they think that limiting the number of fast-food restaurants in a community will encourage people to choose healthier dining options. Other lawmakers do not support such laws because they think that the opportunity to make profits should be available to all kinds of businesses. In your opinion, should communities have laws that ban building new fast-food restaurants?

In your essay, take a position on this question. You may write about either one of the two points of view given, or you may present a different point of view on this question. Use specific reasons and examples to support your position.

Explanation of Procedures Used to Obtain
Scale Scores from Raw Scores

On each of the four tests on which you marked any responses, the total number of correct responses yields a raw score. Use the table below to convert your raw scores to scale scores. For each test, locate and circle your raw score or the range of raw scores that includes it in the table below. Then, read across to either outside column of the table and circle the scale score that corresponds to that raw score. As you determine your scale scores, enter them in the blanks provided on the right. The highest possible scale score for each test is 36. The lowest possible scale score for any test on which you marked any responses is 1.

Next, compute the Composite score by averaging the four scale scores. To do this, add your four scale scores and divide the sum by 4. If the resulting number ends in a fraction, round it off to the nearest whole number. (Round down any fraction less than one-half; round up any fraction that is one-half or more.) Enter this number in the blank. This is your Composite score. The highest possible Composite score is 36. The lowest possible Composite score is 1.

ACT Test 73G   **Your Scale Score**

English   _____

Mathematics   _____

Reading   _____

Science   _____

Sum of scores   _____

Composite score (sum ÷ 4)   _____

NOTE: If you left a test completely blank and marked no items, do not list a scale score for that test. If any test was completely blank, do not calculate a Composite score.

Scale Score	Raw Scores				Scale Score
	Test 1 English	Test 2 Mathematics	Test 3 Reading	Test 4 Science	
36	74-75	59-60	39-40	39-40	36
35	72-73	58	38	38	35
34	71	56-57	37	37	34
33	69-70	55	36	36	33
32	68	54	34-35	—	32
31	67	53	33	35	31
30	66	52	32	34	30
29	65	50-51	—	33	29
28	63-64	47-49	31	32	28
27	61-62	44-46	30	31	27
26	59-60	42-43	29	29-30	26
25	57-58	39-41	28	27-28	25
24	55-56	36-38	26-27	25-26	24
23	52-54	33-35	25	23-24	23
22	50-51	31-32	23-24	21-22	22
21	47-49	30	22	20	21
20	44-46	28-29	20-21	18-19	20
19	42-43	26-27	19	17	19
18	40-41	24-25	17-18	15-16	18
17	37-39	20-23	16	14	17
16	34-36	16-19	15	12-13	16
15	31-33	13-15	13-14	11	15
14	28-30	10-12	12	10	14
13	26-27	8-9	10-11	9	13
12	24-25	7	8-9	8	12
11	21-23	5-6	7	7	11
10	18-20	4	6	6	10
9	15-17	—	5	5	9
8	13-14	3	4	4	8
7	11-12	—	—	3	7
6	8-10	2	3	—	6
5	7	—	—	2	5
4	5-6	1	2	—	4
3	3-4	—	1	1	3
2	2	—	—	—	2
1	0-1	0	0	0	1

Explanation of Procedures Used to Obtain Scale Subscores from Raw Scores

For each of the seven subscore areas, the total number of correct responses yields a raw score. Use the table below to convert your raw scores to scale subscores. For each of the seven subscore areas, locate and circle either the raw score or the range of raw scores that includes it in the table below. Then, read across to either outside column of the table and circle the scale subscore that corresponds to that raw score. As you determine your scale subscores, enter them in the blanks provided on the right. The highest possible scale subscore is 18. The lowest possible scale subscore is 1.

If you left a test completely blank and marked no items, do not list any scale subscores for that test.

ACT Test 73G   Your Scale Subscore

English

    Usage/Mechanics   _____

    Rhetorical Skills   _____

Mathematics

    Pre-Algebra/Elementary Algebra   _____

    Intermed. Algebra/Coord. Geometry   _____

    Plane Geometry/Trigonometry   _____

Reading

    Social Studies/Sciences   _____

    Arts/Literature   _____

Scale Subscore	Raw Scores							Scale Subscore
	Test 1 English		Test 2 Mathematics			Test 3 Reading		
	Usage/ Mechanics	Rhetorical Skills	Pre-Algebra/ Elem. Algebra	Inter. Algebra/ Coord. Geometry	Plane Geometry/ Trigonometry	Social Studies/ Sciences	Arts/ Literature	
18	39-40	35	24-28	18-20	18	20	19-20	18
17	37-38	33-34	22-23	17	—	18-19	18	17
16	35-36	32	21	16	17	16-17	17	16
15	34	30-31	20	14-15	15-16	15	16	15
14	32-33	28-29	19	13	13-14	14	15	14
13	31	27	17-18	11-12	11-12	13	—	13
12	29-30	24-26	16	9-10	10	11-12	14	12
11	26-28	22-23	14-15	8	9	10	13	11
10	24-25	20-21	13	6-7	7-8	9	11-12	10
9	22-23	17-19	11-12	5	5-6	8	10	9
8	19-21	14-16	10	4	4	6-7	9	8
7	17-18	12-13	7-9	3	3	5	8	7
6	15-16	10-11	5-6	2	—	4	6-7	6
5	12-14	8-9	4	—	2	3	5	5
4	9-11	6-7	3	1	—	2	3-4	4
3	7-8	4-5	2	—	1	—	2	3
2	4-6	2-3	1	—	—	1	1	2
1	0-3	0-1	0	0	0	0	0	1

                                                                                    LIN JOYEE
                                                                                    XXXXX4105
                                                                                    082586

                    ITEM   1 1111111112 2222222223 3333333334 4444444445 5555555556 6666666667 77777
                  NUMBER 1234567890 1234567890 1234567890 1234567890 1234567890 1234567890 1234567890 12345

ENGLISH
CORRECT ANSWER   BFCGDGAFAJ CJDJCHDGAG DGCFDJCHBJ AJBGCHDFBH AJCJAHAHCJ DJAGBHAFAG DGBHDJBGCJ CFCFB
YOUR ANSWER   ++++++++++ ++++++++++ ++++++++++ ++++++++++ ++++++++++ ++++++++++ ++++++++++ +++++
SUBSCORE   URURUURRRU URRRRUUUUR URUUUURRRR UUURUURURU UURRURUUUU RRUURURURR UUURRRRUUR UURRR

MATHEMATICS
CORRECT ANSWER   BGBHAHDJEH EJAHCGDKAJ AJEKCGBHCJ DKEFEJCGDJ AJBJAGEGBG CFCFEHBFAK
YOUR ANSWER   ++++++++++ ++++D+++++ ++++++++++ ++++++++++ ++++++++++ ++++++++++
SUBSCORE   AAAAATAATG GATATTATGA AAAGAGAATG TGTTAGAGAG GGTGAAGTTG TTGATAGTTG

READING
CORRECT ANSWER   AHBFDGCHAH DJBHAJBFCF BFBJCFBJCG DGCGDFDFBG
YOUR ANSWER   +F++++++BJ ++++++++++ ++++++++++ +F+++++++
SUBSCORE   LLLLLLLLLL SSSSSSSSSS LLLLLLLLLL SSSSSSSSSS

SCIENCE
CORRECT ANSWER   BGDHDJAGAH BGDHAFDFCJ BFDHBJCJAJ CHBGCGDFAF
YOUR ANSWER   ++++++++++ ++++++++++ ++++++++++ ++++++++++

1st Row: Correct responses to the items on the ACT tests.   0006096

2nd Row: Your Responses: LIN JOYEE
         A plus (+) indicates your response was correct.   301 RUSSELL AVE
         A letter (A through K) is the response you chose,   MONTEREY PARK, CA 91755-3418
           if your answer was incorrect.
         A dash (-) indicates you omitted the item.
         An asterisk (*) indicates you gridded more than
           one response.

3rd Row: If the test includes subscores, one of the letters below
         indicates the category to which each item belongs:

         English: U = Usage/Mechanics
                  R = Rhetorical Skills
         Math: A = Pre-Algebra/Elementary Algebra
                  G = Intermediate Algebra/Coordinate Geometry
                  T = Plane Geometry/Trigonometry
         Reading: S = Social Studies/Sciences
                  L = Arts/Language

PLUS WRITING TEST FORM: 20G
 1st RATER: 05   2nd RATER: 05