

Form 71G

(April 2013)



2012 | 2013

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.

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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

Rubén Blades's Salsa Conciente

While music and politics are an unusual career combination, salsa singer Rubén Blades has tightly interwoven the two.¹ “Music can do more than offer an escape,” said Blades. “It can help bring people together and change their lives.” Blades’s music, known as “*salsa conciente*” (salsa with a message), deals with the same political issues on which he based his 1994 campaign for the presidency of Panama.²

In Blades’s 1977 hit song “Pablo Pueblo” tells the story of a man returning from work, hungry and tired,³ struggling to survive on inadequate wages. Conversely, the⁴

song’s popularity extended beyond Panama. Its lyrics resonated throughout Latin America, where, according to United Nations standards, more than a third of the people⁵ lived in poverty.

1. A. NO CHANGE
B. combination salsa singer, Rubén Blades,
C. combination, salsa singer, Rubén Blades
D. combination, salsa singer Rubén Blades,

2. F. NO CHANGE
G. were dealing
H. have dealt
J. deal

3. A. NO CHANGE
B. Though
C. While
D. DELETE the underlined portion.

4. F. NO CHANGE
G. On the other hand, the
H. Similarly, the
J. The

5. A. NO CHANGE
B. It’s own
C. Their
D. Its

After a series of military dictatorships seized control of Panama in the early 1980s, Blades wrote songs denouncing the governments' violence and corruption. His 1984 album *Buscando América* is a call for reform, Blades believed this would be possible

6

only if Panama were freed from then dictator Manuel Noriega's oppressive regime. Blades believed this change should come from within Panama. Thus, when the United States ousted the dictator in 1989, Blades opposed the outside interference, though he was living in the U.S. at the time.

8

[1] To inspire his fellow Panamanians, Blades wrote songs that celebrated the beauty of his homeland.

9

[2] Many now considering his song

10

"Patria," a second national, anthem.

11

[3] Expressing deep national pride, the song compares the country to "the sun in endless springtime" and "the laughter of a newborn sister."

6. F. NO CHANGE
G. reform, however Blades believed this
H. reform, which Blades believed
J. reform which Blades believing
7. A. NO CHANGE
B. along than
C. along then
D. from than
8. Given that all the choices are true, which one best concludes the paragraph and reaffirms Blades's belief in *salsa conciente*?
F. NO CHANGE
G. a position that was expressed around the world.
H. objecting to U.S. involvement in Panama.
J. a position he expressed in his music.
9. A. NO CHANGE
B. he created to inspire people to appreciate the beauty of their native country.
C. sung the notes praising the beautiful country of Panama.
D. stirred the beauty of his native country.
10. F. NO CHANGE
G. who are now considering
H. now consider
J. who consider
11. A. NO CHANGE
B. "Patria," a second, national,
C. "Patria" a second, national,
D. "Patria" a second national

[4] This sense of pride in our country and in its
 12

people were a driving force behind Blades's
 13 presidential campaign. [5] Blades's music,
 however, wasn't always critical. 14

Although he didn't win the 1994 election, Blades's political career wasn't over. In 2004, he was appointed Panama's Minister of Tourism. His dual background in music and politics uniquely positioned Blades to promote Panama's culture and develop economic opportunities for its citizens.

12. F. NO CHANGE
 G. his country and in their
 H. his country and in its
 J. its country and in its

13. A. NO CHANGE
 B. being a driving force
 C. were driving forces
 D. was a driving force

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

Question 15 asks about the preceding passage as a whole.

15. Suppose the writer's goal had been to describe an election campaign in detail. Would this essay accomplish that goal?
 A. Yes, because the essay describes how Blades used his music to influence voters during his presidential campaign.
 B. Yes, because the essay offers a detailed description of Blades's *salsa conciente*.
 C. No, because the essay primarily focuses on how Blades expressed his political convictions through music, not on his presidential campaign.
 D. No, because the essay clearly states that Blades withdrew from Panama's 1994 presidential race.

PASSAGE II

Listening for Whales

[1]

Each spring, North Atlantic right whales migrate from their winter habitat 16 to their summer feeding grounds around Nova Scotia, Canada. Their route includes the highly industrialized coastline of New England.

16. At this point, the writer is considering adding the following accurate information:
 in the waters off Georgia and Florida
 Should the writer make this addition here?
 F. Yes, because it provides a detail that connects the right whales' near-extinction to a specific region of the United States.
 G. Yes, because it creates a sentence that states the location of the right whales' winter habitat and summer habitat.
 H. No, because it creates confusion regarding whether the right whales' winter habitat is in Massachusetts Bay or in Georgia and Florida.
 J. No, because it provides information that blurs the essay's focus on describing a means of detecting right whales.

Because right whales tend to stay closely to the shore
¹⁷ and feed on zooplankton near the water's surface,

the risk for them of colliding with ships moving along
¹⁸ the busy shipping lanes in Massachusetts Bay.

[2]

[1] In the mid-1700s, right whales were hunted to near extinction, and they have yet to relapse.
¹⁹

[2] Marine biologists estimate that fewer than 400 North Atlantic right whales exist today. [3] The researchers' aim is to detect the presence of whales in shipping areas where the endangered whales may be
²⁰

and then quickly alerting nearby ships to slow down.
²¹

[4] Recently, an international energy company

and federal regulators has funded a group of
²²

scientists, from the Woods Hole Oceanographic
²³
Institution (WHOI), and Cornell University to
²³
design an underwater system to listen for these

endangered right whales. [24]

17. A. NO CHANGE
B. more closely
C. closer
D. close

18. F. NO CHANGE
G. they are at risk of
H. while risking
J. their risk of

19. A. NO CHANGE
B. recover.
C. rebuild.
D. remain.

20. F. NO CHANGE
G. that they would like to be able to locate in areas where ships travel
H. in shipping areas where cargo is transported by ship
J. in shipping areas

21. A. NO CHANGE
B. they would alert
C. having alerted
D. alert

22. F. NO CHANGE
G. been funding
H. have funded
J. is funding

23. A. NO CHANGE
B. scientists from the Woods Hole Oceanographic Institution (WHOI)
C. scientists, from the Woods Hole Oceanographic Institution (WHOI)
D. scientists from the Woods Hole Oceanographic Institution (WHOI),

24. For the sake of the logic and coherence of this paragraph, Sentence 3 should be placed:
F. where it is now.
G. before Sentence 1.
H. after Sentence 1.
J. after Sentence 4.

[3]

This whale-detection system consists of thirteen “auto-detection buoys,” ten of which are installed along a sixty-mile belt of commercial shipping lanes in and out of Boston Harbor. [A] Each buoy is equipped with a hydrophone (an underwater microphone) that carries sound to the surface by means of a hoselike cable. [B]

Data from the hydrophones are transmitted via the cables ²⁵ to computers that can recognize whale calls. During the months when right whales are likely to migrate through Massachusetts Bay analysts at a Cornell lab monitor the computer transmissions twenty-four hours a day. [C]

[4]

When whale calls have been detected, the analysts notify captains of ships in the area. [D] By federal law, these ships must then slow to less than ten knots (about twelve miles per hour) and post a lookout for twenty-four hours. Typically, right whales easily move around slow-moving ships. Biologists at WHOI and Cornell are optimistic that having ships reduce speed for the whales will alleviate this condition.

28

25. A. NO CHANGE
B. traveling
C. with
D. as

26. F. NO CHANGE
G. Bay, analysts at a Cornell lab,
H. Bay, analysts at a Cornell lab
J. Bay analysts at a Cornell lab,

27. A. NO CHANGE
B. fewer than
C. less than
D. few as

28. F. NO CHANGE
G. prevent these regrettable occurrences.
H. avert tragic collisions.
J. stop it.

Questions 29 and 30 ask about the preceding passage as a whole.

29. The writer is considering adding the following sentence to the essay:

The cable is designed to stretch to twice its normal length, a feature that allows it to adapt to harsh sea conditions and also keeps the buoy above water at all times.

If the writer were to add this sentence, it would most logically be placed at Point:

- A. A in Paragraph 3.
B. B in Paragraph 3.
C. C in Paragraph 3.
D. D in Paragraph 4.

30. Suppose the writer’s primary goal had been to explain the rate of success of a recent project to protect the North Atlantic right whale population. Would this essay accomplish that goal?

- F. Yes, because it provides information about the number of North Atlantic right whales alive today.
G. Yes, because it suggests that the project described in the essay has been successful.
H. No, because it instead focuses on providing an overview of a project and does not report results.
J. No, because it instead focuses on describing what an “auto-detection buoy” is and how it works.

PASSAGE III

Rachael Scdoris on the Iditarod Trail

Trademarked as “The Last Great Race on Earth,” the Iditarod is a grueling competition that crosses 1,150 miles of rugged frontier between Anchorage on Alaska’s southern coast and Nome on its northwestern one. A single musher, from the back of a dogsled, directs a team of twelve to sixteen dogs, often through fierce snowstorms and subzero temperatures.

Rachael Scdoris, who works hard to train for races, was born and raised in Bend, Oregon. By age fifteen, she had become the youngest musher to finish a 500-mile

race. Despite her achievements though she felt the Iditarod

might be too dangerous for her. Scdoris had been born

with achromatopsia, a medical condition that limits her

vision. 35

31. Given that all the choices are true, which one serves as the best transition between the preceding paragraph and this paragraph?
- A. NO CHANGE
 - B. a participant in dogsled races, also ran competitive long-distance track and cross-country.
 - C. a musher since the age of eleven, had always dreamed of competing in the Iditarod.
 - D. featured on a number of TV shows, has various magazine articles written about her.
32. F. NO CHANGE
G. achievements, though, she
H. achievements, though she
J. achievements though she,
33. A. NO CHANGE
B. might be to
C. maybe too
D. may be to
34. F. NO CHANGE
G. achromatopsia. A
H. achromatopsia; a
J. achromatopsia a
35. Given that all the following statements are true, which one, if added here, would most specifically elaborate on the effects of achromatopsia on Scdoris’s eyesight?
- A. She is one of 33,000 people in the United States affected by achromatopsia, a condition that affects more men than women.
 - B. She can’t discern colors, shapes, or depth and has a difficult time seeing more than a few feet in front of her.
 - C. Because she has achromatopsia, she can’t see as clearly as others, and she can’t see as much.
 - D. Because of this condition, she might not be able to race as fast as the other mushers.

In 2003, the Iditarod committee approved Scdoris's request to race with a visual interpreter. Driving a separate team alongside her, and using a two-way radio, this guide would warn her of upcoming hazards, such as fallen trees and sharp turns. The rest (including hauling three tons of supplies and caring for her dogs) Scdoris would have to do just like the other competitors: being alone by herself.

Beginning the 2005 Iditarod in Anchorage, the race lasted twelve to sixteen hours a day across frozen rivers, barren tundra, and precipitous mountain passes.

After reaching Eagle Island, 732 miles into the race;

Scdoris's team concluded with surprising rapidity.

Even though Scdoris had taken expert care of her

dogs, they had fallen ill with a virus. She decided

her dogs' health was more important than completing the course.

As she withdrew from the 2005 race, however, Scdoris immediately made plans to enter again. In 2006, she crossed the finish line in Nome, completing her first Iditarod. In 2009, along with her fellow mushers who also made it to Nome,

36. The best placement for the underlined portion is:

- F. where it is now.
- G. after the word *guide*.
- H. after the words *warn her*.
- J. after the word *hazards* (and after the comma).

37. A. NO CHANGE
B. singly and single-handedly.
C. solo on her own.
D. solo.

38. F. NO CHANGE
G. running the race took
H. Scdoris raced
J. it was taking

39. A. NO CHANGE
B. Island, 732 miles into the race,
C. Island 732 miles into the race;
D. Island 732 miles into the race

40. F. NO CHANGE
G. abruptly bottomed out of the race.
H. closed the book on this race.
J. came to a sudden halt.

41. Given that all the choices are true, which one provides the most relevant and specific transition into the last sentence of this paragraph?

- A. NO CHANGE
- B. she was pondering a hard decision at the Eagle Island checkpoint.
- C. she spoke with Mark Nordman, the race marshal, on the telephone.
- D. they rested on beds of straw while Scdoris also slept.

42. F. NO CHANGE
G. her dog's
H. her dogs
J. they're

43. Given that all the choices are true, which one most clearly suggests that it was a particularly noteworthy accomplishment to complete the race in 2009?

- A. NO CHANGE
- B. through some of the most severe conditions in Iditarod history,
- C. averaging a speed of 3.05 miles per hour,
- D. at one point taking a full twenty-four hours to rest,

she completed the race again, securing her status at the age
 of twenty-four as an experienced Iditarod racer.
 44

44

44. Given that all the choices are true, which one most effectively concludes the essay?

- F. NO CHANGE
- G. a goal she wants to continue to reach over and over throughout the years of her future.
- H. which was actually the southern Iditarod course for 2009.
- J. having been guided by veteran musher Tim Osmar.

Question 45 asks about the preceding passage as a whole.

45. Suppose the writer's primary goal had been to present a musher's reflections on the difficulty of racing the Iditarod. Would this essay accomplish that goal?

- A. Yes, because it emphasizes the length of the race throughout the essay.
- B. Yes, because it discusses Scdoris's challenges during the race.
- C. No, because it describes Scdoris's participation in the race more than her personal reflections.
- D. No, because it doesn't mention difficult aspects of the race.

PASSAGE IV

Dog Days

"Come Bye!" the shepherd shouts to a black-and-white border collie. Excitedly, the dog races to gather a group of sheep. Several sheep have broke away. "Look Back!" the shepherd calls.
 46

The dog whirls back to round up the errant sheep. 47

46. F. NO CHANGE
 G. has broken
 H. breaked
 J. break

47. The writer is considering deleting the preceding sentence. Should the sentence be kept or deleted?

- A. Kept, because the sentence indicates that the shepherd is frustrated by the dog's inability to follow multiple commands.
- B. Kept, because the sentence describes the dog's response to the shepherd's command.
- C. Deleted, because the sentence identifies the reason why the dog sometimes misunderstands the shepherd's commands.
- D. Deleted, because the sentence interrupts the paragraph's focus on the interaction between the dog and the shepherd.



Then, the shepherd shouts more commands, the dog
48

moves all around the flock. Keeping the sheep in a
49

controlled group, they are driven across a pasture.
50

The border collie, whose popularity in the United
51
States dramatically increased in the 1990s, emerged along
52

the borders of England, Scotland, and Wales; similarly,
53
the Industrial Revolution increased demand for wool and
large-scale farming. This breed was quick and agile,
woven by the rough terrain typical of sheep farms in
54
the area. Most importantly, this medium-sized dog
socialized well with other breeds of dog. Rather than
barking, nipping, or biting, these dogs often used
“the eye”—a commanding stare inherited from the
dogs’ wolf ancestors—to quietly intimidate stubborn
sheep into rejoining the flock.

Today, border collies herd sheep in much the
same way as your ancestors did centuries ago. To gather
55
a flock of sheep, for example, a shepherd uses a series
of whistles or shouted commands to direct the dog to
run in a wide arc around the sheep. Once the flock
is gathered, the border collie eyes the sheep with
an intense gaze to prevent them from scattering.

48. F. NO CHANGE
G. the shepherd who shouts
H. as the shepherd shouts
J. the shepherd shouted

49. Which choice most vividly captures the energy of the dog’s movements?
A. NO CHANGE
B. keeps the flock together through a series of movements.
C. stalks, darts, and circles around the flock.
D. continues to herd the flock together.

50. F. NO CHANGE
G. the dog was driving them
H. they are driven by him
J. the dog drives them

51. Given that all the choices are true, which one provides material most relevant to the paragraph’s focus?
A. NO CHANGE
B. whose coat ranges in color from black and white to red or blue merle,
C. the quintessential sheep-herding dog,
D. often considered a demanding pet,

52. F. NO CHANGE
G. Wales, being it was that
H. Wales, whereas
J. Wales when

53. A. NO CHANGE
B. made to order by
C. well suited to
D. just like

54. Which choice would best serve as a transition to the next sentence?
F. NO CHANGE
G. performed in bleak weather conditions common to the region.
H. developed affection for the shepherd who worked with it.
J. worked without agitating a flock of sheep.

55. A. NO CHANGE
B. their
C. it’s
D. its



Next, the dog drives the gathered flock toward a specific location, such as a holding pen. The border collie then isolates a small number of sheep by moving within the flock and flanking (running alongside) particular animals. Finally, guiding the smaller group of

57

sheep through a gate and into a pen.

58

Many people are familiar with the loving companionship border collies offer as pets. These dogs, however, are also tireless workers that can perform farming and ranching tasks that normally require the work of three people. Highly intelligent and energetic, border collies are being considered by many farmers and ranchers to be essential to raising sheep.

60

PASSAGE V

With the Sun Behind Me

When my parents were both professional photographers, gave me a camera for my tenth birthday, I immediately expected to shoot the same kinds of stunning photos that decorated the walls of our home. My father was known for his spectacular sunrises over the harbor, my mother for her glittering nighttime cityscapes. My first photos, however, looked nothing like theirs. “Person without a Head,” “Blurry Dog in Motion,” “Blob on the Beach”—these were some examples of photos I took.

62

56. F. NO CHANGE
 G. flock, in one group, toward the direction of
 H. flock of animals in the direction of
 J. flock, consisting of sheep, toward

57. A. NO CHANGE
 B. the dog guiding
 C. the dog guides
 D. having guided

58. F. NO CHANGE
 G. sheep, through a gate, and
 H. sheep through a gate, and
 J. sheep, through a gate

59. A. NO CHANGE
 B. generally demanding, approximately, the work
 C. that, on average, generally require the efforts
 D. that, in general, typically demand the work

60. F. NO CHANGE
 G. border collies are considered by many farmers and ranchers
 H. many farmers and ranchers are considering as border collies
 J. many farmers and ranchers considering border collies

61. A. NO CHANGE
 B. parents who were
 C. parents, were
 D. parents,

62. Which choice most effectively completes the sentence and uses sarcasm to emphasize that the photos named in the sentence were, artistically speaking, unsuccessful?
 F. NO CHANGE
 G. some of the titles I gave my photos.
 H. just a few of my masterpieces.
 J. not very good photos.

Determined to improve, I diligently adhered to every photography rule my parents taught me, such as: use diagonal lines to draw the viewer's gaze to the photo's main subject. Carefully "frame" your shot by paying attention to the details that make up the borders of the picture. [A] Remember to position your main subject by using "the rule of thirds."
And, finally, when taking a photo outdoors, always make sure the sun is behind you. [B] It was this last rule that I expressed loudly to my mother one afternoon when, fumbling with her camera bag, she told me to sit down

on a park bench. [C] "Just trust me," she said. Skeptical, I waited while she pulled out her camera and attached an electronic flash to the top. [D] Now I was baffled. Not only was she going to take my picture with the sun *behind* me but she was going to use a flash? In daylight? Instead of answering my questions, she simply smiled and goes something about rules not always being as clear-cut

as I thought. 68

63. A. NO CHANGE
B. me, for example, use
C. me; to use
D. me: Use
64. F. NO CHANGE
G. you're main subject by using,
H. you're main subject by using
J. your main subject by using,
65. The writer wants to emphasize that the narrator is repeating information she had learned from her mother. Which choice most effectively accomplishes this goal?
A. NO CHANGE
B. stated confidently
C. parroted back
D. announced
66. F. NO CHANGE
G. said, skeptically,
H. said skeptically,
J. said, skeptical,
67. A. NO CHANGE
B. murmured
C. was like
D. says
68. The writer wants to divide this paragraph into two in order to separate the list of photography rules from the anecdote that follows. The most logical place to begin the new paragraph would be at Point:
F. A.
G. B.
H. C.
J. D.

When I saw the prints a few days later, they were far from the blurry, shadowy mess I had expected. Next, the setting sun behind me had created a soft halo along the

edges of my hair. This effect, my mother explained, was

the result of two techniques. Called “backlighting” and “flash fill.” Usually backlighting results in a silhouette,

but she'd had prevented that by using the electronic flash

to radiate my face. The combination of light behind and

in front of me yielded a portrait that, perfectly captured the golden glow of that late afternoon.

69. A. NO CHANGE
B. Meanwhile,
C. As a result,
D. Instead,

70. F. NO CHANGE
G. affect,
H. affect
J. effect

71. A. NO CHANGE
B. techniques, they were called
C. techniques;
D. techniques,

72. F. NO CHANGE
G. she'd prevented
H. she had prevent
J. she prevent

73. A. NO CHANGE
B. illuminate
C. dazzle
D. gleam

74. F. NO CHANGE
G. portrait, that,
H. portrait, that
J. portrait that

Question 75 asks about the preceding passage as a whole.

75. Suppose the writer's goal had been to illustrate that producing professional-quality photographs is as easy as following a few simple rules. Does this essay accomplish that goal?
- A. Yes, because it shows how the narrator's mother created an excellent photograph by breaking what the narrator believed to be an important rule.
B. Yes, because it lists several rules of photography the narrator learned and then used to take successful photographs.
C. No, because it instead describes an experience that reveals that producing a good photograph can be more complicated than following a few simple rules.
D. No, because it instead lists some of the narrator's favorite kinds of photographs and explains how they influenced the narrator's own work.

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. Harry is paid a regular hourly wage of \$12.50 per hour for working up to and including 40 hours in 1 week. For each additional hour he works in a week, Harry is paid twice his regular hourly wage. Harry worked 46 hours this week. What is his pay for this week?

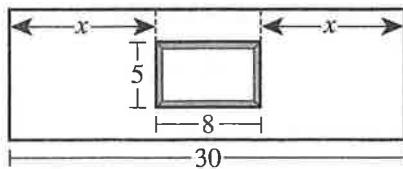
(Note: Amounts are before taxes and benefits are deducted.)

- A. \$ 537.50
- B. \$ 575.00
- C. \$ 650.00
- D. \$ 787.50
- E. \$1,150.00

2. What value of x makes the equation $\frac{4(x - 6)}{3} = 16$ true?

- F. 4.5
- G. 6
- H. 10
- J. 14.5
- K. 18

3. Ayita is helping her uncle center a large framed picture on his living room wall. As shown in the figure below, the rectangular wall is 30 feet long, and the rectangular framed picture is 5 feet high and 8 feet long. The left edge of the frame will be x feet from the left edge of the wall, and the right edge of the frame will be x feet from the right edge of the wall. What is the value of x ?



- A. 11
- B. 12.5
- C. 15
- D. 22
- E. 25

DO YOUR FIGURING HERE.



4. What is the solution to the equation $3(2x - 1) = 3x + 1$?

DO YOUR FIGURING HERE.

F. -2

G. 0

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

J. $\frac{4}{3}$

K. 3

5. For nonzero values of x and y , which of the following expressions is equivalent to $-\frac{24x^4y^3}{4xy}$?

A. $-6x^3y^2$

B. $-6x^4y^3$

C. $-6x^5y^4$

D. $-20x^3y^2$

E. $-28x^3y^2$

6. Tristan has 5 pairs of shoes, 6 pairs of pants, and 5 shirts, which can be worn in any combination. He needs to choose a clothes combination to wear to the school dance. How many different combinations consisting of 1 of his 5 pairs of shoes, 1 of his 6 pairs of pants, and 1 of his 5 shirts are possible for Tristan to wear to the dance?

F. 11

G. 16

H. 30

J. 60

K. 150

7. In Arkansas in the twentieth century, the highest recorded temperature was 120°F and the lowest recorded temperature was -29°F . This highest recorded temperature was how many degrees Fahrenheit greater than this lowest recorded temperature?

A. 75°F

B. 91°F

C. 101°F

D. 109°F

E. 149°F

2



2

DO YOUR FIGURING HERE.

8. A new operation, \diamond , is defined on pairs of ordered pairs of integers as follows: $(a,b) \diamond (c,d) = \frac{ac+bd}{ab-cd}$. What is the value of $(3,1) \diamond (4,5)$?

F. $-\frac{17}{11}$

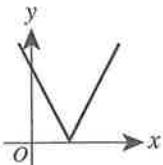
G. -1

H. $\frac{17}{11}$

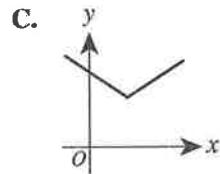
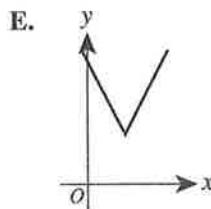
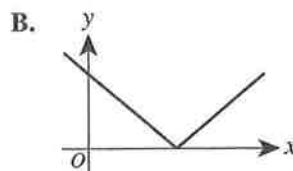
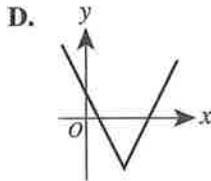
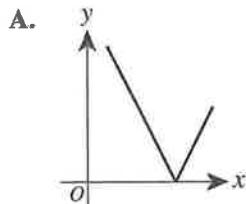
J. $\frac{17}{7}$

K. 17

9. The function $y = 2|x - 3|$ is graphed in the standard (x,y) coordinate plane below.



One of the following graphs in the standard (x,y) coordinate plane shows the result of shifting the function up 4 coordinate units. Which graph?



10. What is the least common denominator of the fractions

$\frac{4}{21}$, $\frac{1}{6}$, and $\frac{3}{4}$?

F. 28

G. 84

H. 126

J. 168

K. 504



DO YOUR FIGURING HERE.

11. The average of 5 numbers is 89. What is the 5th number if the first 4 of the numbers are 78, 92, 96, and 94?

- A. 85
- B. 86
- C. 87
- D. 90
- E. 94

12. A swimming pool in the shape of a right rectangular prism has length 12 feet and width 14 feet. The volume of water in the pool is 2,520 cubic feet. To the nearest foot, what is the depth of the water in the pool?

- F. 7
- G. 10
- H. 15
- J. 24
- K. 90

13. At Hamburger Heaven, Corissa paid less than \$15 for her order of x hamburgers and x bags of french fries. Each hamburger cost h dollars, and each bag of french fries cost f dollars. Which of the following expressions represents the amount of money, in dollars, that Corissa should have received back after she paid for her order with \$15?

(Note: There is no tax on food at Hamburger Heaven.)

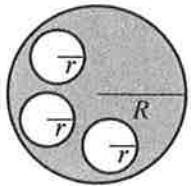
- A. xfh
- B. $x(f + h)$
- C. $15 - xfh$
- D. $15 - x(f + h)$
- E. $15 - x(f - h)$

14. $|8(-6) + 3(2)| = ?$

- F. -48
- G. -42
- H. 42
- J. 48
- K. 54

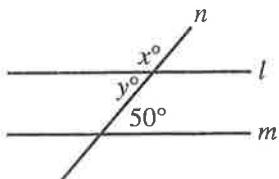
15. A large circle with radius R inches is shown in the figure below; 3 small nonoverlapping circles, each with radius r inches, are removed from the large circle. The shaded region is the area of the large circle remaining after the 3 circles were removed. What is the area, in square inches, of the shaded region?

- A. πr^2
- B. πR^2
- C. $\pi R^2 - \pi r^2$
- D. $\pi R^2 - 2\pi r^2$
- E. $\pi R^2 - 3\pi r^2$





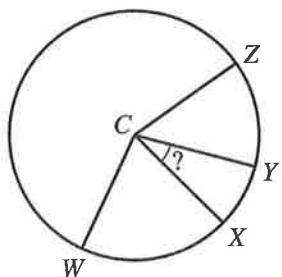
16. In the figure below, lines l and m are parallel, line n is a transversal, and 3 angle measures are given in degrees. What is the value of $x - y$?



- F. -80
G. 50
H. 80
J. 130
K. 180
17. Which of the following graphs shows the solution set for the inequality $3x - 5 \geq 7$?

- A.
- B.
- C.
- D.
- E.

18. Given the function $s(t) = 3t^2 - 5$, what is $s(-3)$?
- F. -42
G. -32
H. -23
J. 12
K. 22
19. A circle with center C is shown below. Points W , X , Y , and Z lie on the circle. The measure of $\angle WCY$ is 100° , the measure of $\angle XCZ$ is 80° , and the measure of $\angle WCZ$ is 150° . What is the measure of $\angle XCY$?



- A. 20°
B. 25°
C. 30°
D. 40°
E. 50°

DO YOUR FIGURING HERE.



DO YOUR FIGURING HERE.

Use the following information to answer questions 20–22.

The table below shows the number of pounds of sugar, flour, and butter required to make 500 of each of 3 types of cookies sold at Van Mert's Bakery. Let s represent the price of 1 pound of sugar, f the price of 1 pound of flour, and b the price of 1 pound of butter. All prices are in dollars.

Type of cookie	Pounds of sugar	Pounds of flour	Pounds of butter
Snickerdoodle	7	8	5.5
Chocolate chip	6	6.5	5
Oatmeal	5	6	4

20. How many pounds of sugar are required to make 200 chocolate chip cookies?

F. 2
G. 2.4
H. 2.5
J. 2.8
K. 3

21. The bakery has 27 pounds of sugar, 24 pounds of flour, and 20 pounds of butter in stock. What is the maximum number of oatmeal cookies the bakery can make from the ingredients in stock?

A. 2,000
B. 2,400
C. 2,500
D. 2,700
E. 3,000

22. Which of the following expressions gives the price of the sugar, flour, and butter required to make 500 snickerdoodle cookies and 500 chocolate chip cookies?

F. $\frac{13}{s} + \frac{14.5}{f} + \frac{10.5}{b}$
G. $\frac{42}{s} + \frac{52}{f} + \frac{27.5}{b}$
H. $13s + 14.5f + 10.5b$
J. $42s + 52f + 27.5b$
K. $42s^2 + 52f^2 + 27.5b^2$



23. In the (a,b) solution to the system of equations below,
 $b = ?$

$$\begin{aligned} 5a &= 3 \\ 2a + 3b &= 5 \end{aligned}$$

- A. $\frac{3}{5}$
 B. $\frac{19}{15}$
 C. $\frac{25}{21}$
 D. $\frac{25}{18}$
 E. 3
24. Send It Out mails advertisements for businesses. Two types of machines—stuffing machines and postage machines—are used to process envelopes. Each stuffing machine processes envelopes at the rate of 150 envelopes per minute, and each postage machine processes envelopes at the rate of 4 envelopes per second. Send It Out is currently using 24 stuffing machines. How many postage machines should be used so that the stuffing machines and the postage machines process the same number of envelopes in 1 minute?

- F. 6
 G. 9
 H. 15
 J. 25
 K. 60

25. What is the result of the subtraction problem below?

$$\begin{array}{r} (7x^2 + 5) \\ - (-4x^2 + 6x + 3) \\ \hline ? \end{array}$$

- A. $3x^2 + 6x + 2$
 B. $3x^2 - 6x + 2$
 C. $11x^2 + 2$
 D. $11x^2 + 6x + 8$
 E. $11x^2 - 6x + 2$

26. For what real number value of a is the equation $(x^2)^3(x^4)^5 = x^a$ true?

- F. 14
 G. 15
 H. 25
 J. 26
 K. 45

27. The number 0.003 is 100 times what number?

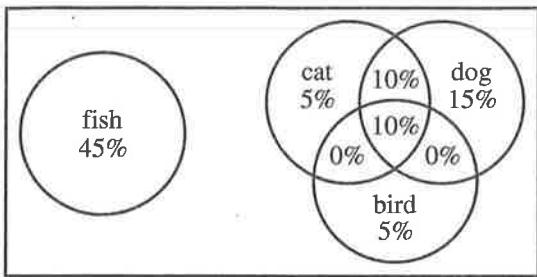
- A. 0.3
 B. 0.03
 C. 0.000 3
 D. 0.000 03
 E. 0.000 003

DO YOUR FIGURING HERE.



Use the following information to answer questions 28–30.

Each of the 200 people in a random sample of the 2,500 people at the mall today was asked which, if any, of the following types of pets he or she owns: bird, cat, dog, or fish. All 200 people answered the question. The answers were tallied, and the exact percents of people who own the pets are shown in the diagram below.

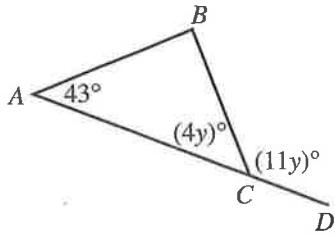


28. Because this was a random sample, the percents in the sample are the most likely estimates for the corresponding percents among all the people at the mall today. What estimate does this give for the number of people at the mall today who own dogs but none of the other 3 types of pets?
- F. 125
 G. 250
 H. 375
 J. 500
 K. 875
29. What percent of the people in the random sample own exactly 1 type of the 4 types of pets?
- A. 10%
 B. 25%
 C. 45%
 D. 70%
 E. 90%
30. Suppose 25 additional people at random were asked the question, with the following answers: 15 own fish only, 5 own a cat and a dog only, and 5 own a cat, a dog, and a bird only. Among all 225 people asked, what fraction own fish but none of the other 3 types of pets?
- F. $\frac{105}{225}$
 G. $\frac{105}{215}$
 H. $\frac{105}{200}$
 J. $\frac{115}{225}$
 K. $\frac{115}{200}$



31. Triangle $\triangle ABC$ and collinear points A , C , and D are shown in the figure below. The measure of $\angle A$ is 43° , the measure of $\angle BCA$ is $(4y)^\circ$, and the measure of $\angle BCD$ is $(11y)^\circ$. What is the measure of $\angle B$?

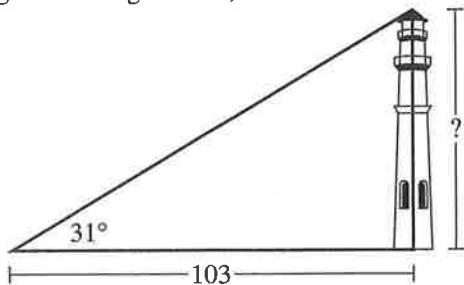
- A. 12°
 B. 48°
 C. 89°
 D. 91°
 E. 132°



32. In the standard (x,y) coordinate plane, what are the coordinates of the center of the circle with equation $(x - \sqrt{5})^2 + (y - 1)^2 = 1$?

- F. $(\sqrt{5}, 1)$
 G. $(-\sqrt{5}, -1)$
 H. $(-\sqrt{5}, 1)$
 J. $(1, \sqrt{5})$
 K. $(-1, -\sqrt{5})$

33. Anoki wants to determine the height of a vertical lighthouse, shown below. He measures the angle of elevation to the top of the lighthouse at a point 103 feet along level ground from the center of the base of the lighthouse. The angle of elevation is 31° . Which of the following expressions gives the best approximation of the height of the lighthouse, in feet?



- A. $\frac{\cos 31^\circ}{103}$
 B. $\frac{\tan 31^\circ}{103}$
 C. $103 \sin 31^\circ$
 D. $103 \cos 31^\circ$
 E. $103 \tan 31^\circ$

34. When graphed in the standard (x,y) coordinate plane, the graph of one of the following linear equations is a line parallel to the x -axis. Which one?

- F. $x = 4$
 G. $x = 4y$
 H. $x = y$
 J. $y = 4$
 K. $y = 4x$

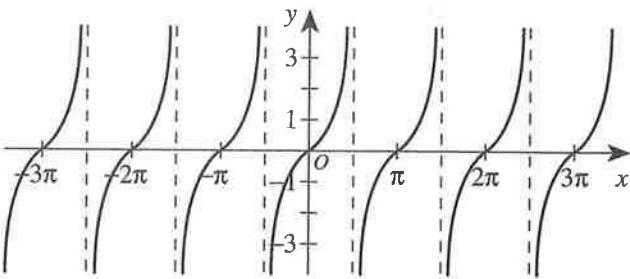
DO YOUR FIGURING HERE.



35. Let $2x + 3y = 12$ be an equation of line l in the standard (x,y) coordinate plane. Line p has a slope that is 2 times the slope of l and has a y -intercept that is 3 less than the y -intercept of l . Line p has which of the following equations?

- A. $y = -\frac{1}{3}x + 7$
- B. $y = -\frac{4}{3}x + 1$
- C. $y = -\frac{4}{3}x + 3$
- D. $y = -\frac{2}{3}x + \frac{3}{2}$
- E. $y = -\frac{3}{2}x + \frac{10}{9}$

36. The graph of $y = \tan x$ is shown in the standard (x,y) coordinate plane below. What is the period of $\tan x$?



- F. $\frac{\pi}{4}$
 - G. $\frac{\pi}{2}$
 - H. π
 - J. $\frac{3\pi}{2}$
 - K. 2π
37. In a certain rectangle, the ratio of the lengths of 2 adjacent sides is 5 to 2. If the area of the rectangle is 90 square inches, what is the length, in inches, of the longer side?

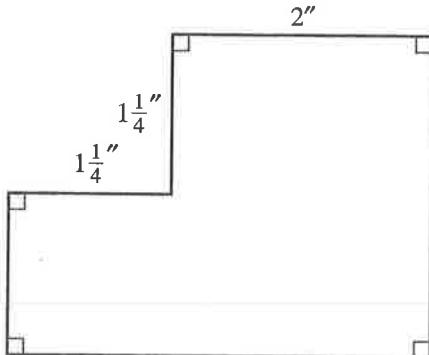
- A. 6
 - B. 9
 - C. 15
 - D. 18
 - E. 45
38. Josey rode her bicycle 4 km at a constant speed, beginning and ending at her home. A graph, with distance traveled plotted along the y -axis and elapsed time during the ride plotted along the x -axis, was constructed for the values of y from 0 km through 4 km. The shape of the graph can best be described as a:
- F. circle.
 - G. line segment with a positive slope.
 - H. line segment with a negative slope.
 - J. horizontal line segment.
 - K. vertical line segment.

DO YOUR FIGURING HERE.

2

39. What is the area, in square inches, of the figure below?

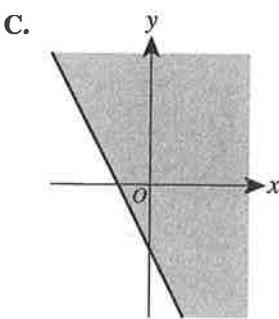
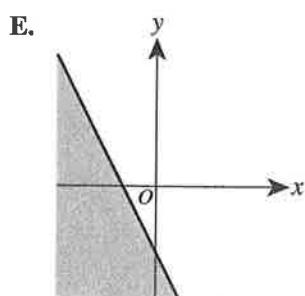
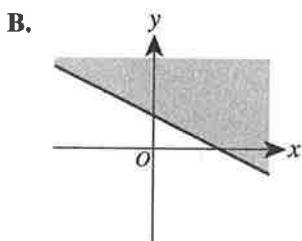
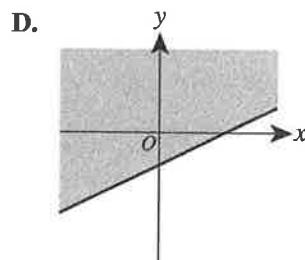
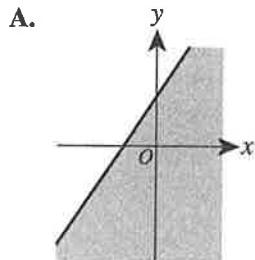
- A. $4\frac{1}{16}$
 B. $6\frac{9}{16}$
 C. $8\frac{1}{8}$
 D. $9\frac{1}{16}$
 E. $11\frac{1}{2}$



40. In the standard (x,y) coordinate plane, $P(-3,-1)$ will be reflected over the y -axis. What will be the coordinates of the image of P ?

- F. $(-3, 1)$
 G. $(-1, 3)$
 H. $(1, -3)$
 J. $(1, 3)$
 K. $(3, -1)$

41. One of the following graphs in the standard (x,y) coordinate plane is the graph of $y \geq ax + b$ for some positive a and negative b . Which graph?



DO YOUR FIGURING HERE.

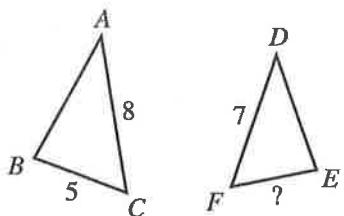


42. If $\frac{2x-y}{x+y} = \frac{3}{4}$, then $\frac{x}{y} = ?$

- F. $\frac{2}{5}$
 G. $\frac{3}{4}$
 H. $\frac{7}{2}$
 J. $\frac{7}{3}$
 K. $\frac{7}{5}$

DO YOUR FIGURING HERE.

43. Shown below are similar triangles $\triangle ABC$ and $\triangle DEF$ with $\angle A \cong \angle D$ and $\angle B \cong \angle E$. The given lengths are in inches. What is the length, in inches, of \overline{EF} ?



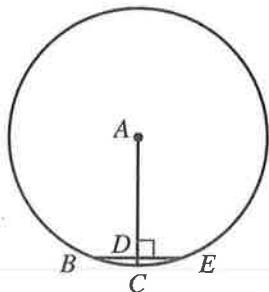
- A. 3
 B. 4
 C. $4\frac{3}{8}$
 D. $5\frac{5}{7}$
 E. $6\frac{1}{2}$

44. A person's *body mass index*, BMI, varies directly as the person's weight in kilograms and inversely as the square of the person's height in meters. If k represents the constant of variation, which of the following expressions represents the BMI of a person who weighs w kilograms and is h meters tall?

- F. $\frac{k}{wh^2}$
 G. $\frac{kw}{h^2}$
 H. $\frac{kh^2}{w}$
 J. $\frac{wh^2}{k}$
 K. kwh^2

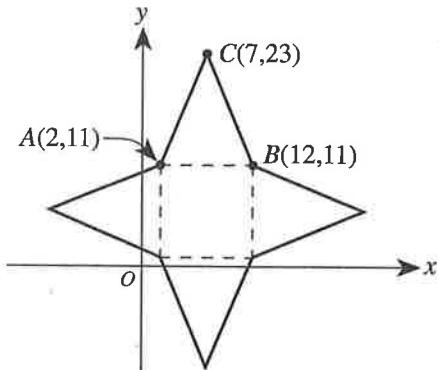


45. In the circle shown below, radius \overline{AC} is 15 inches long, chord \overline{BE} is 10 inches long, and \overline{AC} is perpendicular to \overline{BE} at D . How many inches long is \overline{AD} ?



- A. 10
- B. 15
- C. $5\sqrt{5}$
- D. $5\sqrt{10}$
- E. $10\sqrt{2}$

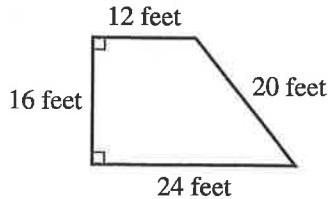
46. A pyramid composed of 4 congruent triangular sides and a square base is shown “unfolded” in the standard (x,y) coordinate plane below. Points A , B , and C are vertices of 1 of the triangular sides. What is the total surface area, in square coordinate units, of the pyramid?



- F. 240
- G. 340
- H. 432
- J. 480
- K. 580

47. The side lengths of the flat, trapezoidal ceiling of a bedroom are given in the figure below. Marie will paint the entire ceiling with 1 coat of paint, using paint that has a price of \$8 per quart and is sold only by the full quart. Each quart of paint covers an area of 90 square feet with 1 coat of paint. What is the total price of the paint that Marie needs to buy?

- A. \$ 8
- B. \$16
- C. \$24
- D. \$32
- E. \$40

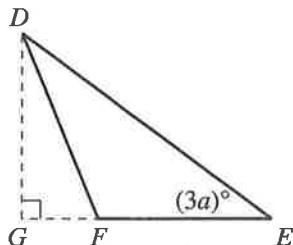


DO YOUR FIGURING HERE.



DO YOUR FIGURING HERE.

48. In the figure below, F lies on \overline{EG} , and the measure of $\angle E$ is $(3a)^\circ$. Which of the following inequalities is true?



- F. $0 < a < 30$
 G. $30 < a < 45$
 H. $45 < a < 60$
 J. $60 < a < 90$
 K. $90 < a < 180$
49. Each contestant at a math competition starts with 30 points. A contestant earns 10 points for each question answered correctly and loses 5 points for each question answered incorrectly. Sammi answered twice as many questions correctly as incorrectly, finishing with 150 points. How many questions did Sammi answer correctly?

- A. 8
 B. 12
 C. 16
 D. 20
 E. 24

50. In the standard (x,y) coordinate plane, when $a \neq 0$ and $b \neq 0$, the graph of $f(x) = \frac{2x+b}{x+a}$ has a *horizontal* asymptote at:

- F. $y = -2$
 G. $y = a$
 H. $y = -a$
 J. $y = -\frac{b}{2}$
 K. $y = \frac{b}{a}$

51. On the real number line, -0.423 is between $\frac{n}{100}$ and $\frac{(n+1)}{100}$ for some integer n . What is the value of n ?

- A. -423
 B. -43
 C. -42
 D. -5
 E. -4



52. The stem-and-leaf plot below shows the number of daily credit card sales at Fancy Fabrics during a 34-day period. What is the median number of daily credit card sales?

Stem	Leaf
3	1 2 2 4 6 8
4	2 2 3 3 5 5 7 8
5	0 0 1 3 5 7 9 9 9
6	0 2 4 4 5 5 6
7	2 6 6 7

Key: 3 | 1 = 31

- F. 52
 G. 53
 H. 54
 J. 55
 K. 59
53. Angle A has a measure of $\frac{25}{3}\pi$ radians. Angle A and Angle B are coterminal. Angle B could have which of the following measures?

- A. 3°
 B. 14°
 C. 26°
 D. 60°
 E. 120°

54. Which of the following complex numbers equals $(6 - 7i)(\pi + 6i)$?
- F. $6\pi - 42i$
 G. $(6 + \pi) - i$
 H. $(6 + \pi) + i$
 J. $(6\pi + 42) + (36 - 7\pi)i$
 K. $(6\pi - 42) + (36 - 7\pi)i$

55. If $x = 4$ is one solution to the equation $x^2 - ax - 12 = 0$, then the other solution is:
- A. -3
 B. -2
 C. -1
 D. 1
 E. 3

56. For all x such that $\tan x \neq 0$, the expression $\frac{\sec^2 x \cdot \sin x}{\tan x}$ is equivalent to which of the following?

(Note: $\sec x = \frac{1}{\cos x}$; $\tan x = \frac{\sin x}{\cos x}$)

- F. 1
 G. $\cos x$
 H. $\cos^3 x$
 J. $\sec x$
 K. $\sec x \cdot \tan^2 x$

DO YOUR FIGURING HERE.



DO YOUR FIGURING HERE.

57. All quadrilaterals in one of the following categories have diagonals that are congruent. Which category?

- A. Parallelogram (each side parallel to opposite side)
- B. Trapezoid (1 pair of parallel sides)
- C. Kite (perpendicular diagonals)
- D. Rhombus (4 congruent sides)
- E. Rectangle (4 right angles)

58. Three line segments are graphed in the standard (x,y) coordinate plane below. Line segment \overline{AB} has endpoints $A(2,0)$ and $B(4,0)$, $\overline{A'B'}$ is the image of \overline{AB} after a rotation counterclockwise (\curvearrowleft) by 120° about the origin, and $\overline{A''B''}$ is $\overline{A'B'}$ projected onto the x -axis. What is the length, in coordinate units, of $\overline{A''B''}$?

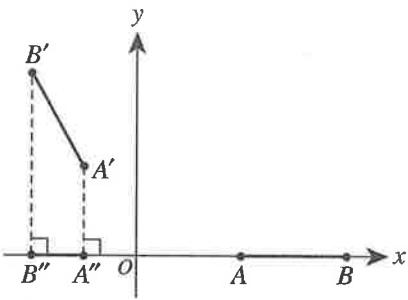
E. 1

G. $\sqrt{2}$

H. $\sqrt{3}$

J. $\frac{2}{\sqrt{2}}$

K. $\frac{2}{\sqrt{3}}$



59. Consecutive terms of a certain arithmetic sequence have a positive common difference. The sum of the first 3 terms of the sequence is 120. Which of the following values CANNOT be the first term of the arithmetic sequence?

A. 20

B. 24

C. 30

D. 39

E. 44

60. Given $f(x) = \sqrt[3]{x+2}$, which of the following expressions is equal to $f^{-1}(x)$ for all real numbers x ?

F. $x^3 - 2$

G. $(x-2)^3$

H. $-\sqrt[3]{x+2}$

J. $\sqrt[3]{x-2}$

K. $\sqrt[3]{x} - 2$

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 four 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.

Passage I

PROSE FICTION: This passage is adapted from the short story "Bye Bye Brewster" by Steven Barthelme (©2006 by Southwest Review).

I hadn't seen Brewster since he moved, about five months before. He was twice my age, but a bond had been fashioned out of necessity, because he was old and alone, because my life hadn't turned out as I'd hoped—
 5 all I had was a job and this apartment. It hasn't gotten any better since he moved. It seems strange but the time I knew him had become in my memory an oddly contented and happy time, one of those periods of one's life during which one complains incessantly which later
 10 becomes a life sorely missed. There wasn't anything extraordinary about those months: we had shared a lot of evenings, eaten together, played card games, talked a lot, awaited and then watched favorite TV shows every week, rituals of a friendship. He had lent me money and
 15 then forgiven the debts; I had helped him out sometimes. He said his son was in California, maybe Washington state. He never heard from him. I had had a father who was easy to disappoint, and after I disappointed him I took poor care of him, which maybe
 20 explains the Brewster thing.

For the two years we were friends I did everything that Brewster needed done, so much so that I got into the habit of knocking on his door when I got home from work in case there was some errand or muscle work he
 25 needed, so I could get it done before I settled in to watch the news and have dinner, so that I wouldn't be interrupted; it was a practical matter. I would walk up an extra flight of the steel and concrete stairs at the apartments, past mine on the second level, up to his on
 30 the third, knock and wait until he came to the door, say Hi, as if I were checking on him.

Often he didn't have anything for me to do. But sometimes he'd have some job he'd saved all day until I got home, hold this, drill this, cut this, move these
 35 over there and those where these were, do you know where I can find a good this, maybe you could accompany me there. He had been an engineer but his father had done millwork and fine carpentry, worked a lathe, skills Brewster had learned as a boy and used to make
 40 tables and shelving, cabinets, and small cases for things, beautifully crafted boxes made from wood and covered in fabric, although now at seventy-something his hands were unsteady and his eyes were shot.

"An old duck," is what he called himself and any
 45 other old man he liked. A man he didn't like was a "louse." I liked him, in part, because he talked like no one else I knew, probably only a reflection of his age, vestiges of another time showing in his vocabulary, favorite expressions, a reserve of restraint which prevented him from using most vulgar language.

I still live in the apartment complex. He had been here for years—I never was clear on how many—when I moved in two years ago. When he was evicted from the apartments, he asked me to move in with him, to
 55 split the house he was moving to. I had sort of agreed; at least we had talked about getting a place at one time, so he had reason to expect it, but when it really came up, I couldn't get over the idea of moving in with a seventy-year-old man. He was way past caring about
 60 how strange such a roommate arrangement might seem. I was afraid of getting still more tangled up than I already was, of his growing dependency, of making my temporary abandonment of social life with people of my own age and station into a permanent condition.

65 Splitting a house with Brewster might not have meant that, but at the time the prospect felt like being pulled under water I had been just sort of pleasantly floating in, expecting sometime sooner or later to return to land. So I guess I wasn't much of a friend to him,
 70 when it came down to it, or at least had misrepresented the friend I was.

"You know," Brewster said, "you could move in with me. Take half the house. There're two kitchens over there. Four bedrooms." We were standing on the
 75 concrete walkway outside the apartment he was leaving. He was serious. "We could split it up any way you want." His body was short and heavy with a belly and thick forearms, still strong. His big, bald, ruddy face had round areas where the skin looked thin and stretched. He was looking at me. I should say something, I thought, but the only thing in my head was what I usually said to Brewster—"Sure"—and I didn't want to say that. Finally I said, "Well," and looked down into the courtyard, so obviously with nothing to
 80 look at that I almost stumbled into the railing. Brewster shrugged, and the light left his blue eyes. "Well, you can think about it," he said. "House isn't going anywhere." He nodded to the door of his now bare apartment. "Play some cards?" We went in.

3

3

1. The narrator states that he does NOT really know when:
 - A. Brewster moved into the apartment complex.
 - B. Brewster moved out of the apartment complex.
 - C. he himself had moved into the apartment complex.
 - D. he and Brewster last discussed sharing a house.

2. It can most reasonably be inferred from the narrator's account that Brewster interprets the narrator's "Well" (line 83) to mean which of the following?
 - F. "Yes."
 - G. "I'll seriously consider it."
 - H. "I don't understand the question."
 - J. "No."

3. When the narrator mentions "rituals of a friendship" (line 14), he's most nearly referring to:
 - A. unusual acts of kindness performed at great cost to both friends.
 - B. everyday activities routinely undertaken with someone else.
 - C. time spent celebrating holidays and important moments with someone.
 - D. the lending out of money and the subsequent forgiving of debts.

4. The narrator speculates that one reason for his bond with Brewster might have been that:
 - F. Brewster and the narrator's father had been friends, which led the narrator to feel protective of Brewster.
 - G. the narrator knew how to help Brewster because of the narrator's positive experience helping his own father.
 - H. Brewster's circumstances evoked in the narrator feelings of guilt regarding his relationship with his own father.
 - J. the narrator knew from talking with Brewster's son that Brewster could use a friend in the apartment complex.

5. The passage reveals that when Brewster was evicted from the apartment complex, he offered to share a house with the narrator. The narrator indicates that he viewed this offer as:
 - A. entirely unexpected, which accounts for the narrator's surprised reaction.
 - B. rather predictable, which didn't keep the narrator from struggling to respond.
 - C. rashly made, which explains the narrator's hesitancy.
 - D. actually insincere, which left the narrator feeling annoyed.

6. As it is used in line 64, the word *station* most nearly means:
 - F. physical location.
 - G. base of operations.
 - H. duty.
 - J. status.

7. The narrator claims that since Brewster moved out of the apartment complex, the narrator's own circumstances have:
 - A. improved greatly.
 - B. improved slightly.
 - C. not improved.
 - D. worsened greatly.

8. As the narrator looks back on the period he knew Brewster, the narrator realizes that he:
 - F. enjoyed it greatly while it was happening, but now regards it with anguish and guilt.
 - G. complained a great deal while it was happening, but now regards it fondly.
 - H. didn't like it while it was happening, and he hasn't changed his mind since then.
 - J. appreciated it while it was happening, and time has simply increased his appreciation.

9. The references to water and land in lines 65–69 are most likely intended to suggest that at the time, the narrator felt:
 - A. fearful of losing himself in a further commitment to Brewster.
 - B. grateful for having been saved from trouble by Brewster's friendship.
 - C. pleased at the prospect of living in the country with Brewster.
 - D. distressed at having grown distant from Brewster.

10. In the context of the passage, the concluding two sentences (line 89) are most likely meant to suggest that:
 - F. a painful realization is being downplayed.
 - G. a halfhearted attempt at reconciliation has been rejected.
 - H. an unusual offer is being happily accepted.
 - J. a serious argument has been settled peacefully.

Passage II

SOCIAL SCIENCE: This passage is adapted from the article "Greening the World's Most Popular Fruit" by Christine Mlot (©2004 by National Wildlife Federation).

The banana has a huge fan base. Babies love its easy-to-eat-and-digest sweetness; athletes gulp it for potassium-rich quick energy. The banana is popular worldwide, with more than 25 pounds consumed annually per capita in the United States, most eaten straight out of the wrapper. In East Africa, where bananas and their plantain cousins are dietary staples, consumption is seven times that amount.

What the banana lacks, though, is a huge genetic base. The familiar yellow fruit—botanically, a berry—is largely derived from a single variety known as Cavendish, grown on plants that are essentially cuttings, or clones, of the same stock. The lack of sexual reproduction, with its mixing of genes, leaves the crop vulnerable to diseases and pests such as fungi, viruses, bacteria, insects and roundworms, some of which have become epidemic in recent years.

This means that conventional banana production depends heavily on pesticides—and lots of them. Fungicides, for example, may be applied 40 times a year, even though the chemicals lose their effectiveness with overuse. Worse, these highly toxic compounds often drift or run off of farm fields, posing a threat to fish, birds and other species—including humans. Even more poisonous to people and the environment are the nematicides typically used to control roundworm pests. And conventional banana production generates a host of other problems as well—from rivers polluted with eroded sediment and plastic waste to tropical forests razed to carve out new plantations.

These environmental problems, along with historically poor conditions for banana workers, have prompted several organizations to create certification and seals of approval for producers that meet certain environmental and social standards. In addition, a small but growing number of exporters are harvesting organically grown bananas, eschewing agrochemicals altogether. The result: Consumers today have a much greater opportunity to purchase bananas that are friendly to the environment than even a decade ago.

The Better Banana Project, sponsored by the New York-based Rainforest Alliance, is one of the oldest certification efforts. Launched in 1991, it requires producers to maintain health and safety standards for workers and to demonstrate reduced pesticide use and other sound environment practices such as soil conservation and proper waste disposal. Today 15 percent of all bananas traded on the global market are certified by the project. One major global producer has converted all of its Latin American farms to meet the project's standards.

The Better Banana Project has "improved conditions on all [of that brand's] plantations greatly," says

an organic agriculture consultant to small-scale farmers in Costa Rica. The use of toxic nematicides, for example, has been halved on certified farms, and tons of blue plastic bags and twine, which once littered virtually all banana farms, have been recycled through the program. In addition, pay and other benefits for workers have improved greatly. Thanks to efforts of project participants, "the banana industry is making a long, slow 180-degree turn," says the Rainforest Alliance's Chris Wille, one of the project's founders. "Now there's even competition among workers to get jobs on certified farms and competition between farms to see who can have the cleanest and greenest one."

For pesticide-free fruit, one can choose organic bananas. Though less than one percent of the bananas sold in the United States now are organic, that fraction is growing by more than 20 percent per year nationally and by 30 percent globally, according to the United Nations Food and Agriculture Organization.

Certified organic bananas are taking root throughout Latin America, often in drier habitats where harmful fungi don't occur. The Dominican Republic is the region's biggest exporter of organic bananas, followed by Mexico and Colombia. Small- and medium-scale growers are even managing to grow organic bananas in Costa Rica, where the fungal disease black sigatoka is a constant problem for large producers. By planting bananas in the shade in combination with other marketable crops such as cacao, these producers can get a modest but pesticide-free crop that commands a premium price. U.S. consumers looking for organic bananas can often find them in natural food stores and even main grocery chains for just slightly more than conventionally grown bananas.

The fruit that sustains hundreds of millions of people is itself slowly becoming a more sustainable crop.

11. It can most reasonably be inferred that the author's reason for including a variety of problems associated with banana production is to:
 - A. convince readers not to eat so many bananas.
 - B. persuade readers to consider investing in banana production.
 - C. encourage readers to think of new solutions to the problems of banana production.
 - D. show readers the need for the innovations discussed in the passage.

12. The passage's description of the Better Banana Project reveals that the project has as one of its goals to:
 - F. improve the taste of bananas.
 - G. change the way bananas are traded in world markets.
 - H. improve conditions for workers in the banana industry.
 - J. reduce the quantity of bananas produced.

3

3

13. The main idea of the second paragraph (lines 9–17) is that:
- bananas are becoming increasingly resistant to various diseases.
 - bananas' narrow genetic base poses a danger to the crop.
 - banana production illustrates some benefits of cloning.
 - fungi are the primary threat to banana production.
14. The passage indicates that attempts to protect the banana crop during conventional banana production may result in:
- many of the bananas being wasted.
 - bananas' asexual reproduction.
 - bananas losing their good flavor.
 - human health being endangered.
15. The passage states that in order to become certified, banana producers must, among other things, do all of the following EXCEPT:
- maintain healthful conditions for workers.
 - develop new varieties of bananas.
 - dispose of waste properly.
 - practice soil conservation.
16. The passage indicates that compared to conventionally grown bananas, organic bananas are somewhat more:
- costly to ship.
 - expensive to buy.
 - widely purchased.
 - harmful to workers.
17. The passage notes that enormous amounts of pesticides are used in conventional banana production despite the fact that:
- most bananas are derived from a single variety.
 - bananas are attacked by an increasingly wide variety of pests.
 - overusing the chemicals decreases their effectiveness.
 - tropical rain forests are being razed.
18. The passage refers to nematicides as being used to control:
- roundworms.
 - bacteria.
 - viruses.
 - fungi.
19. The passage indicates that organic bananas are often grown in drier habitats in Latin America because in these areas:
- black sigatoka is more prevalent.
 - harvesting bananas is easier.
 - ground transportation is more readily available.
 - harmful fungi are nonexistent.
20. The last paragraph leaves the reader with the clear impression that the banana industry is:
- quickly deteriorating.
 - rapidly expanding.
 - gradually reforming.
 - slowly disappearing.

Passage III

HUMANITIES: This passage is adapted from the memoir *Under the Royal Palms: A Childhood in Cuba* by Alma Flor Ada (©1998 by Alma Flor Ada).

Daily life in *La Quinta Simoni* started very early in the morning. The placid night fragrances of jasmine and gardenias, which entered my bedroom from the garden, were quickly overtaken by the acrid but friendly smell of coffee brewing.

Before I was fully awake, my grandmother would often scoop me in her arms to take me to where they were milking the cows she still kept.

When we returned to the house, everyone would be bustling about, getting ready to leave—my father to teach at the high school, my uncle Manolo to the radio station, my uncle Medardo to his office, my aunt Lolita to her classes, and my grandmother to the school she ran.

Before long the big house was all my mother's and mine. While she worked on her bookkeeping ledgers, I would spend hours playing outside, under the trees, just by myself.

Every afternoon, around four o'clock, I had to take a bath and get dressed "for the evening." I would set aside the boots I hated, with their hard insoles to support my flat feet, and put on my white shoes with a little strap on top and a buckle on the side. As my mother tied the bow at the back of my dress, I felt like a butterfly, daily forced to return to her chrysalis, and daily freed again.

The next thing to be done each afternoon was to gather *maravillas*. These simple wild flowers—red, orange, white, purple, or spotted—opened late in the day. It was as if, like me, they led two lives; one curled up and wrinkled in the heat of the day, one open and splendid in the late afternoon as the sun began to go down. They grew plentifully on an empty lot about half a block from the old *Quinta Simoni*. I would walk proudly down the sidewalk, glancing at my shoes, ready to gather as many flowers as I could.

On my return, my grandmother would be waiting for me on the front porch, sitting in a rocking chair, ready to praise the beauty of my simple offering. Then, we would both go on tip-toes, as if approaching an altar, to place the flowers on top of the piano, a ritual that pleased us both.

Once the ritual was finished, we would walk hand in hand out to the large front porch with its high masonry arches. She would sit in the rocking chair. I would sit on the steps a few feet away, listening to her sing verses set to music she herself had composed.

And the night would fall around us, almost without notice, as it does in the tropics. Then the first of the

50 bats would appear. They lived above the porch, between the ceiling and the roof. We never saw or heard them during the day. But at nightfall their squeaks began, like an orchestra tuning its instruments before a concert, and it was as if the ceiling came alive.

Occasionally, a little one would fall to the floor through a crack in the ceiling either pushed by a thoughtless adult or as a result of its own carelessness. Even though it was not ready to fly yet, by instinct the little bat would open its membranous wings, glide down, and land alive, although perhaps somewhat stunned. Sometimes an adult bat would come immediately to the rescue. Then the little one would cling to the adult's chest and enjoy a safe return home. But on occasions when no adult came, we had to decide whether to fetch the tall ladder and try to place the baby back in the nest, or keep it in a shoe box and feed it with my doll's bottle. Fortunately, this only happened once in a while.

Most nights, my grandmother and I would pretend to count the bats as they left their nest to feed on the fruit from our backyard: sweet mangoes, guavas, soft and delicious *nisperos*. We knew already that it was impossible to keep a true tally, because in a few minutes their number would increase from a handful circling over our heads to several dozens, coming and going, so that we were unable to tell which were the ones just leaving the nest. Counting them over and over again, we would finally give up and burst out laughing, at the bats, at ourselves, at our game, and at the delightful warmth of the night, fragrant with the aroma of jasmine and gardenias. My aunts and my mother would smile, and shake their heads: "There go those two, counting bats again . . ."

The quiet serenity of those evenings and the tender love my grandmother and I shared has nourished me often throughout my life. On the many occasions when I have later felt that I am once more trying to count bats, engaged in an impossible task, I have allowed myself to laugh, happy to remember that some of the best things in life are like counting bats: It was never the final count that mattered, but rather the joy of seeing them fly.

21. The point of view from which the passage is told is best described as that of:
- a young girl talking about being a child in *La Quinta Simoni*.
 - a young girl describing how her imagination helps her understand her day-to-day life.
 - an adult reflecting on a typical day of her young childhood.
 - an adult conveying her childhood thoughts and actions in third person.

22. In the passage, which of the following activities is NOT mentioned as one where the author's grandmother was present?
- F. Counting bats after sunset
G. Getting dressed for the evening
H. Milking cows in the morning
J. Listening to songs at dusk
23. In the passage, the author compares herself to:
- I. a baby bat.
II. the *maravillas*.
III. a butterfly.
- A. III only
B. I and III only
C. II and III only
D. I, II, and III
24. It can most reasonably be inferred from the passage that the author's white shoes contributed to making her feel:
- F. proud to walk down the sidewalk.
G. worried about getting her evening attire dirty.
H. uncomfortable because they do not support her flat feet.
J. grown-up because her mother has shoes that are similar to them.
25. In the fifth and sixth paragraphs (lines 19–36), the author constructs a contrast primarily between the:
- A. work her family completed at home late in the afternoon and the work they did away from the house during the day.
B. relationship she had with her grandmother and the one she had with her mother.
C. image she had of herself in the heat of the day and the one she had in the late afternoon.
D. dreams she had at night and the typical routine of her day.
26. Which of the following tasks does the author say she completed with the greatest care and solemnity?
- F. Setting aside her boots and bathing for the evening
G. Helping her family members during their morning routine
H. Spending time outside under the trees while her mother worked on bookkeeping ledgers
J. Placing *maravillas* on top of the piano
27. It can most reasonably be inferred from the passage that when a baby bat fell to the floor, the author most preferred to:
- A. nurse it with her doll's bottle.
B. place it in a shoe box.
C. place it back in the nest.
D. watch an adult bat rescue it.
28. The details the author recalls from the early mornings of her childhood are based primarily on which physical sense?
- F. Sight
G. Touch
H. Smell
J. Sound
29. Which of the following of her relatives does the author NOT identify as involved in education outside of the home?
- A. The author's grandmother
B. The author's father
C. Lolita
D. Manolo
30. In the context of the passage, the phrase *has nourished me* (line 85) can most nearly be paraphrased as:
- F. helped me be self-critical.
G. sustained me with nutrients.
H. raised me like a child.
J. given me emotional support.

Passage IV

NATURAL SCIENCE: This passage is adapted from the article "The Dean of Debunking" by John Cornwell (©2006 by Times Newspapers Ltd.).

- Cornwell is reviewing the book *Not Even Wrong: The Failure of String Theory and the Continuing Challenge to Unify the Laws of Physics* by Peter Woit.

What is the basic, unifying stuff of our universe? One philosopher in ancient Greece thought that everything was reducible to water, another to air. Later, a philosopher called Democritus taught that the world is ultimately made up of tiny, eternal particles of varying weight known as "atoms", which form and re-form as nature undergoes its constant round of change, death and rebirth. Today, 2,500 years on, and after several great revolutions in modern physics, a large and expanding community of scientists believes that the basic stuff of our universe is "strings". Hence "string theory".

These are no ordinary strings. The physicists envisage tiny, vibrating, folding and elongating coils of energy, each 100 billion billion times smaller than the protons at the nucleus of an atom; so small, indeed, that they can be understood only in terms of extremely sophisticated mathematics impenetrable to all but an elite of specialists.

String theory, which nowadays dominates the research programmes and main funding of theoretical physics in many western universities, was not so much discovered as invented in order to solve a vexing explanatory deficit. In the early 1970s, physicists announced the so-called "standard model"—a theory that seeks agreement between the contrasting realms of super-huge objects, such as stars and planets (known as relativity), and the super-small realms of the subatomic (known as quantum). The standard model, however, failed to explain gravity. Enter string theory to rectify the problem. In its simplest terms, this complex set of notions claims 10 or 11 space dimensions (as opposed to the three of everyday human perception), and assumes a "landscape" of myriad elementary bundles of energy (strings) that interface not only with the universe we inhabit but a multiplicity of unseen and unknowable parallel universes.

But is string theory true? Peter Woit, a mathematician at Columbia University, has challenged the entire string-theory discipline by proclaiming that its topic is not a genuine theory at all and that many of its exponents do not understand the complex mathematics it employs. String theory, he avers, has become a form of science fiction.

Woit's book, highly readable, accessible and powerfully persuasive, is designed to give a short history of recent particle and theoretical physics. Ultimately he seeks not only to rattle but to dismantle the cage of the string theorists. What gives the book its searingly provocative edge, moreover, is the fact that Woit isn't

even a tenured professor, but a mere mathematics instructor specialising in computer systems. Yet he has formidable allies such as David Gross (the Nobel Laureate theoretical physicist), Roger Penrose (the world-class mathematician) and Lee Smolin (the leading cosmologist), plus an accumulating constituency of other big-name supporters.

Woit grants that an explanation for gravity is usefully embedded in string theory, but he challenges its authenticity as proper science. In his view, string theory offers no foreseeable prospect of making predictions, a crucial criterion for any theory worthy of the name. Matching the theory with the way we see the world, he argues, depends on believing in several tiny unobserved spatial dimensions wrapped around each other. Hence there is an infinite number of possible choices as to how one would make predictions, and nobody knows how to determine which choice is correct.

Woit's second main objection is that string theory offers no possibility of producing experimental evidence. Even the proposed prodigiously expensive class of accelerators known as Superconducting Super Colliders (SSCs), he claims, would have failed to provide the merest clue as to whether the theory had merit.

Woit's most compelling accusation, however, is that the domination of string theory in universities has stifled progress in alternative research programmes within theoretical physics. As long as the leadership of the physics community refuses to accept that string theory is a "failed project", he writes, "there is little likelihood of new ideas finding fertile ground in which to grow".

Now that Woit has thrown a wild cat among the theoreticians, we can be sure that the ruffled string-theory advocates will be preparing a rebuttal. Woit, the humble maths instructor, has nothing to lose in terms of academic standing, but physics might have much to gain from his boldness. While his book tends to be negative, it may well shake up a community of scientists that has evidently become complacent if not entirely ossified in its thinking.

31. How does the passage's author characterize the status of string theory within the physics community?
 - A. Entrenched, to the point where competing theories are rarely considered
 - B. Prominent, to the point where it's one of several equally popular theories
 - C. Controversial, in that it's supported by the scientific elite but rejected by typical scientists
 - D. Declining, in that a standard model has begun to supplant string theory

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32. Which of the following best describes how the passage's author portrays Woit?
- F. A relatively unknown truth-teller willing to challenge those who accept bad science
 G. A self-promoter seeking to disrupt the search for scientific truth in order to advance his career
 H. A well-meaning, humble scholar who had no idea that his book would upset so many people
 J. A tireless researcher hoping to replace one theory of gravity with his own theory of it
33. Based on the passage, Woit would most likely say that accepting string theory is more a matter of:
- A. taking something on faith than of insisting on proof.
 B. dealing in science fact than of indulging in science fiction.
 C. giving in to fear than of being hopeful.
 D. being pragmatic than of being reckless.
34. It can reasonably be inferred from the passage that by titling his book *Not Even Wrong*, Woit was trying to suggest that string theory:
- F. has turned out to be accurate after all.
 G. isn't a real theory capable of being tested.
 H. hasn't had a fair chance to prove itself.
 J. is the leading theory of the universe's basic stuff.
35. Based on the passage, the phrase *vexing explanatory deficit* (lines 23–24) most precisely refers to an inability to explain:
- A. string theory.
 B. the standard model.
 C. gravity.
 D. physics.
36. According to the passage, Woit believes that many supporters of string theory don't:
- F. care whether the theory is popular.
 G. bother to read leading scientific journals.
 H. even know the standard model exists.
 J. grasp the mathematics used in the theory.
37. As a piece of writing, Woit's book is judged by the passage's author to be:
- A. impenetrable to all but elite specialists in the field of physics.
 B. impressive in the power and ease with which its ideas are conveyed.
 C. unprecedented in the number of subjects it attempts to take on.
 D. oversimplified in an attempt to appeal to nonscientists.
38. The passage states that Woit specializes in:
- F. the history of science.
 G. theoretical physics.
 H. computer systems.
 J. cosmology.
39. As it is used in line 58, the word *grants* most nearly refers to the idea of:
- A. conceding a point.
 B. receiving research money.
 C. fulfilling a request.
 D. transferring ownership.
40. According to the passage, Woit views the use of Superconducting Super Colliders to test string theory as an idea that is:
- F. commendable.
 G. risky.
 H. intriguing.
 J. senseless.

END OF TEST 3

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.
DO NOT RETURN TO A PREVIOUS TEST.

SCIENCE TEST

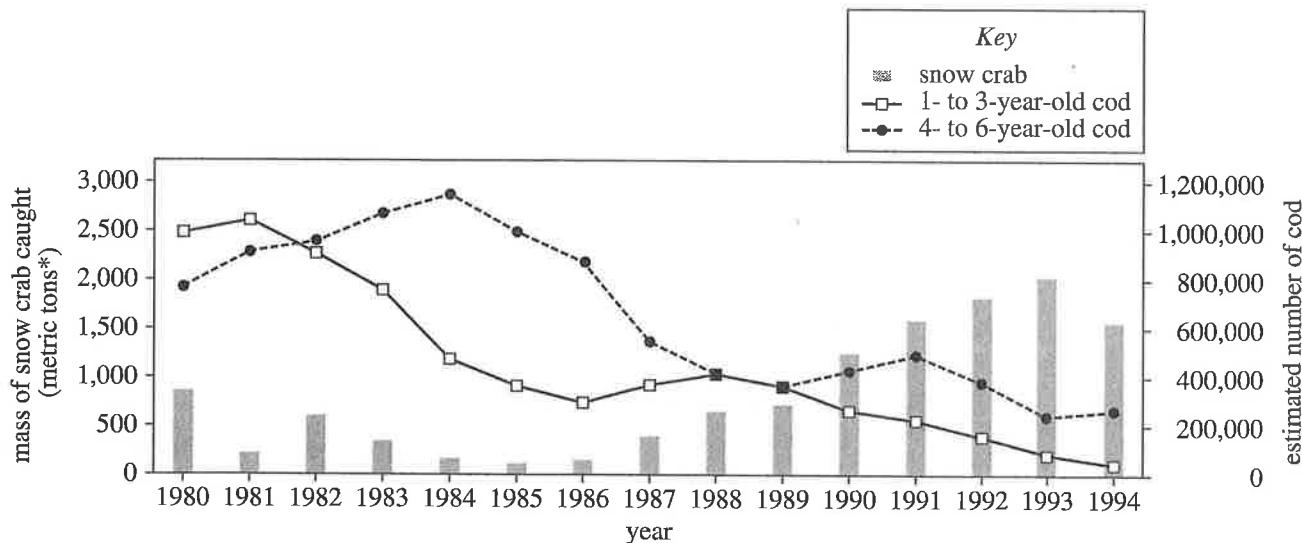
35 Minutes—40 Questions

DIRECTIONS: There are seven 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

Snow crab (*Chionoecetes opilio*) is a subarctic species of crab that is commercially fished in the Atlantic Ocean. Because snow crab are eaten by fish such as cod, the number of cod present in an area may affect snow crab populations. The figure below shows the mass of snow crab caught on the eastern Scotian Shelf in the Atlantic Ocean each year from 1980 through 1994. The figure also shows, for the same area, the estimated number of 1- to 3-year-old cod and the estimated number of 4- to 6-year-old cod present each year from 1980 through 1994.



*1 metric ton = 1,000 kg

Figure adapted from M. J. Tremblay, "Snow Crab (*Chionoecetes opilio*) Distribution Limits and Abundance Trends on the Scotian Shelf." ©1997 by Journal of Northwest Atlantic Fishery Science.

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1. According to the figure, the estimated number of 1- to 3-year-old cod present in 1980 was approximately:
 - A. 100,000.
 - B. 200,000.
 - C. 600,000.
 - D. 1,000,000.

2. According to the figure, when the estimated number of 1- to 3-year-old cod was the greatest, the number of metric tons of snow crab caught was closest to which of the following values?
 - F. 200
 - G. 500
 - H. 800
 - J. 1,500

3. In the relationship between cod and snow crab described in the passage, are the cod the predators or are they the prey?
 - A. Predators, because the cod eat the snow crab.
 - B. Predators, because the cod are eaten by the snow crab.
 - C. Prey, because the cod eat the snow crab.
 - D. Prey, because the cod are eaten by the snow crab.

4. Consider the statement “When the total estimated number of cod (including both 1- to 3-year-old cod and 4- to 6-year-old cod) was relatively high, the mass of snow crab caught was relatively low.” Are the data in the figure for 1984 through 1986 and for 1992 through 1994 consistent with this statement?
 - F. Yes; from 1984 through 1986 the mass of snow crab caught was relatively low compared to the mass of snow crab caught from 1992 through 1994.
 - G. Yes; from 1984 through 1986 the mass of snow crab caught was relatively high compared to the mass of snow crab caught from 1992 through 1994.
 - H. No; from 1984 through 1986 the mass of snow crab caught was relatively low compared to the mass of snow crab caught from 1992 through 1994.
 - J. No; from 1984 through 1986 the mass of snow crab caught was relatively high compared to the mass of snow crab caught from 1992 through 1994.

5. Based on the figure, the mass of snow crab caught was closest to 500,000 kg in which of the following years?
 - A. 1980
 - B. 1987
 - C. 1991
 - D. 1994



Passage II

Bone mineral density (BMD) is an indicator of overall bone health. Low BMD increases the risk for bone fracture. Scientists have determined that BMD is linked to dietary intake. Two studies, one with humans and one with rats, examined the effect of caffeinated cola consumption on BMD.

Study 1

A food-and-drink questionnaire was given to 1,413 adult women who had an average age of 58.2 yr. Each woman was assigned to 1 of 5 groups according to her caffeinated cola consumption. The average BMD for each group is shown in Figure 1.

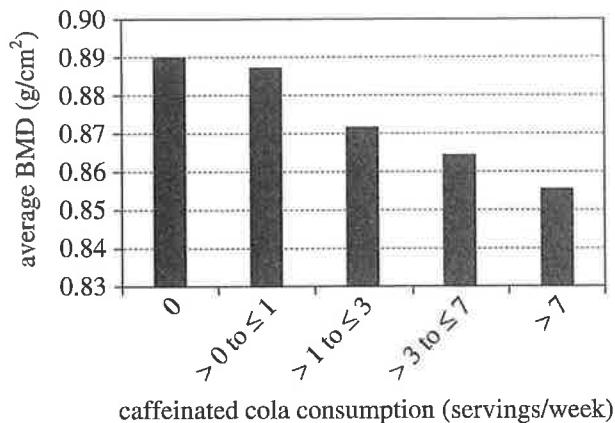
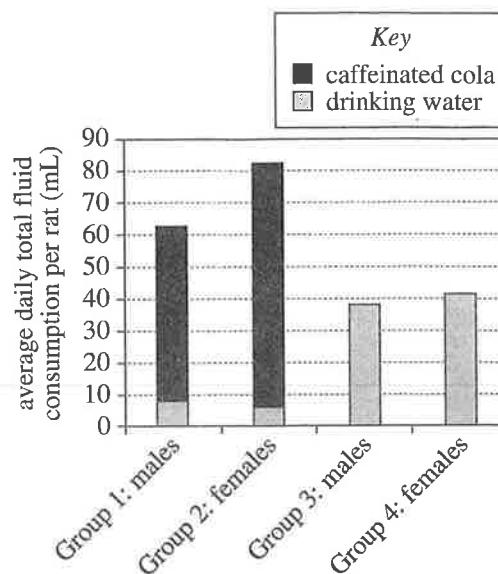


Figure 1

Figure 1 adapted from Katherine L. Tucker et al., "Colas, but Not Other Carbonated Beverages, Are Associated with Low Bone Mineral Density in Older Women: The Framingham Osteoporosis Study." ©2006 by American Society for Nutrition.

Study 2

Thirty 10-week-old rats were divided into 4 groups: Groups 1 and 2 consisted of 10 male and 10 female rats, respectively; Groups 3 and 4 consisted of 5 male and 5 female rats, respectively. Each rat in Groups 1 and 2 was provided with unlimited supplies of a solid rat food, drinking water, and caffeinated cola for 30 days. Each rat in Groups 3 and 4 was provided with unlimited supplies of the rat food and drinking water, but no cola, for 30 days. Figure 2 shows, for each group, the average daily caffeinated cola consumption per rat, the average daily drinking water consumption per rat, and the average daily total fluid consumption per rat.



Note: Bars are stacked.

Figure 2

Figure 3 shows, for each group, the average BMD on Day 30.

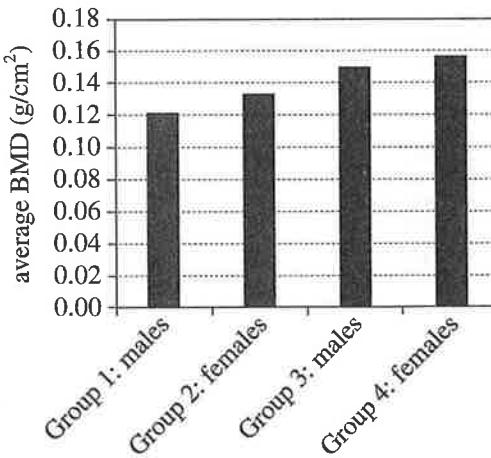


Figure 3

Figures 2 and 3 adapted from Recai Ogur et al., "Evaluation of the Effect of Cola Drinks on Bone Mineral Density and Associated Factors." ©2007 by Nordic Pharmacological Society.

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6. Based on the results of Study 2, on average, did male rats or did female rats consume more caffeinated cola per day?
- F. Female rats; Group 1 rats, on average, consumed more caffeinated cola per day than did the Group 2 rats.
 G. Female rats; Group 2 rats, on average, consumed more caffeinated cola per day than did the Group 1 rats.
 H. Male rats; Group 1 rats, on average, consumed more caffeinated cola per day than did the Group 2 rats.
 J. Male rats; Group 2 rats, on average, consumed more caffeinated cola per day than did the Group 1 rats.
7. Which 2 groups of rats served as the control groups in Study 2?
- A. Group 1 and Group 2
 B. Group 1 and Group 3
 C. Group 2 and Group 4
 D. Group 3 and Group 4
8. In Study 2, the average daily total fluid consumption per rat for Group 4 was approximately half that of the average daily total fluid consumption per rat for Group 2. Which of the following statements gives the most likely reason for this difference?
- F. There were half as many rats in Group 2 as were in Group 4.
 G. There were half as many rats in Group 4 as were in Group 2.
 H. The average daily total fluid consumption per rat was higher for Group 2 rats because they preferred cola over water.
 J. The average daily total fluid consumption per rat was lower for Group 4 rats because they were provided cola, and rats do not consume cola.
9. In Study 1, the greatest number of women were assigned to the group that consumed how many servings of caffeinated cola per week?
- A. > 0 to ≤ 1 servings
 B. > 1 to ≤ 3 servings
 C. > 7 servings
 D. Cannot be determined from the given information
10. The BMDs of the subjects in Studies 1 and 2 were determined by scans of their hip bones. Based on Figures 1 and 3, was the average BMD for any group of rats greater than or less than the average BMD for any group of women?
- F. Greater; a rat's hip bone is less dense than is a woman's hip bone.
 G. Greater; a rat's hip bone is more dense than is a woman's hip bone.
 H. Less; a rat's hip bone is less dense than is a woman's hip bone.
 J. Less; a rat's hip bone is more dense than is a woman's hip bone.
11. Consider the statement "It is possible that average BMD differed among the groups in the study partly because the subjects in the study ate different types of solid food." This statement applies to which of the studies, if either?
- A. Study 1 only
 B. Study 2 only
 C. Both Study 1 and Study 2
 D. Neither Study 1 nor Study 2

Passage III

In an experiment to study the effect of circulation on ice formation in water, 2 identical insulated containers without lids (Tank X and Tank Y) were each fitted with 2 thermometers as shown in Figure 1. A pump was mounted on the base of Tank X. Each tank was filled with 20 L of 14°C water. Both filled tanks were then placed in a temperature-controlled freezer set to -12°C , and the pump was switched on, circulating the water in Tank X. The temperature from each thermometer was recorded every hour for 30 hours (see Figures 2 and 3).

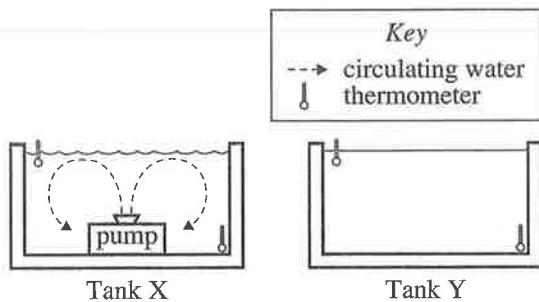


Figure 1

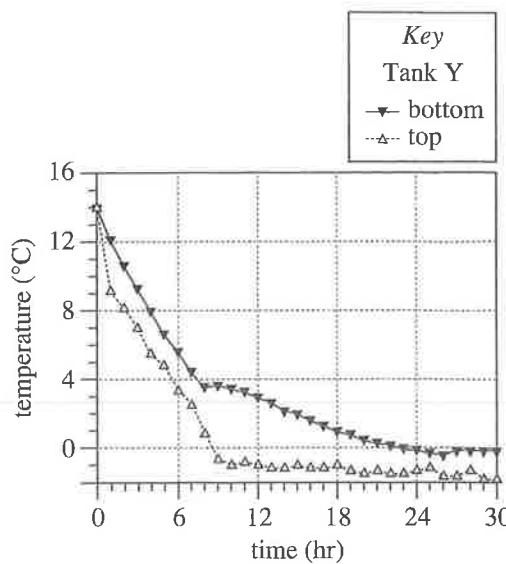


Figure 3

Figures 2 and 3 adapted from T. Moreau, R. Lamontagne, and D. Letzring, "How Circulation of Water Affects Freezing in Ponds." ©2007 by the American Association of Physics Teachers.

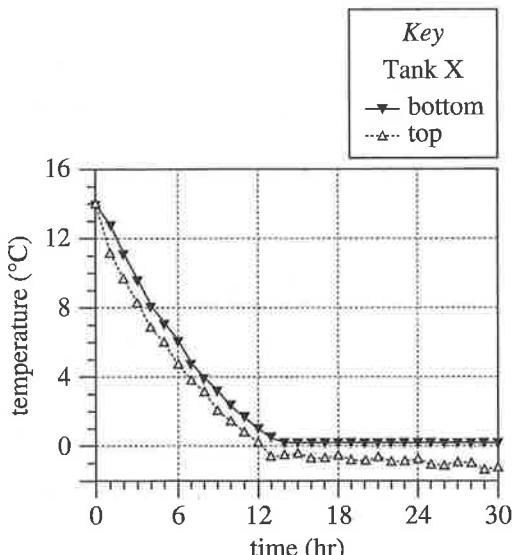


Figure 2

12. Over the 30 hr of the experiment, the temperature of the water at the bottom of Tank X:
- increased, then fluctuated up and down.
 - decreased, then fluctuated up and down.
 - increased, then remained constant.
 - decreased, then remained constant.
13. Compared to the water at the top of Tank Y, the water at the bottom of Tank Y took approximately how many more hours, or how many fewer hours, to reach 0°C ?
- 10 fewer hours
 - 24 fewer hours
 - 15 more hours
 - 30 more hours

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14. Two streams, Stream A and Stream B, are identical in all respects, except that water flows rapidly in Stream A but is nearly at rest in Stream B. Based on the results of the experiment, during a prolonged period of -5°C weather, water at the top of which stream is *less* likely to begin freezing first, and why?
- F. Stream A, because Figures 2 and 3 indicate that turbulent water freezes more slowly than does water at rest.
 G. Stream A, because Figures 2 and 3 indicate that turbulent water freezes more quickly than does water at rest.
 H. Stream B, because Figures 2 and 3 indicate that turbulent water freezes more slowly than does water at rest.
 J. Stream B, because Figures 2 and 3 indicate that turbulent water freezes more quickly than does water at rest.
15. Suppose that Tank Y had been covered throughout the experiment with a lid made of the same insulating material, and having the same thickness, as the walls and base of the tank. At 2 hr, the temperature of the water at the top of Tank Y would most likely have been:
- A. less than or equal to 8°C .
 B. greater than 8°C , but less than or equal to 14°C .
 C. greater than 14°C , but less than or equal to 16°C .
 D. greater than 16°C .
16. Suppose both tanks were left in the freezer until the H_2O in each reached thermal equilibrium with the air in the freezer. Based on the passage, the temperature of the H_2O in each tank would most likely have been:
- F. 0°C .
 G. -2°C .
 H. -12°C .
 J. -14°C .

**Passage IV**

Four 1800s scientists provide different gas models that attempt to explain what happens when a gas is released into an evacuated container and what happens when a gas in a closed container of fixed volume is heated.

Scientist 1

A gas is composed of small particles that repel each other. The particles are bound together in a 3-dimensional lattice, but are never in contact with each other. If a gas is released into an evacuated container, the particles in the lattice will move apart from each other until the gas completely fills the container, then stop moving. Thus, the particles can move only if the size of their container changes.

If a gas in a closed container of fixed volume is heated, the repulsive forces between particles will increase. This cannot change the distance between the particles in the gas lattice, but does cause the lattice to push harder against the container, and thus increases the pressure.

Scientist 2

Scientist 1's model is correct with only one exception. If a gas in a closed container of fixed volume is heated, the repulsive force between particles will decrease, causing the gas lattice to push less hard against the container.

Scientist 3

A gas is composed of small particles that repel each other. The particles are not bound to each other and are in constant, random motion. If a gas is released into an evacuated container, the random motion will cause the gas to spread out to fill the container. If gas particles are on path to collide, the repulsive force between the particles will push each particle into a new path. Thus, gas particles never collide.

If a gas in a closed container of fixed volume is heated, the speed of the gas particles will increase. Therefore, the number of particles colliding with the walls of the container will increase, which will cause the pressure to increase. Increasing the temperature has no effect on the repulsive force.

Scientist 4

Scientist 3's model is correct, except that gas particles do not repel each other. (Nor do they attract each other.) Thus, gas particles can collide with each other. When they do collide, the collisions are *elastic* because no energy is lost during the collision.

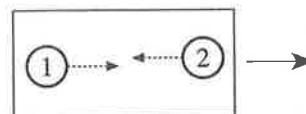
17. Which of the scientists, if any, claimed that gas particles are attracted to each other?

- A. Scientist 2 only
- B. Scientist 4 only
- C. All of the scientists
- D. None of the scientists

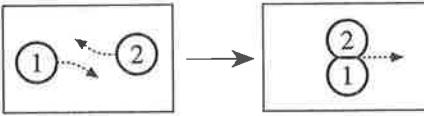
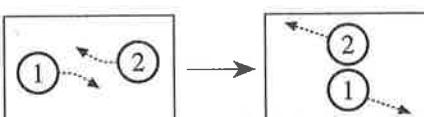
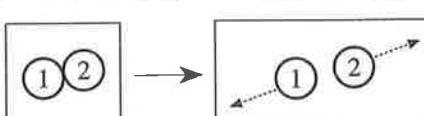
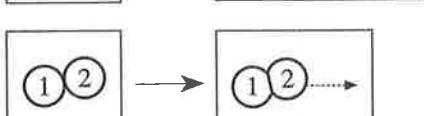
18. Which scientist would be most likely to predict that heating the air inside a sealed balloon will cause the balloon to *decrease* in size?

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

19. Gas Particles 1 and 2 are moving straight toward each other, as indicated by the dotted arrows in the diagram shown below:

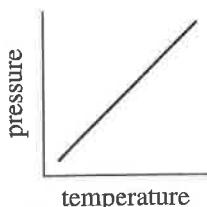


Based on Scientist 3's model, which of the following diagrams best shows, in sequence, how these particles will behave as they continue in motion?

- A. 
- B. 
- C. 
- D. 

4 4

20. Consider the graph shown below of pressure versus temperature for a gas in a closed container of fixed volume:



This graph is consistent with the model(s) provided by which of the scientists?

- F. Scientist 2 only
 - G. Scientists 3 and 4 only
 - H. Scientists 1, 3, and 4 only
 - J. Scientists 1, 2, 3, and 4
21. Tank A contains 5 g of helium (He) and Tank B contains 10 g of He. The temperature of the gas in each tank is 25°C, and the tanks have the same volume. Would Scientist 4 more likely predict that the pressure would be greater in Tank A or in Tank B ?
- A. Tank A, because more He atoms would be striking the walls of Tank A.
 - B. Tank A, because the greater number of He atoms in Tank A would produce the greater repulsive force between the He atoms in the gas lattice.
 - C. Tank B, because more He atoms would be striking the walls of Tank B.
 - D. Tank B, because the greater number of He atoms in Tank B would produce the greater repulsive force between the He atoms in the gas lattice.

22. Which of the scientists would agree with the statement "If a gas is kept at a constant volume and temperature, the gas molecules will have no motion"?

- F. Scientist 1 only
- G. Scientists 1 and 2 only
- H. Scientists 3 and 4 only
- J. Scientists 1, 2, 3, and 4

23. Science textbooks describe gases according to a model called the *kinetic theory of gases*. The kinetic theory of gases is most consistent with the model provided by which scientist?

- A. Scientist 1
- B. Scientist 2
- C. Scientist 3
- D. Scientist 4

Passage V

To treat water for drinking, *ozone* (O_3) gas can be bubbled through the water to kill bacteria and viruses. This process is called *ozonation*. When *bromide ions*, Br^- , are present in the water, O_3 reacts with the Br^- to produce *bromate ions*, BrO_3^- . In drinking water, a BrO_3^- concentration at or above 10 micrograms per liter ($\mu g/L$) is considered unsafe.

Three studies examined how initial Br^- concentration, *contact time* (the amount of time O_3 has been bubbled through the water), pH, and the addition of ammonia affected BrO_3^- formation during ozonation of $25^\circ C$ water from a particular source. Each water sample was buffered to maintain a constant pH during ozonation.

Study 1

Three 1 L water samples were prepared, all having the same pH but each having a different initial Br^- concentration: 50 $\mu g/L$, 200 $\mu g/L$, or 500 $\mu g/L$. Each sample was then placed in a separate 2 L container and ozonated at a rate of 10 L O_3 /hr for 30 min. At various times during ozonation, a small volume of water was removed from each container and analyzed for BrO_3^- (see Figure 1).

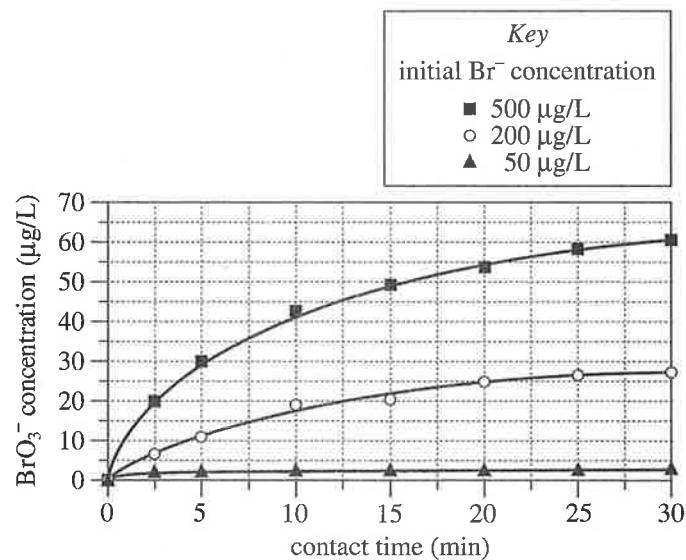


Figure 1

Study 2

Three 1 L water samples were prepared, all having an initial Br^- concentration of 200 $\mu g/L$ but each having a different pH: 8.4, 7.0, or 6.4. Each sample was then ozonated and analyzed as in Study 1 (see Figure 2).

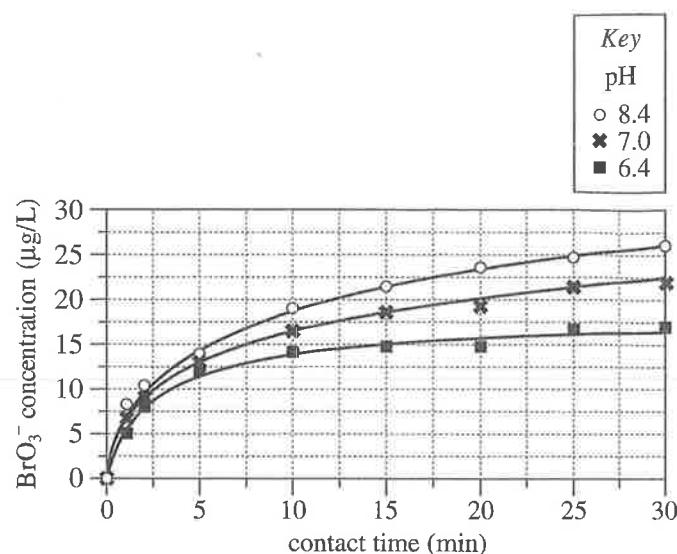


Figure 2

Study 3

Two 1 L water samples were prepared, both having an initial Br^- concentration of 200 $\mu g/L$ and a pH of 8.4. Ten mL of ammonia solution having a concentration of 0.2 mg/L was added to one sample. No ammonia was added to the other sample. Each sample was then ozonated and analyzed as in Study 1 (see Figure 3).

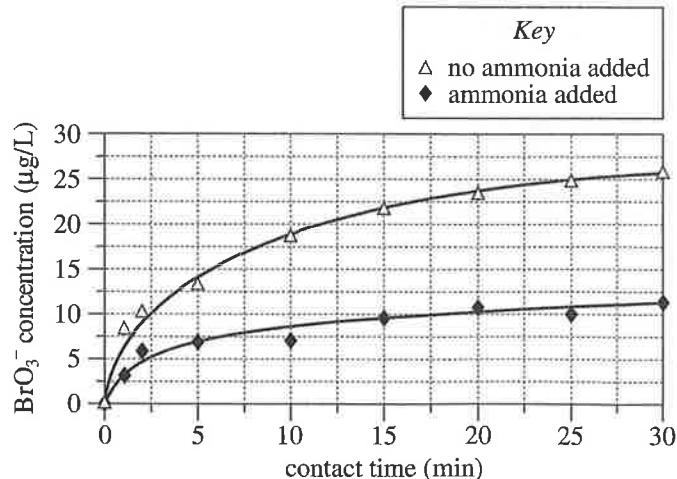


Figure 3

Figures adapted from J. P. Croué, B. K. Koudjou, and B. Legube, "Parameters Affecting the Formation of Bromate Ion During Ozonation." ©1996 by the International Ozone Association.

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24. According to the results of Study 1, for an initial Br^- concentration of 200 $\mu\text{g/L}$ or 500 $\mu\text{g/L}$, as contact time increased, BrO_3^- concentration:
- increased only.
 - decreased only.
 - increased, then decreased.
 - decreased, then increased.
25. Suppose that in Study 1 a 1 L water sample having an initial Br^- concentration of 350 $\mu\text{g/L}$ and the same pH as the other 3 samples had also been tested. At a contact time of 15 min, the BrO_3^- concentration for this sample would most likely have been:
- less than 5 $\mu\text{g/L}$.
 - between 5 $\mu\text{g/L}$ and 20 $\mu\text{g/L}$.
 - between 20 $\mu\text{g/L}$ and 50 $\mu\text{g/L}$.
 - greater than 50 $\mu\text{g/L}$.
26. According to the results of Studies 1–3, from 5 min until 30 min, how often was a small volume of water removed from each container for analysis?
- Every 1 min
 - Every 2 min
 - Every 5 min
 - Every 10 min
27. According to the results of Study 3, for contact times after 0 min, how did the addition of ammonia to the water sample affect the production of BrO_3^- , if at all?
- At all times after 0 min, the BrO_3^- concentration was less with ammonia added than it was with no ammonia added.
 - At all times after 0 min, the BrO_3^- concentration was the same with ammonia added as it was with no ammonia added.
 - At all times after 0 min, the BrO_3^- concentration was greater with ammonia added than it was with no ammonia added.
 - At some of the times after 0 min, the BrO_3^- concentration was greater with ammonia added than it was with no ammonia added; at the other times after 0 min, the BrO_3^- concentration was less with ammonia added than it was with no ammonia added.
28. What variable had the same value for all the water samples in Study 1 but did not have the same value for all the water samples in Study 2?
- Initial Br^- concentration
 - BrO_3^- concentration
 - Water temperature
 - pH
29. Based on the results of Study 2, was more BrO_3^- produced during ozonation of the acidic water sample or of the basic water sample?
- The acidic water sample, because at any contact time after 0 min, the BrO_3^- concentration was higher for pH 6.4 than it was for pH 8.4.
 - The acidic water sample, because at any contact time after 0 min, the BrO_3^- concentration was higher for pH 8.4 than it was for pH 6.4.
 - The basic water sample, because at any contact time after 0 min, the BrO_3^- concentration was higher for pH 6.4 than it was for pH 8.4.
 - The basic water sample, because at any contact time after 0 min, the BrO_3^- concentration was higher for pH 8.4 than it was for pH 6.4.

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Passage VI

A star's brightness is described by its *magnitude*. As magnitude increases, brightness *decreases*. A star's *apparent magnitude* is measured from Earth. A star's *absolute magnitude* is the magnitude that would be measured 10 parsecs from the star (1 parsec [pc] = 3.1×10^{16} m). V represents the apparent magnitude of a star's visible light. M_V and M_B represent the absolute magnitudes of a star's visible light and blue light, respectively.

Table 1 lists V , M_V , $V - M_V$, and $M_B - M_V$ for particular stars in each of 4 hypothetical star clusters (SCs). Figure 1 shows SC age versus $M_B - M_V$. Figure 2 shows SC distance from Earth versus $V - M_V$. Table 2 lists a star's power output of visible light for a given M_V .

Table 1

SC	V	M_V	$V - M_V$	$M_B - M_V$
I	10.5	1.5	9.0	0.00
II	11.8	-2.1	13.9	-0.25
III	12.1	2.1	10.0	0.15
IV	15.3	2.8	10.5	0.30

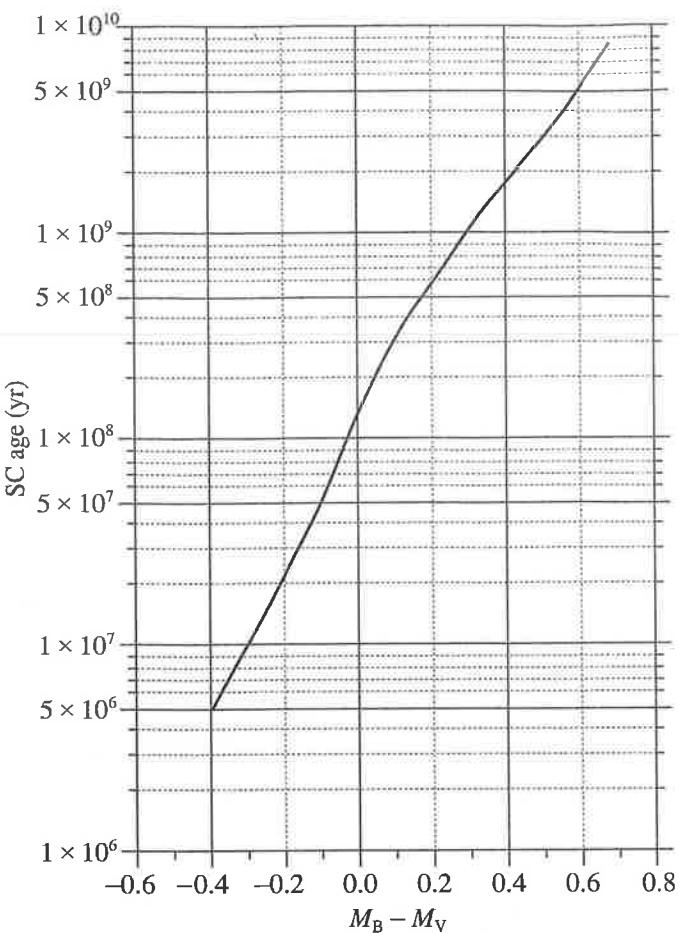


Figure 1

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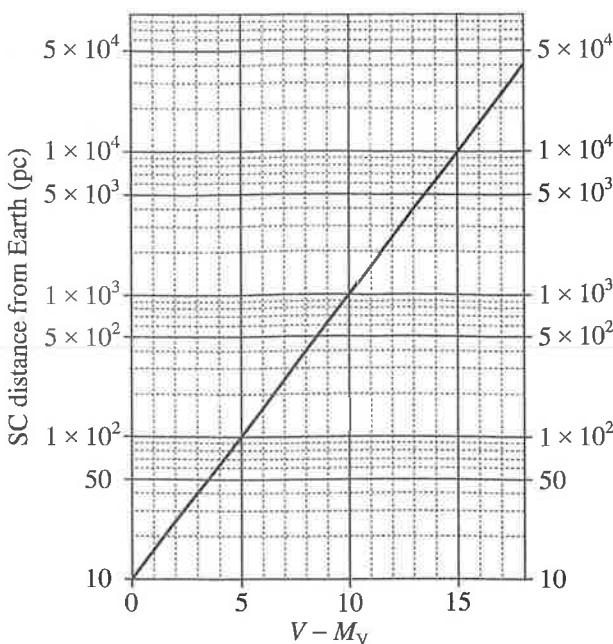


Figure 2

Figures adapted from Darrel B. Hoff, Linda J. Kelsey, and John S. Neff, *Activities in Astronomy*, 2nd ed. ©1984 by Kendall/Hunt Publishing Company.

Table 2	
M_V	Power output (W*)
-3.0	5.0×10^{29}
-2.0	2.0×10^{29}
-1.0	8.1×10^{28}
0.0	3.2×10^{28}
1.0	1.3×10^{28}
2.0	5.0×10^{27}
3.0	2.0×10^{27}
4.0	8.1×10^{26}
5.0	3.2×10^{26}

*W = watts

30. Based on Figure 1, for a star cluster that is 5.0×10^9 years old, $M_B - M_V$ will be closest to which of the following?
- F. -0.6
G. -0.2
H. 0.2
J. 0.6
31. Consider a star cluster having a particular star for which $V = M_V$. Based on Figure 2, the distance from Earth to the particular star will be which of the following?
- A. 1 pc
B. 10 pc
C. 15 pc
D. 20 pc
32. Based on Tables 1 and 2, the power output of visible light is greatest from the particular stars in which of the 4 star clusters?
- E. SC I
G. SC II
H. SC III
J. SC IV
33. Based on Table 1, M_B for the particular stars in SC I is which of the following?
- A. -1.5
B. 0.0
C. 1.5
D. 3.0
34. As $M_B - M_V$ increases, stellar surface temperature decreases. Based on Table 1, is the surface temperature lower for the particular stars in SC III or for the particular stars in SC IV?
- F. SC III, because $M_B - M_V$ is less for SC III than for SC IV.
G. SC III, because $M_B - M_V$ is greater for SC III than for SC IV.
H. SC IV, because $M_B - M_V$ is less for SC IV than for SC III.
J. SC IV, because $M_B - M_V$ is greater for SC IV than for SC III.

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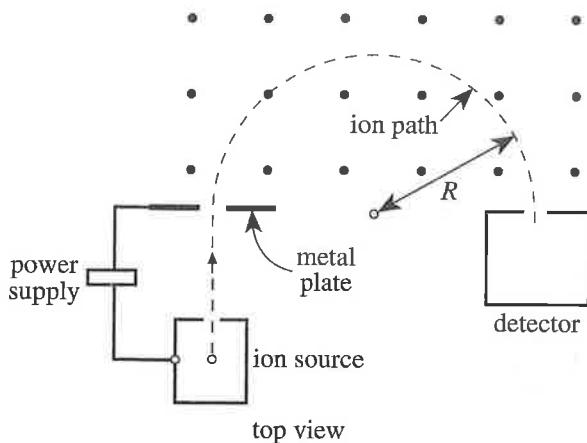


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Passage VII

When an ion moves through a uniform magnetic field, the ion follows a circular path having a radius R . A group of students conducted 3 studies to determine R under a variety of conditions for ions having the same mass.

The students used an apparatus consisting of an ion source, a metal plate with a hole in it, a power supply for generating various voltages between the ion source and the metal plate, and a movable charged-particle detector. Figure 1 shows the apparatus with the detector positioned to detect particular ions.



Note: The black dots represent the uniform magnetic field.

Figure 1

Figure 1 adapted from John D. Cutnell and Kenneth W. Johnson, *Physics*, 7th ed. ©2007 by John Wiley and Sons, Inc.

In each trial, the following occurred: Ions with the same electrical charge, Q , as well as the same mass were emitted by the ion source. The ions sped up, due to the voltage provided by the power supply, until they reached the hole in the plate. At the hole, their speed was V . After passing through the hole, they entered a uniform magnetic field of strength B . Under the influence of the field, they traveled along a circular path, still at speed V . The students moved the detector from side to side until it intercepted the ions and detected them. The students measured the distance between the hole in the metal plate and the ions' point of entry into the detector; R equaled this distance divided by 2.

Study 1

R was determined for ions having different V (see Table 1). Each ion had a Q of +1, and B equaled 0.10 tesla (T).

Table 1

Trial	V (m/sec)	R (m)
1	3,000	0.056
2	4,500	0.084
3	6,000	0.112
4	7,500	0.140

Study 2

R was determined for ions having various Q (see Table 2). Each ion had a V of 7,500 m/sec, and B equaled 0.10 T.

Table 2

Trial	Q	R (m)
5	+2	0.070
6	+3	0.047
7	+4	0.035

Study 3

R was determined for various B (see Table 3). Each ion had a Q of +1 and a V of 7,500 m/sec.

Table 3

Trial	B (T)	R (m)
8	0.04	0.352
9	0.08	0.176
10	0.12	0.117

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35. If, in Study 1, a trial had been conducted in which V equaled 9,000 m/sec, R would most likely have been closest to which of the following values?

- A. 0.098 m
B. 0.126 m
C. 0.140 m
D. 0.168 m

36. Suppose that in a new trial, the students repeated the procedure used in Trial 6, but the ion source malfunctioned, and the students detected ions at 2 values of R : 0.047 m and 0.070 m. Which of the following statements regarding the electrical charge(s) of the ions in this new trial best explains this result?

- F. Each ion had a Q of +2.
G. Each ion had a Q of +2.5.
H. For a portion of the ions, Q was +3; for the remainder of the ions, Q was +2.
J. For a portion of the ions, Q was +3; for the remainder of the ions, Q was +4.

37. As the ions traveled from the ion source to the hole in the metal plate, they were accelerating. They were also accelerating as they traveled from the hole in the metal plate to the detector. For each interval of motion, were the ions accelerating because the *magnitude* of their velocity was changing or because the *direction* of their velocity was changing?

- | | |
|--|--|
| <u>from ion source to hole</u>
A. magnitude of velocity
B. magnitude of velocity
C. direction of velocity
D. direction of velocity | <u>from hole to detector</u>
magnitude of velocity
direction of velocity
magnitude of velocity
direction of velocity |
|--|--|

38. Based on the results of the 3 studies, R is directly proportional to which of the variables tested, and R is inversely proportional to which of the variables tested?

	directly proportional	inversely proportional
F.	V only	Q and B only
G.	B only	V and Q only
H.	V and Q only	B only
J.	Q and B only	V only

39. Suppose that the procedure used in Trial 7 had been repeated in a new trial, except that B equaled 0.12 T instead of 0.10 T. Based on the results of Studies 2 and 3, R would most likely have been:

- A. less than 0.035 m.
B. between 0.035 m and 0.047 m.
C. between 0.047 m and 0.070 m.
D. greater than 0.070 m.

40. Based on Figure 1, the distance each ion traveled along its path from the time it left the hole in the metal plate until the time it entered the detector is given by which of the following expressions?

- F. R
G. $2R$
H. πR
J. $2\pi R$

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

Form 18J (XQ)
ACT® Writing Test Prompt
(April 2013)

Lawmakers debate whether businesses and factories located near schools should be required to eliminate the pollutants and harmful emissions they release into the air. Some lawmakers support such a requirement because they think schools' learning environments should include safe and healthy air for students to breathe. Other lawmakers do not support such a requirement because they think it would force businesses and factories located near schools to close or move, which could hurt local economies. In your opinion, should businesses and factories located near schools be required to eliminate the pollutants and harmful emissions they release into the air?

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.

English			Mathematics			Reading			Science		
1	A	36	F	1	C	31	C	1	A	1	D
2	F	37	D	2	K	32	F	2	J	2	F
3	D	38	H	3	A	33	E	3	B	3	A
4	J	39	B	4	J	34	J	4	H	4	F
5	D	40	J	5	A	35	B	5	B	5	B
6	H	41	A	6	K	36	H	6	J	6	G
7	A	42	F	7	E	37	C	7	C	7	D
8	J	43	B	8	G	38	G	8	G	8	H
9	A	44	F	9	E	39	B	9	A	9	D
10	H	45	C	10	G	40	K	10	F	10	H
11	D	46	J	11	A	41	D	11	D	11	A
12	H	47	B	12	H	42	K	12	H	12	J
13	D	48	H	13	D	43	C	13	B	13	C
14	G	49	C	14	H	44	G	14	J	14	F
15	C	50	J	15	E	45	E	15	B	15	B
16	G	51	C	16	H	46	G	16	G	16	H
17	D	52	J	17	B	47	D	17	C	17	D
18	G	53	C	18	K	48	F	18	F	18	G
19	B	54	J	19	C	49	C	19	D	19	B
20	J	55	B	20	G	50	F	20	H	20	H
21	D	56	F	21	A	51	B	21	C	21	C
22	H	57	C	22	H	52	F	22	G	22	G
23	B	58	F	23	B	53	D	23	C	23	D
24	J	59	A	24	H	54	J	24	F	24	F
25	A	60	G	25	E	55	A	25	C	25	C
26	H	61	D	26	J	56	J	26	J	26	H
27	C	62	H	27	D	57	E	27	D	27	A
28	H	63	D	28	H	58	F	28	H	28	J
29	B	64	F	29	D	59	E	29	D	29	D
30	H	65	C	30	F	60	F	30	J	30	J
31	C	66	F					31	A	31	B
32	G	67	B					32	F	32	G
33	A	68	G					33	A	33	C
34	F	69	D					34	G	34	J
35	B	70	F					35	C	35	D
		71	D					36	J	36	H
		72	G					37	B	37	B
		73	B					38	H	38	F
		74	J					39	A	39	A
		75	C					40	J	40	H

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 71G**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	75	59-60	40	39-40	36
35	73-74	58	—	38	35
34	72	56-57	39	37	34
33	70-71	55	38	36	33
32	69	54	36-37	35	32
31	68	53	35	34	31
30	67	52	34	33	30
29	66	50-51	33	32	29
28	64-65	48-49	32	31	28
27	62-63	46-47	31	30	27
26	60-61	43-45	30	28-29	26
25	58-59	41-42	29	27	25
24	55-57	38-40	28	25-26	24
23	52-54	36-37	26-27	23-24	23
22	49-51	34-35	25	22	22
21	46-48	32-33	23-24	20-21	21
20	42-45	31	21-22	19	20
19	40-41	29-30	20	18	19
18	38-39	27-28	18-19	16-17	18
17	36-37	23-26	17	15	17
16	34-35	18-22	15-16	14	16
15	30-33	14-17	14	13	15
14	28-29	11-13	13	12	14
13	25-27	9-10	11-12	11	13
12	23-24	7-8	9-10	10	12
11	21-22	6	8	9	11
10	19-20	5	7	8	10
9	16-18	4	6	7	9
8	14-15	3	5	5-6	8
7	11-13	—	4	4	7
6	9-10	2	—	—	6
5	7-8	—	3	3	5
4	5-6	1	2	2	4
3	4	—	—	—	3
2	2-3	—	1	1	2
1	0-1	0	0	0	1