

080660

Practice Test 3

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Today's Date



The **ACT**®

Form 16MC3

2015 | 2016

Directions

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

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

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

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

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

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

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

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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

Miami Time

My family is part of the Miami
 tribe a Native American people, with strong
 ties to territory in present-day Ohio, Indiana,
 and Illinois. Growing up in the Midwest, I often
 heard my grandmother talk about "Miami time."
 When she was doing something she loved, whether
 it was making freezer jam or researching tribal history,
 she refused to be rushed in a hurry. "I'm on Miami time
 today," she would say. Conversely, if we were running
 late for an appointment. She would chide us by saying,
 "Get a move on. We're not running on Miami time today,
 you know."

1. A. NO CHANGE
 B. tribe, a Native American, people
 C. tribe, a Native American people
 D. tribe; a Native American people
2. At this point, the writer would like to provide a glimpse into the grandmother's interests. Given that all the choices are true, which one best accomplishes this purpose?
 F. NO CHANGE
 G. being actively involved in her pursuits,
 H. things I really hope she'll teach me one day,
 J. historical research as well as domestic projects,
3. A. NO CHANGE
 B. hurried or rushed.
 C. made to go faster or rushed.
 D. rushed.
4. F. NO CHANGE
 G. appointment; she
 H. appointment and she
 J. appointment, she

GO ON TO THE NEXT PAGE.



It was a difficult concept for me to grasp. My
⁵
 grandmother tried to explain that “Miami time” referred to

those moments, when time seemed to slow down or stand
⁶

still. Recently, the meaning of her words started to sink in.
⁷

One morning, my son and I will inadvertently slip out of
⁸
 the world measured in seconds, minutes, and hours, and
 into one measured by curiosity and sensation.

[1] On a familiar trail near our house, I was pushing
 Jeremy in his stroller and were thinking of the day ahead
⁹
 and the tasks I had to complete. [2] Suddenly, he squealed
 with pure delight and pointed toward a clearing. [3] There,
 two does and three fawns stood watching us. [4] Five pairs
¹⁰
 of ears flicked like antennae seeking a signal. [5] After a
 few moments, the deer lowered their heads and began to
 eat, as if they had decided we were harmless. [6] By then,
 my son’s face was full of wonder. [11]

We spent the rest of the morning veering from the
 trail to investigate small snatches of life. Lizards lazing
 in the sun and quail rustled through grasses surprised us.
¹²

Wild blackberries melted on our tongues. For example, the
¹³
 aroma of crushed eucalyptus leaves tingled in our noses.

5. Given that all the choices are true, which one provides the best opening to this paragraph?
 A. NO CHANGE
 B. I remember being late for a doctor’s appointment one day.
 C. My grandmother lived with us, and as a result she and I became close over the years.
 D. My son asks me about my grandmother, whom he never met.
6. F. NO CHANGE
 G. moments when
 H. moments, as if
 J. moments, because
7. A. NO CHANGE
 B. spoken statements to my ears
 C. expressed opinions on the matter
 D. verbal remarks in conversation
8. F. NO CHANGE
 G. inadvertently slip
 H. are inadvertently slipping
 J. inadvertently slipped
9. A. NO CHANGE
 B. were having thoughts
 C. thinking
 D. DELETE the underlined portion.
10. F. NO CHANGE
 G. does, and three fawns
 H. does and three fawns,
 J. does and, three fawns
11. For the sake of the logic and coherence of this paragraph, Sentence 3 should be placed:
 A. where it is now.
 B. before Sentence 1.
 C. after Sentence 1.
 D. after Sentence 4.
12. F. NO CHANGE
 G. rustling
 H. were rustling
 J. DELETE the underlined portion.
13. A. NO CHANGE
 B. On the other hand, the
 C. Just in case, the
 D. The

GO ON TO THE NEXT PAGE.



By the time we found our way back to the car, the sun was high in the sky. We had taken three hours to complete a hike we usually finished in forty-five minutes. Yet the hike felt shorter than ever. As we drove off, I remembered something else my grandmother used to say: “Miami time passes all too quickly.”

14. F. NO CHANGE
 G. more shorter then
 H. the shortest than
 J. shorter than

Question 15 asks about the preceding passage as a whole.

15. Suppose the writer’s goal had been to write a brief essay conveying a personal experience with “Miami time.” Would this essay successfully fulfill that goal?
- A. Yes, because it presents the narrator’s firsthand experience of a morning spent in Miami time.
 B. Yes, because it reveals that after a conversation with the grandmother, the narrator decided to live in Miami time.
 C. No, because it shares the views of more than one person with regard to the meaning of Miami time.
 D. No, because the term “Miami time” belonged to the grandmother, not to the narrator.

PASSAGE II

Faith Ringgold’s Quilting Bee

The artist Faith Ringgold has made a name for herself with her “story quilts,” lively combinations of painting, quilting, and storytelling. Each artwork consists of a painting framed by quilted squares of fabric and story panels. One of these artworks, *The Sunflowers Quilting Bee at Arles*, depicts a scene of women at work on a quilt in a field of towering yellow flowers that eight African American women sit around the quilt that covers their laps. Who are these people stitching among the flowers? What brings them so close that their shoulders touch?

16. F. NO CHANGE
 G. flowers and eight
 H. flowers. Eight
 J. flowers, eight

GO ON TO THE NEXT PAGE.



Thus, the answers to these questions can
¹⁷
 be found in the artwork itself. Ringgold has told

the story of this gathering on two horizontal panels of text.
¹⁸
 One panel is sewn into the piece's top border,

the other into it's bottom border. These eight
¹⁹

women the story explains, strove
²⁰

in their various ways to support
²¹
 the cause of justice in the world.

In reality, these women never met to piece together
²²

a quilt. The scene comes out of the artists imagination as
²³
 a statement of the unity of purpose that she perceives in
 their lives. Sojourner Truth and Harriet Tubman fought
 to abolish slavery and, later, was active in the crusade
²⁴
 for suffrage. Newspaper journalist Ida B. Wells

courageously spoke out for social and racial justice
²⁵
 in the late nineteenth and early twentieth centuries.
²⁵

17. A. NO CHANGE
B. Instead, the
C. Furthermore, the
D. The
18. F. NO CHANGE
G. of this gathering the story on two horizontal panels of text.
H. on two horizontal panels the story of this gathering of text.
J. the story on two horizontal panels of text of this gathering.
19. A. NO CHANGE
B. its'
C. its
D. their
20. F. NO CHANGE
G. women, the story explains—
H. women the story explains—
J. women, the story explains,
21. The underlined phrase could be placed in all the following locations EXCEPT:
A. where it is now.
B. after the word *support*.
C. after the word *cause*.
D. after the word *world* (ending the sentence with a period).
22. F. NO CHANGE
G. summary,
H. addition,
J. contrast,
23. A. NO CHANGE
B. artist's imagination
C. artists' imagination
D. artists imagination,
24. F. NO CHANGE
G. was actively engaged
H. was engaged
J. were active
25. Given that all the choices are true, which one provides the most relevant information at this point in the essay?
A. NO CHANGE
B. married Ferdinand Barnett, editor of the first Black newspaper in Chicago, the *Chicago Conservator*.
C. wrote for newspapers in Memphis, New York City, and finally, Chicago.
D. was born in Holly Springs, Mississippi, in 1862, the eldest of eight children.

GO ON TO THE NEXT PAGE.



Establishing her own hair products business, herself²⁶
in the first decade of the twentieth century,

millions of dollars were later bequeathed by Madam²⁷
C. J. Walker to charities and educational institutions.²⁷
Among the schools that benefited from this

generosity, were²⁸ those that Mary McLeod Bethune
opened and ran in order to provide a better education
for Black students. And Fannie Lou Hamer, Ella Baker,
and Rosa Parks showed leadership and strength during the
civil rights movement, it happened in the 1950s and 1960s.²⁹

In the artwork, Ringgold has surrounded these women
with bright sunflowers. The flowers seem to celebrate the
women's accomplishments and the beauty of their shared
vision. 30

26. F. NO CHANGE
G. business belonging to her
H. business, herself,
J. business
27. A. NO CHANGE
B. Madam C. J. Walker later bequeathed millions of dollars to charities and educational institutions.
C. charities and educational institutions later received millions of dollars from Madam C. J. Walker.
D. millions of dollars were later bequeathed to charities and educational institutions by Madam C. J. Walker.
28. F. NO CHANGE
G. generosity; were
H. generosity were
J. generosity were:
29. A. NO CHANGE
B. movement, it took place in
C. movement, that happened in
D. movement of
30. If the writer were to delete the preceding sentence, the essay would primarily lose:
F. an interpretation of the artwork that serves to summarize the essay.
G. a reflection on the women depicted in the artwork that compares them to Ringgold.
H. a description of a brushwork technique that refers back to the essay's opening.
J. an evaluation of Ringgold's artistic talent that places her in a historical context.

PASSAGE III

1902: A Space Odyssey

Our technologically advanced times has allowed³¹
filmmakers to create spectacular science fiction films to
intrigue us with worlds beyond our experience. Imagine
the excitement in 1902 when audiences first saw *Le Voyage*³²
dans la lune (*A Trip to the Moon*), a groundbreaking movie
produced by Georges Méliès.

31. A. NO CHANGE
B. have allowed
C. allows
D. was allowing
32. F. NO CHANGE
G. 1902, and when
H. 1902, which
J. 1902, where

GO ON TO THE NEXT PAGE.



[1] Undaunted, Méliès honed his photographic skills to tell fantasy stories instead. [2] Méliès, a French magician, was fascinated by the workings of the new motion picture camera. [3] Specializing in stage illusions, he thought the camera offered potential to expand its spectacular magic productions. [4] By 1895, he³³ was working with the new invention. [5] He found out, however, that the public preferred live magic³⁴ acts to filmed versions. [35]

Méliès's magician's eye led him to discover the basics of special effects. [36] He experimented with effects such as speeding up and slowing down the action, reversing it for backward movement, and superimposing images of fantastic creatures over real people. Using overhead

pulleys and trapdoors, he was able to do interesting things.³⁷

Aware of the popularity of Jules Verne's science fiction novels, Méliès saw exciting possibilities in filming a space odyssey. The interplanetary travel film that he created, *A Trip to the Moon*, had production costs of \$4,000, highly excessively for its time. In this film, a space³⁸

capsule that is fired and thereby launched and projected³⁹ from a cannon lands in the eye of the Man in the Moon.

33. A. NO CHANGE
B. their
C. his
D. it's
34. F. NO CHANGE
G. out, however;
H. out, however
J. out however,
35. For the sake of the logic and coherence of this paragraph, Sentence 1 should be placed:
A. where it is now.
B. after Sentence 2.
C. after Sentence 3.
D. after Sentence 5.
36. The writer is considering deleting the preceding sentence from the essay. The sentence should NOT be deleted because it:
F. describes Méliès's ability as a magician, which is important to understanding the essay.
G. begins to explain the techniques of trick photography that Méliès eventually learned.
H. creates a transition that provides a further connection between Méliès the magician and Méliès the filmmaker.
J. indicates that Méliès's interest in learning about trick photography existed before his interest in magic.
37. Given that all the choices are true, which one would best conclude this sentence so that it illustrates Méliès's skill and inventiveness?
A. NO CHANGE
B. he used effects commonly seen in his stage productions.
C. his actors could enter and leave the scene.
D. he perfected eerie film entrances and exits.
38. F. NO CHANGE
G. exceeding highly
H. high excessively
J. exceedingly high
39. A. NO CHANGE
B. fired
C. fired from and consequently projected
D. fired and thereby propelled

GO ON TO THE NEXT PAGE.



In a strange terrain filled with hostile creatures, the
40
space travelers experience many adventures. They
escape back to Earth in the capsule by falling off the
edge of the moon, landing in the ocean, they bob
41
around until a passing ship finally rescues them.

Producing the film long before
interplanetary explorations had begun,
42

Méliès could arouse his audience's
43
curiosity with unconstrained fantasy.

People are still going to theaters to see
44
science fiction films.
44

40. F. NO CHANGE
G. creatures, who they now realize live there,
H. creatures, whom they are encountering,
J. creatures who are found there,
41. A. NO CHANGE
B. moon after landing
C. moon. Landing
D. moon, after landing
42. F. NO CHANGE
G. would of begun,
H. have began,
J. had begun,
43. Which of the following alternatives to the underlined word would be LEAST acceptable?
A. whet
B. stimulate
C. awaken
D. disturb
44. Given that all the choices are true, which one would most effectively express the writer's viewpoint about Méliès's role in science fiction filmmaking?
F. NO CHANGE
G. This first space odyssey provided the genesis for a film genre that still packs theaters.
H. Méliès made an important contribution to film-making many years ago.
J. In Méliès's production even the film crew knew a lot about space.

Question 45 asks about the preceding passage as a whole.

45. Suppose the writer's goal had been to write a brief essay highlighting the contributions a single artist can make to a particular art form. Would this essay fulfill that goal?
A. Yes, because the essay asserts that Méliès's work as a magician never would have succeeded without the contributions of the artists in the film industry.
B. Yes, because the essay presents Méliès as a magician who used his talents and curiosity to explore and excel in the film world.
C. No, because the essay focuses on the process of making science fiction films, not on a single artist's work.
D. No, because the essay suggests that it took many artists working together to create the success that Méliès enjoyed.

GO ON TO THE NEXT PAGE.

1



1

PASSAGE IV

Nancy Drew in the Twenty-First Century

I thought the Nancy Drew mystery series had
 went out of style. I was sure that girls growing up
⁴⁶
 today would have more up-to-date role models and my
 generation's favorite sleuth would of been retired to the
⁴⁷
 library's dusty, back rooms. I was wrong.
⁴⁸
 Nancy Drew, the teenaged heroine of heaps of young
⁴⁹
 adult mystery novels, is alive and well and still on the job.
⁵⁰
 I know because my niece, Liana, and her friends were
 reading that all summer long. By the time Liana went back
⁵¹
 to school and had followed Nancy Drew on a safari to
⁵²
 solve *The Spider Sapphire Mystery* and had explored Incan
⁵³
 ruins for clues to *The Secret of the Crossword Cipher*.
 With Nancy's help, Liana had read about different
⁵⁴
 places and various cultures all over the world.
⁵⁴

46. F. NO CHANGE
 G. gone out of
 H. went from
 J. gone from
47. A. NO CHANGE
 B. would have been
 C. would of
 D. DELETE the underlined portion.
48. F. NO CHANGE
 G. libraries dusty,
 H. libraries dusty
 J. library's dusty
49. Which choice provides the most specific information?
 A. NO CHANGE
 B. a high number
 C. hundreds
 D. plenty
50. F. NO CHANGE
 G. novels, is alive,
 H. novels is alive,
 J. novels is alive
51. A. NO CHANGE
 B. the mysteries
 C. up on that
 D. it over
52. F. NO CHANGE
 G. school, she had
 H. school, having
 J. school, she
53. A. NO CHANGE
 B. solve:
 C. solve;
 D. solve,
54. Given that all the choices are true, which one best illustrates the variety of settings for the Nancy Drew mysteries and also expresses Liana's interest in these books?
 F. NO CHANGE
 G. Along with Nancy, Liana had many breathtaking adventures involving all sorts of colorful characters.
 H. With Nancy in the lead, Liana had chased suspects from Arizona to Argentina, from Nairobi to New York.
 J. Through her exposure to Nancy, Liana learned about many new places around the world.

GO ON TO THE NEXT PAGE.



When I was a girl in the 1960s,
my friends and I loved Nancy Drew. 55
We loved her loyal companions, her bravado, and

there was a love for her freedom to do what she wanted.

56

We also loved how smart she was and how pretty, how
57
confident and successful. We were surprised and delighted
that eighteen-year-old Nancy was so accomplished at so

many things. She was able to solve crimes, win golf
58
tournaments, kick bad guys in the shins, and impress her
father's distinguished clients. She did it all—and without
scuffing her shoes or losing her supportive boyfriend, Ned.

Liana and her friends don't seem to care that Nancy is
pretty or popular. They laugh, mockingly I think, at
Nancy's friend Bess, who squeals at spiders. They prefer
her other girlfriend George, the judo expert and computer
whiz. They skip over the long descriptions of outfits and
fashion accessories. According to Liana, they just want to
get on with the story.

55. At this point, the writer is thinking about adding the following true statement:

One of a number of series that have featured the young female detective, the Nancy Drew Mystery Story series was begun in 1930 and now totals 173 books.

Should the writer make this addition here?

- A. Yes, because it supports statements about the longevity and popularity of this series.
 - B. Yes, because it helps to explain why the narrator "loved Nancy Drew."
 - C. No, because it distracts the reader from the main focus of this paragraph.
 - D. No, because it fails to include relevant information about the author of the series.
56. F. NO CHANGE
G. a love for her freedom to do what she wanted.
H. her freedom to do what she wanted.
J. the freedom to do as one wants.
57. Which of the following alternatives to the underlined portion would be LEAST acceptable?
- A. furthermore
 - B. therefore
 - C. likewise
 - D. DELETE the underlined portion.
58. F. NO CHANGE
G. was capable of solving crimes,
H. was good at crime solving,
J. solved crimes,

GO ON TO THE NEXT PAGE.



Perhaps I am overly optimistic, but I'd like to believe that Liana's generation doesn't love Nancy Drew because she's a successful girl detective. They don't need to be reminded that girls can be successful they know that.
 What these girls need and love are the stories themselves:
those exciting adventure tales spiced with mystery.

59. A. NO CHANGE
 B. successful they already know
 C. successful; they know
 D. successful, knowing
60. Which choice most effectively supports the point being made in the first part of this sentence?
 F. NO CHANGE
 G. the answers to the mysteries of their lives.
 H. a strong role model for their generation.
 J. the ability to overcome obstacles.

PASSAGE V

Visiting Mars on a Budget

With its distinctive red tint and its polar ice caps, the planet Mars has fascinated humans for thousands of years. There were ancient Babylonian astronomers who associated Mars with their war god Negral, to twentieth-century science fiction writers whose works become best-sellers, this planet has often been a symbol of ill will and danger.

The United States has competed with other countries to explore space. By 2003, the National Aeronautics and

Space Administration (NASA) would of sent thirty

spacecraft to the red planet, speculation has been prompted that a human voyage may no longer be the stuff of fiction.

61. A. NO CHANGE
 B. When
 C. From
 D. Those
62. Given that all the choices are true, which one is most relevant to the statement that follows in this sentence?
 F. NO CHANGE
 G. with their wild imaginations about outer space,
 H. who penned spine-tingling stories of "little green men from Mars,"
 J. who created images of Mars in literature,
63. Given that all the choices are true, which one best leads from the preceding paragraph to the subject of this paragraph?
 A. NO CHANGE
 B. Today, such negative associations seem to be dissipating.
 C. In 1958, the United States founded an agency to run its space program.
 D. Earth and Mars are both planets in the inner solar system.
64. F. NO CHANGE
 G. had sent
 H. send
 J. have sent
65. A. NO CHANGE
 B. to which speculation has prompted
 C. prompting speculation
 D. which is speculation

GO ON TO THE NEXT PAGE.



Few would deny that the idea of a human mission to Mars is exciting, who is ready to pay for such an expedition?

Recent reports suggest that the cost of a human voyage to Mars could run as high as 100 billion dollars. This is a startling number, especially in light of the fact that the International Space Station, the most ambitious NASA project yet, carried a projected price tag of “only” 17 billion dollars. In the end, NASA overspent on the

International Space Station. 68 One can only imagine

if the final price of a human voyage to Mars would be.

In contrast, the two Mars Rovers—robotic spacecraft launched in 2003—carried a combined price tag of less than one billion dollars. These Rovers are sophisticated pieces of

technology, with the capacity and ability to examine soil and rocks. Their equipment may answer questions that have long been posed about the presence of water and life on Mars.

66. F. NO CHANGE
G. Maybe a few
H. Although few
J. Few, if any,

67. A. NO CHANGE
B. yet
C. yet:
D. yet—

68. The writer is considering adding the following true information to the end of the preceding sentence (placing a comma after the word *Station*):

with a final construction cost of almost 30 billion dollars.

Should the writer make this addition?

- F. Yes, because it strengthens the assertion made in this sentence by adding explicit detail.
G. Yes, because it proves space flight will be more affordable in the future.
H. No, because it weakens the point made in the paragraph about the cost of human flight to Mars.
J. No, because it detracts from the essay’s focus on the human experience in travel to Mars.
69. A. NO CHANGE
B. what
C. how
D. DELETE the underlined portion.
70. Given that all the choices are true, which one most effectively describes what the Mars Rovers are?
F. NO CHANGE
G. which captured the imagination of the general public—
H. the products described at length in the media—
J. familiar to many who watched the news coverage at the time—

71. A. NO CHANGE
B. genuine capacity
C. potential capacity
D. capacity

GO ON TO THE NEXT PAGE.



Sending machines unaccompanied by humans to Mars does drain some of the romance out of aging or older
72

visions of space travel. In other words,
73 we need to keep in mind that the right equipment can accomplish as much as

any crew of scientists, if not more—such as a fraction of
74 the cost. Before any astronaut boards a spacecraft for that distant planet, the staggering expense of such a mission should be carefully considered. 75

72. F. NO CHANGE
G. old age
H. aging old
J. age-old

73. A. NO CHANGE
B. For that reason alone,
C. In that time frame,
D. Even so,

74. F. NO CHANGE
G. at
H. but only
J. DELETE the underlined portion.

75. The writer is considering ending the essay with the following statement:

With the passage of time, humans will continue to gaze in awe toward the heavenly skies as a source of inspiration and mystery.

Should the writer add this sentence here?

- A. Yes, because it captures the emotion that is the basis for the space exploration described in the essay.
B. Yes, because it invites the reader to reflect on the insignificance of money in relation to the mystery of space.
C. No, because it does not logically follow the essay's chronological history of people who traveled in space.
D. No, because it strays too far from the essay's focus on Mars and the cost of sending humans there.

END OF TEST 1

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

2



2

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. On level ground, a vertical rod 12 feet tall casts a shadow 4 feet long, and at the same time a nearby vertical flagpole casts a shadow 12 feet long. How many feet tall is the flagpole?

A. 4
B. 8
C. 12
D. 20
E. 36

2. Kalino earned 85, 95, 93, and 80 points on the 4 tests, each worth 100 points, given so far this term. How many points must he earn on his fifth test, also worth 100 points, to average 90 points for the 5 tests given this term?

F. 87
G. 88
H. 90
J. 92
K. 97

3. If $x = -5$, what is the value of $\frac{x^2 - 1}{x + 1}$?

A. -6
B. -4
C. 4
D. $5\frac{4}{5}$
E. 19

DO YOUR FIGURING HERE.**GO ON TO THE NEXT PAGE.**

2



2

4. Kaya ran $1\frac{2}{5}$ miles on Monday and $2\frac{1}{3}$ miles on Tuesday. What was the total distance, in miles, Kaya ran during those 2 days?

DO YOUR FIGURING HERE.

- F. $3\frac{2}{15}$
 G. $3\frac{3}{8}$
 H. $3\frac{2}{5}$
 J. $3\frac{7}{15}$
 K. $3\frac{11}{15}$
5. Consider the 3 statements below to be true.
 All insects that are attracted to honey are ants.
 Insect I is not an ant.
 Insect J is attracted to honey.
 Which of the following statements is necessarily true?
 A. Insect I is an ant not attracted to honey.
 B. Insect I is an ant attracted to honey.
 C. Insect I is attracted to honey.
 D. Insect J is not attracted to honey.
 E. Insect J is an ant.
6. What is the value of the expression $\sqrt{\frac{m}{x-3}}$ when $x = -1$ and $m = -16$?
 F. -2
 G. 2
 H. $2\sqrt{2}$
 J. $2i$
 K. $2i\sqrt{2}$
7. Tickets for a community theater production cost \$6 each when bought in advance and \$8 each when bought at the door. The theater group's goal is at least \$2,000 in ticket sales for opening night. The theater group sold 142 opening-night tickets in advance. What is the minimum number of tickets they need to sell at the door on opening night to make their goal?
 A. 143
 B. 144
 C. 192
 D. 250
 E. 357

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8. Mark and Juanita own a sandwich shop. They offer 3 kinds of bread, 5 kinds of meat, and 3 kinds of cheese. Each type of sandwich has a combination of exactly 3 ingredients: 1 bread, 1 meat, and 1 cheese. How many types of sandwiches are possible?

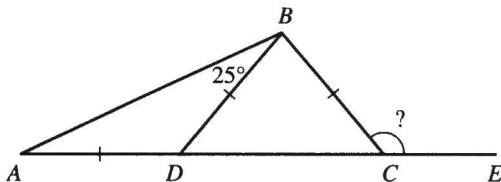
F. 11
G. 15
H. 30
J. 45
K. 120

DO YOUR FIGURING HERE.

9. If $12(x - 11) = -15$, then $x = ?$

A. $-\frac{49}{4}$
B. $-\frac{13}{6}$
C. $-\frac{5}{4}$
D. $-\frac{1}{3}$
E. $\frac{39}{4}$

10. In the figure below, A , D , C , and E are collinear. \overline{AD} , \overline{BD} , and \overline{BC} are all the same length, and the angle measure of $\angle ABD$ is as marked. What is the degree measure of $\angle BCE$?



F. 50°
G. 100°
H. 105°
J. 130°
K. 160°

11. If $f(x) = 9x^2 + 5x - 8$, then $f(-2) = ?$

A. -54
B. -18
C. 18
D. 36
E. 38

12. What is the least common multiple of 30, 20, and 70?

F. 40
G. 42
H. 120
J. 420
K. 42,000

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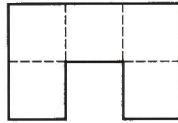


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13. While doing a problem on his calculator, Tom meant to divide a number by 2, but instead he accidentally multiplied the number by 2. Which of the following calculations could Tom then do to the result on the calculator screen to obtain the result he originally wanted?
- A. Subtract the original number
 - B. Multiply by 2
 - C. Multiply by 4
 - D. Divide by 2
 - E. Divide by 4

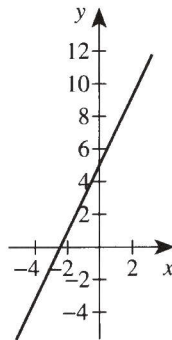
DO YOUR FIGURING HERE.

14. The 8-sided figure below is divided into 5 congruent squares. The total area of the 5 squares is 125 square inches. What is the perimeter, in inches, of the figure?
- F. 25
 - G. 60
 - H. 80
 - J. 100
 - K. 125



15. Hai has \$100 available to buy USB drives to back up data for his business computers. Each USB drive has a price of \$8, and Hai will pay a sales tax of 7% of the total price of the USB drives. What is the maximum number of USB drives Hai can buy?
- A. 11
 - B. 12
 - C. 13
 - D. 14
 - E. 15
16. A certain computer performs 1.5×10^8 calculations per second. How many seconds would it take this computer to perform 6.0×10^{16} calculations?
- F. 2.5×10^{-9}
 - G. 9.0×10^0
 - H. 4.0×10^2
 - J. 4.0×10^8
 - K. 9.0×10^{24}

17. One of the following is an equation of the linear relation shown in the standard (x,y) coordinate plane below. Which equation is it?



- A. $y = 5x$
- B. $y = 2x$
- C. $y = 5x + 2$
- D. $y = 2x - 5$
- E. $y = 2x + 5$

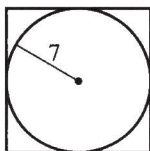
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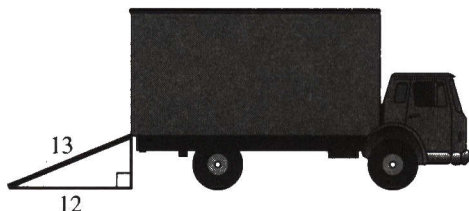
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18. A square is circumscribed about a circle of 7-foot radius, as shown below. What is the area of the square, in square feet?



DO YOUR FIGURING HERE.

- F. 49
G. 56
H. 98
J. 49π
K. 196
19. Two workers were hired to begin work at the same time. Worker A's contract called for a starting salary of \$20,000 with an increase of \$800 after each year of employment. Worker B's contract called for a starting salary of \$15,200 with an increase of \$2,000 after each year of employment. If x represents the number of full years' employment (that is, the number of yearly increases each worker has received), which of the following equations could be solved to determine the number of years until B's yearly salary equals A's yearly salary?
- A. $20,000 + 800x = 15,200 + 2,000x$
B. $20,000 + 2,000x = 15,200 + 800x$
C. $(20,000 + 800)x = (15,200 + 2,000)x$
D. $(2,000 + 800)x = 20,000 - 15,200$
E. $(2,000 - 800)x = 20,000 + 15,200$
20. A ramp for loading trucks is 13 feet long and covers 12 feet along the level ground, as shown below. How many feet high is the highest point on the ramp?



- F. 1
G. 2
H. 4
J. 5
K. $6\frac{1}{4}$

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21. The expression $7(x + 3) - 3(2x - 2)$ is equivalent to:

DO YOUR FIGURING HERE.

- A. $x + 1$
- B. $x + 15$
- C. $x + 19$
- D. $x + 23$
- E. $x + 27$

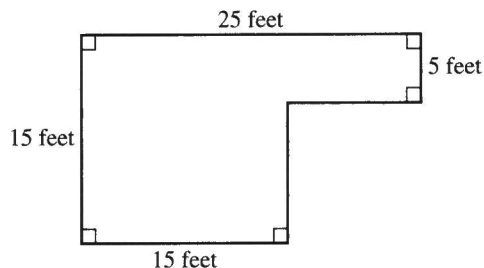
22. If 115% of a number is 460, what is 75% of the number?

- F. 280
- G. 300
- H. 320
- J. 345
- K. 400

23. When $(2x - 3)^2$ is written in the form $ax^2 + bx + c$, where a , b , and c are integers, $a + b + c = ?$

- A. -17
- B. -5
- C. 1
- D. 13
- E. 25

24. What is the area, in square feet, of the figure below?



- F. 60
- G. 80
- H. 275
- J. 375
- K. 450

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DO YOUR FIGURING HERE.

25. Barb is going to cover a rectangular area 8 feet by 10 feet with rectangular paving blocks that are 4 inches by 8 inches by 2 inches to make a flat patio. What is the minimum number of paving blocks she will need if all the paving blocks will face the same direction?

(Note: Barb will not cut any of the paving blocks.)

- A. 80
 - B. 360
 - C. 601
 - D. 960
 - E. 1,213
26. What is the slope of the line represented by the equation $6y - 14x = 5$?
- F. -14
 - G. $\frac{5}{6}$
 - H. $\frac{7}{3}$
 - J. 6
 - K. 14
27. Let m and n be 2 positive integers, such that $m < n$. Which of the following compound inequalities *must* be true?
- A. $0 < \sqrt{mn} < m$
 - B. $1 < \sqrt{mn} < m$
 - C. $m < \sqrt{mn} < n$
 - D. $\sqrt{m} < \sqrt{mn} < \sqrt{n}$
 - E. $\sqrt{m-n} < \sqrt{mn} < \sqrt{m+n}$
28. Two similar triangles have perimeters in the ratio 3:5. The sides of the smaller triangle measure 3 cm, 5 cm, and 7 cm, respectively. What is the perimeter, in centimeters, of the larger triangle?
- F. 15
 - G. 18
 - H. 20
 - J. 25
 - K. 36

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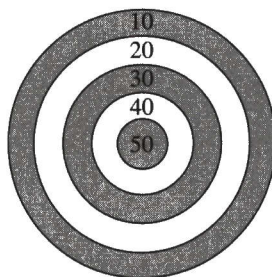


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29. Thomas and Jonelle are playing darts in their garage using the board with the point values for each region shown below. The radius of the outside circle is 10 inches, and each of the other circles has a radius 2 inches smaller than the next larger circle. All of the circles have the same center. Thomas has only 1 dart left to throw and needs at least 30 points to win the game. Assuming that his last dart hits at a random point within a single region on the board, what is the percent chance that Thomas will win the game?

DO YOUR FIGURING HERE.

- A. 36%
- B. 30%
- C. 16%
- D. 9%
- E. $1\frac{1}{2}\%$



30. When asked his age, the algebra teacher said, "If you square my age, then subtract 23 times my age, the result is 50." How old is he?
- F. 23
 - G. 25
 - H. 27
 - J. 46
 - K. 50
31. The distance, d , an accelerating object travels in t seconds can be modeled by the equation $d = \frac{1}{2}at^2$, where a is the acceleration rate, in meters per second per second. If a car accelerates from a stop at the rate of 20 meters per second per second and travels a distance of 80 meters, about how many seconds did the car travel?
- A. Between 1 and 2
 - B. Between 2 and 3
 - C. Between 3 and 4
 - D. 4
 - E. 8
32. Which of the following is the set of all real numbers x such that $x + 3 > x + 5$?
- F. The empty set
 - G. The set containing all real numbers
 - H. The set containing all negative real numbers
 - J. The set containing all nonnegative real numbers
 - K. The set containing only zero

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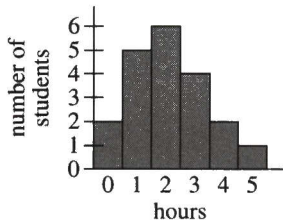


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Use the following information to answer questions 33–35.

DO YOUR FIGURING HERE.

A survey in a study skills class asked the 20 students enrolled in the class how many hours (rounded to the nearest hour) they had spent studying on the previous evening. The 20 responses are summarized by the histogram below.



33. What fraction of the students responded that they had spent less than 3 hours studying?
- A. $\frac{13}{100}$
 B. $\frac{1}{5}$
 C. $\frac{3}{10}$
 D. $\frac{13}{20}$
 E. $\frac{17}{20}$
34. The teacher decides to show the data in a circle graph (pie chart). What should be the measure of the central angle of the sector for 3 hours?
- F. 18°
 G. 20°
 H. 36°
 J. 72°
 K. 90°
35. To the nearest tenth of an hour, what is the average number of hours for the 20 survey responses?
- A. 2.0
 B. 2.1
 C. 2.3
 D. 2.5
 E. 3.0

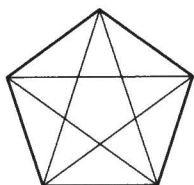
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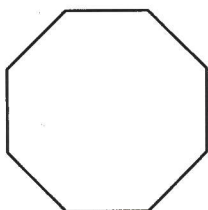
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36. Pentagons have 5 diagonals, as illustrated below.



DO YOUR FIGURING HERE.

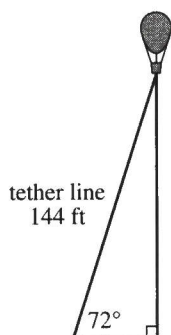
How many diagonals does the octagon below have?



- F. 8
- G. 16
- H. 20
- J. 30
- K. 40

37. The bottom of the basket of a hot-air balloon is parallel to the level ground. One taut tether line 144 feet long is attached to the center of the bottom of the basket and is anchored to the ground at an angle of 72° , as shown in the figure below. Which of the following expressions gives the distance, in feet, from the center of the bottom of the basket to the ground?

- A. $\frac{144}{\cos 72^\circ}$
- B. $\frac{144}{\sin 72^\circ}$
- C. $144 \tan 72^\circ$
- D. $144 \cos 72^\circ$
- E. $144 \sin 72^\circ$



38. The coordinates of the endpoints of \overline{GH} , in the standard (x,y) coordinate plane, are $(-8,-3)$ and $(2,3)$. What is the x -coordinate of the midpoint of \overline{GH} ?

- F. -6
- G. -3
- H. 0
- J. 3
- K. 5

GO ON TO THE NEXT PAGE.



DO YOUR FIGURING HERE.

39. Let $2x + 3y = 4$ and $5x + 6y = 7$. What is the value of $8x + 9y$?

A. -10
 B. -1
 C. 2
 D. 7
 E. 10

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

F. $\frac{\pi}{4}$ and $\frac{3\pi}{4}$ only
 G. $\frac{3\pi}{4}$ and $\frac{5\pi}{4}$ only
 H. $\frac{3\pi}{4}$ and $\frac{7\pi}{4}$ only
 J. $\frac{5\pi}{4}$ and $\frac{7\pi}{4}$ only
 K. $\frac{\pi}{4}$, $\frac{3\pi}{4}$, $\frac{5\pi}{4}$, and $\frac{7\pi}{4}$

41. For the complex number i and an integer x , which of the following is a possible value of i^x ?

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

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

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

F. $2\frac{2}{3}$
 G. 4
 H. 5
 J. $6\frac{2}{3}$
 K. 8

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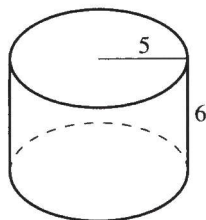


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43. The height and radius of the right circular cylinder below are given in meters. What is the volume, in cubic meters, of the cylinder?

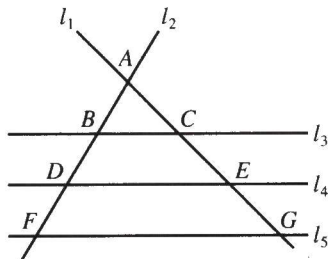
DO YOUR FIGURING HERE.

- A. 30π
B. 31π
C. 150π
D. 180π
E. 900π

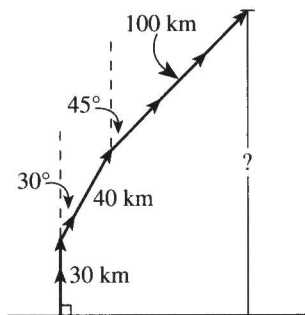


44. Lines l_1 and l_2 intersect each other and 3 parallel lines, l_3 , l_4 , and l_5 , at the points shown in the figure below. The ratio of the perimeter of $\triangle ABC$ to the perimeter of $\triangle AFG$ is 1:3. The ratio of DE to FG is 2:3. What is the ratio of AC to CE ?

- F. 1:1
G. 1:2
H. 1:3
J. 2:1
K. 3:1



45. A rocket lifted off from a launch pad and traveled vertically 30 kilometers, then traveled 40 kilometers at 30° from the vertical, and then traveled 100 kilometers at 45° from the vertical, as shown in the figure below. At that point, the rocket was how many kilometers above the height of the launch pad?



- A. 100
B. 170
C. 190
D. $20\sqrt{3} + 50\sqrt{2}$
E. $30 + 20\sqrt{3} + 50\sqrt{2}$

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46. Machine A produces 500 springs a day. The number of defective springs produced by this machine each day is recorded for 60 days. Based on the distribution given below, what is the expected value of the number of defective springs produced by Machine A in any single day?

DO YOUR FIGURING HERE.

Number, n , of defective springs produced	Probability that n defective springs are produced in any single day
0	0.70
1	0.20
2	0.05
3	0.05

- F. 0.00
G. 0.45
H. 0.70
J. 1.00
K. 1.50
47. The height above the ground, h units, of an object t seconds after being thrown from the top of a building is given by the equation $h = -2t^2 + 10t + 48$. An equivalent factored form of this equation shows that the object:
- A. starts at a point 2 units off the ground.
B. reaches a maximum height of 3 units.
C. reaches a maximum height of 8 units.
D. reaches the ground at 3 seconds.
E. reaches the ground at 8 seconds.
48. For all positive values of g and h , which of the following expressions is equivalent to $g^2\sqrt{g^5} \cdot h^2\sqrt[4]{h^5}$?
- F. $g^2h^2\sqrt[5]{g^2h^2}$
G. $g^3h^4\sqrt[4]{g^2h^3}$
H. $g^4h^3\sqrt[4]{g^2h}$
J. $g^4h^4\sqrt{gh}$
K. g^7h^7
49. The value of $\log_5\left(5^{\frac{13}{2}}\right)$ is between which of the following pairs of consecutive integers?
- A. 0 and 1
B. 4 and 5
C. 5 and 6
D. 6 and 7
E. 9 and 10

GO ON TO THE NEXT PAGE.

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Use the following information to answer questions 50–52.

DO YOUR FIGURING HERE.

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

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

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

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

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

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

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

F. $2^3 \cdot x$
 G. 2^{3x}
 H. $2^{(2+x)}$
 J. $2(x+1)^2$
 K. $(x+2)^2$

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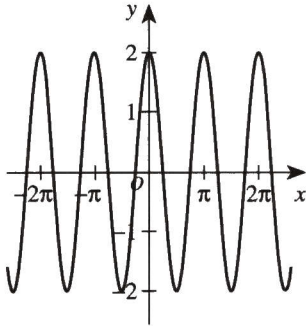
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53. A trigonometric function with equation $y = a \sin(bx + c)$, where a , b , and c are real numbers, is graphed in the standard (x,y) coordinate plane below. The *period* of this function $f(x)$ is the smallest positive number p such that $f(x + p) = f(x)$ for every real number x . One of the following is the period of this function. Which one is it?

DO YOUR FIGURING HERE.



- A. $\frac{\pi}{2}$
 B. π
 C. 2π
 D. 4π
 E. 2
54. The component forms of vectors \mathbf{u} and \mathbf{v} are given by $\mathbf{u} = \langle 5, 3 \rangle$ and $\mathbf{v} = \langle 2, -7 \rangle$. Given that $2\mathbf{u} + (-3\mathbf{v}) + \mathbf{w} = \mathbf{0}$, what is the component form of \mathbf{w} ?
- F. $\langle -16, 15 \rangle$
 G. $\langle -4, -27 \rangle$
 H. $\langle 3, 10 \rangle$
 J. $\langle 4, 27 \rangle$
 K. $\langle 16, -15 \rangle$
55. For how many integers x is the equation $3^{x+1} = 9^{x-2}$ true?
- A. 0
 B. 1
 C. 2
 D. 3
 E. An infinite number

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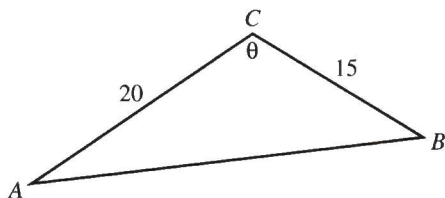
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56. In $\triangle ABC$ shown below, the length of \overline{AC} and the measure of θ will remain constant. The length of \overline{AC} is 20 inches and the measure of $\angle C$ is equal to θ . Initially, the length of \overline{BC} is 15 inches, and the length of \overline{BC} is the function given by $f(t) = 15 - 2t$, where t is time, in seconds, since the length of \overline{BC} began to decrease. What is the time, t , at which the resulting triangle will have an area that is $\frac{1}{2}$ the area of the original triangle?

(Note: The area of a triangle is $\frac{1}{2}ab \sin x$, where a and b are the lengths of the sides that form the interior angle with measure x .)



- F. 0
G. $\frac{15}{8}$
H. $\frac{15}{4}$
J. $\frac{45}{8}$
K. $\frac{45}{4}$

57. Which of the following expressions gives the number of distinct permutations of the letters in PEOPLE ?

- A. $6!$
B. $4(4!)$
C. $\frac{6!}{4!}$
D. $\frac{6!}{2!}$
E. $\frac{6!}{(2!)(2!)}$

DO YOUR FIGURING HERE.

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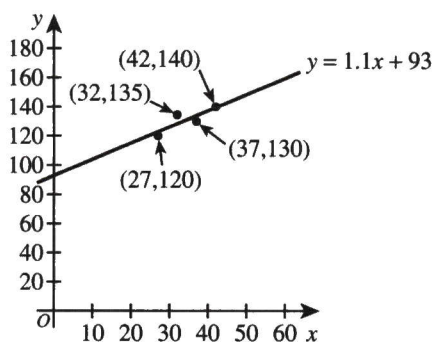
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58. Which of the following expressions is equivalent to $49x^2 + 81$?

DO YOUR FIGURING HERE.

- F. $(7x + 9)^2$
 G. $(7x + 9i)^2$
 H. $(7x - 9i)^2$
 J. $(7x - 9)(7x + 9)$
 K. $(7x - 9i)(7x + 9i)$

59. A bivariate data set of observed values along with a line of best fit for the data set are shown in the standard (x,y) coordinate plane below. The set of 4 residuals for the model is given by $y_i - y(x_i)$, for $i = 1, 2, 3, 4$, where y_i is the observed y -value corresponding to the input x_i , and $(x_i, y(x_i))$ is on the line of best fit. What is the absolute value of the largest residual for this model?



- A. 2.5
 B. 6.8
 C. 15.0
 D. 20.0
 E. 42.0

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60. For the first 5 possible values of x , the table below gives the probability, $P(x)$, that a certain factory machine will make x errors on any given workday.

x errors	$P(x)$
0	0.0823
1	0.2185
2	0.2712
3	0.2046
4	0.1238

Which of the following values is closest to the probability that this machine will make at least 1 error on any given workday?

- F. 0.2185
- G. 0.5996
- H. 0.6992
- J. 0.8181
- K. 0.9177

DO YOUR FIGURING HERE.

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.

READING TEST

35 Minutes—40 Questions

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

Passage I

PROSE FICTION: This passage is adapted from the novel *The Fisher King* by Paule Marshall (©2000 by Paule Marshall).

It was nearing the end of the second set, the jazz show winding down when Hattie heard Abe Kaiser at the microphone call Everett Payne's name. Heard his name and, to her surprise, saw him slowly stand up in the bullpen up front. She hadn't seen him join the other local musicians, including Shades Bowen with his tenor sax, in what was called the bullpen, which was simply a dozen or so chairs grouped near the bandstand. The young locals gathered there each Sunday evening, hoping for a chance to perform. Because toward the end of the final set, the custom was to invite one or two of them to sit in with the band. They sometimes even got to choose the tune they wanted to play.

This Sunday, Everett Payne, not long out of the army, was the one being invited to sit in.

Breath held, Hattie watched him separate himself from the hopefuls and approach the stand, taking his time, moving with what almost seemed a deliberate pause between each step. The crowd waiting.

That was his way, Hattie knew. His body moving absentmindedly through space, his head, his thoughts on something other than his surroundings, and his eyes like a curtain he occasionally drew aside a fraction of an inch to peer out at the world. A world far less interesting than the music inside his head.

She watched now as he slowly mounted the bandstand and conferred with the bassist and drummer, those two were all he would need. Then, without announcing the name of the tune he intended playing, without in any way acknowledging the audience, he sat down at the piano and brought his hands—large hands, the fingers long and splayed and slightly arched—down on the opening bars of "Sonny Boy Blue."

"Sonny Boy Blue!" That hokey-doke tune!

Around her, the purists looked askance at each other from behind their regulation shades and slouched deeper in their chairs in open disgust.

At first, hokey though it was, he played the song straight through as written, the rather long introduction, verse, and chorus. And he did so with great care, although at a slower tempo than was called for and with a formality that lent the Tin Pan Alley tune a depth and thoughtfulness no one else would have accorded it.

Quickly taking their cue from him, the bassist reached for his bow, the drummer for his brushes, the two of them also treating the original as if it were a serious piece of music.

Everett Payne took his time paying his respects to the tune as written, and once that was done, he hunched closer to the piano, angled his head sharply to the left, completely closed the curtain of his gaze, and with his hands commanding the length and breadth of the keyboard he unleashed a dazzling pyrotechnic of chords (you could almost see their colors), polyrhythms, seemingly unrelated harmonies, and ideas—fresh, brash, outrageous ideas. It was an outpouring of ideas and feelings informed by his own brand of lyricism and lit from time to time by flashes of the recognizable melody. He continued to acknowledge the little simple-minded tune, while at the same time furiously recasting and reinventing it in an image all his own.

A collective in-suck of breath throughout the club.

Where, Hattie wondered, did he come by the dazzling array of ideas and wealth of feeling? What was the source? It had to do, she speculated, listening intently, with the way he held his head, angled to the left like that, tilted toward both heaven and earth. His right side, his right ear directed skyward, hearing up there, in the Upper Room among the stars Mahalia sang about, a new kind of music: splintered, atonal, profane, and possessing a wonderful dissonance that spoke to him, to his soul-case. For him, this was the true music of the spheres, of the maelstrom up there. When at the piano, he kept his right ear tuned to it at all times, letting it guide him, inspire him. His other ear? It remained earthbound, trained on the bedrock that for him was Bach and the blues.

Again and again he took them on a joyous, terrifying roller coaster of a ride it seemed to Hattie, and when he finally deposited them on terra firma after close to twenty minutes, everyone in Putnam Royal

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could only sit there as if they were in church and weren't supposed to clap. Overcome. Until finally Alvin Edwards, who lived on Decatur Street and played trumpet in the school band, leaped to his feet and renamed him.

Alvin brought everyone up with him. Including the purists who normally refused to applaud even genius. They too stood up in languid praise of him.

1. It can reasonably be inferred from the passage that Shades Bowen:
 - A. did not accompany Everett Payne as he played "Sonny Boy Blue."
 - B. had been in the army with Everett Payne.
 - C. was the oldest musician in the bullpen.
 - D. did not usually allow the local musicians to play with the band.
2. The main purpose of the statement in line 62 is to:
 - F. illustrate the high expectations the audience initially had for Everett Payne's performance.
 - G. inform the reader of the audience's reaction to Everett Payne's performance.
 - H. counteract the narrator's description of Everett Payne's performance.
 - J. provide proof that Everett Payne was well known to the audience.
3. The passage most strongly suggests that the second set of the jazz shows at the club is:
 - A. the final set.
 - B. much longer than the first set.
 - C. followed by a third set on Sunday nights.
 - D. performed solely by the musicians in the bullpen.
4. Which of the following details is used in the passage to indicate how the purists in the audience initially reacted to Everett Payne's choice of music?
 - F. The overall silence of the audience, including the purists
 - G. The description of the audience's collective in-suck of breath
 - H. The posture the purists assumed in their seats
 - J. The fact that the purists stood up
5. According to the narrator, what did Hattie see Everett Payne do prior to playing "Sonny Boy Blue"?
 - A. Move quickly from his seat to the bandstand
 - B. Study the audience around him
 - C. Confer with the bassist and the drummer
 - D. Announce the name of the tune he was going to play
6. The passage initially portrays the purists most nearly as:
 - F. knowledgeable and open minded.
 - G. snobbish and intolerant.
 - H. rational and well educated.
 - J. inexperienced and uninhibited.
7. It can reasonably be inferred from the passage that Hattie believed Bach and the blues were the:
 - A. musical influences that Everett Payne tried to avoid representing when he played piano.
 - B. foundation of Everett Payne's inventive piano playing.
 - C. true music of the heavens that inspired Everett Payne's creativity as a piano player.
 - D. reason why Everett Payne's piano-playing abilities limited him to Tin Pan Alley tunes.
8. According to the passage, when Everett Payne first played "Sonny Boy Blue" straight through, he did so:
 - F. more slowly than was intended by the composer.
 - G. after it had been suggested by Abe Kaiser.
 - H. against the wishes of the bassist and drummer.
 - J. without following the original tune.
9. According to the passage, Hattie speculated that the source of Everett Payne's musical ideas and feelings during "Sonny Boy Blue" was in:
 - A. the way he tilted his head.
 - B. the simplemindedness of the song.
 - C. his ability to play with great formality.
 - D. his connection with the silent audience.
10. The narrator states that to Hattie, Everett Payne's performance was:
 - F. overly slow and formal.
 - G. deliberate yet absentminded.
 - H. like a song played in a church.
 - J. a roller coaster of a ride.

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Passage II

SOCIAL STUDIES: This passage is adapted from Richard Moe's article "Mindless Madness Called Sprawl," based on a speech he gave on November 30, 1996, in Fresno, California (©1996 by Richard Moe).

At the time he gave the speech, Moe was president of the National Trust for Historic Preservation.

Drive down any highway leading into any town in the country, and what do you see? Fast-food outlets, office parks and shopping malls rising out of vast barren plains of asphalt. Residential subdivisions spreading like inkblots obliterating forests and farms in their relentless march across the landscape. Cars moving sluggishly down the broad ribbons of pavement or halting in frustrated clumps at choked intersections. You see communities drowning in a destructive, soulless, ugly mess called sprawl.

Many of us have developed a frightening form of selective blindness that allows us to pass by the appalling mess without really seeing it. We've allowed our communities to be destroyed bit by bit, and most of us have shrugged off this destruction as "the price of progress."

Development that destroys communities isn't progress. It's chaos. And it isn't inevitable, it's merely easy. Too many developers follow standard formulas, and too many government entities have adopted laws and policies that constitute powerful incentives for sprawl.

Why is an organization like the National Trust for Historic Preservation so concerned about sprawl? We're concerned because sprawl devastates older communities, leaving historic buildings and neighborhoods underused, poorly maintained or abandoned. We've learned that we can't hope to revitalize these communities without doing something to control the sprawl that keeps pushing further and further out from the center.

But our concern goes beyond that, because preservation today is about more than bricks and mortar. There's a growing body of grim evidence to support our belief that the destruction of traditional downtowns and older neighborhoods—places that people care about—is corroding the very sense of community that helps bind us together as a people and as a nation.

One form of sprawl—retail development that transforms roads into strip malls—is frequently spurred on by discount retailers, many of whom are now concentrating on the construction of superstores with more than 200,000 square feet of space. In many small towns, a single new superstore may have more retail space than the entire downtown business district. When a store like that opens, the retail center of gravity shifts away from Main Street. Downtown becomes a ghost town.

Sprawl's other most familiar form—spread-out residential subdivisions that "leapfrog" from the urban

fringe into the countryside—is driven largely by the American dream of a detached home in the middle of a grassy lawn. Developers frequently claim they can build more "affordable" housing on the edge of town—but "affordable" for whom?

The developer's own expenses may be less, and the home buyer may find the prices attractive—but who picks up the extra costs of fire and police protection, new roads and new utility infrastructure in these outlying areas? We all do, in the form of higher taxes for needless duplication of services and infrastructure that already exist in older parts of our cities and towns.

People who say that sprawl is merely the natural product of marketplace forces at work fail to recognize that the game isn't being played on a level field. Government at every level is riddled with policies that mandate or encourage sprawl.

By prohibiting mixed uses and mandating inordinate amounts of parking and unreasonable setback requirements, most current zoning laws make it impossible—even illegal—to create the sort of compact walkable environment that attracts us to older neighborhoods and historic communities all over the world. These codes are a major reason why 82 percent of all trips in the United States are taken by car. The average American household now allocates more than 18 percent of its budget to transportation expenses, most of which are auto-related. That's more than it spends for food and three times more than it spends for health care.

Our communities should be shaped by choice, not by chance. One of the most effective ways to reach this goal is to insist on sensible land-use planning. The way we zone and design our communities either opens up or forecloses alternatives to the automobile. Municipalities should promote downtown housing and mixed-use zoning that reduce the distances people must travel between home and work. The goal should be an integrated system of planning decisions and regulations that knit communities together instead of tearing them apart. We should demand land-use planning that exhibits a strong bias in favor of existing communities.

11. The principal aim of the passage can best be classified as:
 - A. persuasive.
 - B. explanatory.
 - C. descriptive.
 - D. narrative.

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12. Among the following quotations from the passage, the one that best summarizes what the author would like to see happen is:
- F. "laws and policies that constitute powerful incentives for sprawl" (lines 20–22).
 - G. "the destruction of traditional downtowns" (line 34).
 - H. "'affordable' housing on the edge of town" (line 53).
 - J. "an integrated system of planning decisions and regulations" (lines 87–88).
13. The last paragraph differs from the first paragraph in that in the last paragraph the author:
- A. asks a question and then answers it.
 - B. uses more statistics to support his arguments.
 - C. incorporates more emotional language.
 - D. offers solutions rather than stating a problem.
14. In the passage, the author answers all of the following questions EXCEPT:
- F. How long has sprawl been happening in US cities?
 - G. Is development synonymous with progress?
 - H. What is one major reason that people in the United States use automobiles so much?
 - J. What should communities do to combat sprawl?
15. The author states that one superstore may do all of the following EXCEPT:
- A. have more retail space than an entire downtown.
 - B. lead to serious downtown renovations.
 - C. make the downtown area into a ghost town.
 - D. shift the center of gravity away from downtown.
16. The statistics cited by the author in the tenth paragraph (lines 67–79) are used to illustrate the concept that:
- F. allowing mixed uses of land leads to environmental destruction.
 - G. current zoning laws help create a compact, walkable environment.
 - H. land-use regulations now in effect increase the overall costs of transportation.
 - J. Americans spend too much of their budgets on food and health care.
17. One form of sprawl the author describes is retail development that:
- A. adjoins existing downtown areas.
 - B. utilizes historic buildings.
 - C. turns roads into strip malls.
 - D. promotes a sense of community around a superstore.
18. As it is used in line 51, the word *detached* most nearly means:
- F. objective.
 - G. set apart.
 - H. broken apart.
 - J. taken away.
19. The author uses the statement "The game isn't being played on a level field" (line 64) most nearly to mean that:
- A. cities needlessly duplicate essential services.
 - B. higher taxes for some people make their lives more difficult.
 - C. marketplace forces are at work.
 - D. governmental decisions influence marketplace forces.
20. The phrase *mixed uses* (line 67) most likely refers to:
- F. having large parking lots around even larger stores.
 - G. preserving and restoring historic neighborhoods.
 - H. ensuring that automobiles cannot be driven to the various local businesses.
 - J. allowing one area to contain various types of development.

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Passage III

HUMANITIES: This passage is adapted from the essay “My Life with a Field Guide” by Diana Kappel-Smith (©2002 by Phi Beta Kappa Society).

I was seventeen when it started. My family was on vacation, and one day we went on a nature walk led by a young man a few years older than I. Probably I wanted to get his attention—I’m sure I did—so I pointed to a flower and asked, “What’s that?”

“Hmmm? Oh, just an aster,” he said.

Was there a hint of a sniff as he turned away? There was! It was just an aster and I was just a total ignoramus!

And I remember the aster. Its rays were a brilliant purple, its core a dense coin of yellow velvet. It focused light as a crystal will. It faced the sun; it was the sun’s echo.

Later that day, a book with a green cover lay on the arm of a chair under an apple tree. It was the same volume that our guide had carried as he marched us through the woods. The book had been left there, by itself. It was a thing of power. In the thin summer shadow of the tree, quivering, like a veil, the book was revealed, and I reached for it. A **FIELD GUIDE TO WILD FLOWERS—PETERSON & McKENNY**, its cover said. Its backside was ruled like a measuring tape, its inside was full of drawings of flowers. By the end of that week I had my own copy. I have it still.

Over the next several years this field guide would become my closest companion, a slice of worldview, as indispensable as eyes or hands. I didn’t arrive at this intimacy right away, however. This wasn’t going to be an easy affair for either of us.

I’ll give you an example of how it went. After I’d owned the Peterson’s for about a week, I went on a hike with some friends up a little mountain, taking the book along. Halfway up the mountain, there by the trailside was a yellow flower, a nice opportunity to take my new guide for a test drive. “Go on ahead!” I said to my hiking companions, “I’ll be a minute . . .” Famous last words.

I had already figured out the business of the book’s colored tabs. I turned in an authoritative way to the Yellow part and began to flip through. By the time the last of my friends had disappeared up the trail, I’d arrived at a page where things looked right. Five petals? Yes. Pinnate leaves? Whatever. Buttercup? There are, amazingly, *eleven* buttercups. Who would have thought? However hard I tried to make it so, my item was not one of them. Next page. Aha! this looked more like it. Bushy cinquefoil? Nope, leaves not *quiiiite* right, are they? As the gnats descended, I noticed that there were six more pages ahead, each packed with five-petaled yellow flowers—St. Johnsworts, loose-strifes, puccoons.

Why I persisted in carrying it around and consulting its crowded pages at every opportunity, I have no idea. The book was stubborn; well, I was stubborn, too; that was part of it. And I had no choice, really, not if I wanted to *get in*. A landscape may be handsome in the aggregate, but this book led to the particulars, and that’s what I wanted. A less complete guide would have been easier to start with, but more frustrating in the end. A more complete book would have been impossible for me to use. So I persisted in wrestling with the Peterson’s, and thus by slow degrees the crowd of plant stuff in the world became composed of individuals. As it did, the book changed: its cover was stained by water and snack food, the spine grew invitingly lax, and some of the margins sprouted cryptic annotations.

By the time the next summer came, I had fully discovered the joy of the hunt, and every new species had its trophy of data—name and place and date—to be jotted down. If I’d found a flower before, I was happy to see it again. I often addressed it with enthusiasm: *Hi there, Solidago hispida!* I discovered early on that a plant’s Latin name is a name of power by which the plant can be uniquely identified among different spoken tongues, across continents, and through time. The genus name lashes it firmly to its closest kin, while its species name describes a personal attribute—*rubrum* meaning red, *officinale* meaning medicinal, *odoratus* meaning smelly, and so on. It all makes such delightful sense!

My friend Julie and I identified individual plants in our rambles, but from the particulars we began to know wholes. Bogs held one community, montane forests held another, and the plants they held in common were clues to intricate dramas of climate change and continental drift. So from plant communities it followed that the grand schemes of things, when they came our way, arrived rooted in real place and personal experience: quaternary geology, biogeography, evolutionary biology all lay on the road that we had begun to travel.

21. The passage is best described as being told from the point of view of someone who is:
- A. tracing her developing interest in identifying flowers and in the natural world.
 - B. reexamining the event that led her to a lifelong fascination with asters.
 - C. reviewing her relationships with people who have shared her interest in flowers.
 - D. describing how her hobby of identifying flowers became a profitable career.

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22. As portrayed by the author, the young man responded to her question about the flower with what is best described as:
- F. acceptance.
 - G. surprise.
 - H. condescension.
 - J. anger.
23. What name, if any, does the author report assigning to the yellow flower she came across during a mountain hike?
- A. St. Johnswort
 - B. Loosestrife
 - C. Puccoon
 - D. The passage doesn't name the flower.
24. Looking back at her early experiences with the Peterson's, the author most strongly implies that the guide was:
- F. daunting at first, but in retrospect preferable to either a more or a less complete guide.
 - G. easy to use in the beginning, but more frustrating in the end than a more complete guide would have been.
 - H. impossible for her to follow until she started pairing it with a different guide written for beginners.
 - J. appealing initially until she realized how poorly illustrated its crowded pages were.
25. As it is used in line 56, the phrase *get in* most nearly means:
- A. arrive at a physical location.
 - B. be chosen for group membership.
 - C. truly understand the subject.
 - D. be friendly with someone.
26. The passage best supports which of the following conclusions about Julie?
- F. She has more experience than the author has in identifying flowers.
 - G. She owns a house that's close to either a bog or a montane forest.
 - H. She sees value in understanding the various communities of plants.
 - J. She stopped using the Peterson's as her primary source of flower information.
27. The author states that the Peterson's became her closest companion over a period of several:
- A. days.
 - B. weeks.
 - C. months.
 - D. years.
28. In the context of the passage, the author's statement in lines 56–58 most nearly means that she:
- F. learned to understand landscapes by looking at their overall patterns rather than their details.
 - G. found that landscapes lost their appeal the more she tried to understand them logically.
 - H. hoped to paint attractive portraits of landscapes by paying careful attention to details.
 - J. sought a deeper knowledge of landscapes through learning about their individual parts.
29. The details in lines 64–66 primarily serve to suggest the:
- A. poor craftsmanship the publishing company used in producing the Peterson's.
 - B. transformation the author's copy of the Peterson's underwent as a result of heavy use.
 - C. strange writing the author often encountered in reading the Peterson's.
 - D. carelessness with which the author used the Peterson's, much to her later regret.
30. The author refers to *Solidago hispida* as an example of a flower that she:
- F. had great trouble identifying the first time she stumbled upon it.
 - G. hopes to finally come across on one of her nature walks.
 - H. was pleased to encounter again after she had learned to identify it.
 - J. feels has an inappropriate name given the plant's characteristics.

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Passage IV

NATURAL SCIENCE: This passage is adapted from the article "When Research Is a Snow Job" by Sarah Boyle (©2002 by National Wildlife).

The figure is beyond comprehension: Every year, 1,000,000,000,000,000,000,000,000 (1 septillion) snowflakes fall worldwide. As the crystals fall, they encounter different atmospheric conditions that produce 5 flakes with unique attributes. The more complex those conditions are, the more elaborate the crystals.

Kenneth Libbrecht is a physicist at the California Institute of Technology. Along with the work of scientists at the U.S. Department of Agriculture's Agricultural Research Service (ARS), his research is 10 uncovering new information about the magical world of snow crystals—information that has practical applications in such diverse areas as agriculture and the production of electricity.

15 Snow crystals are individual crystals—usually in a hexagonal form—while snowflakes are collections of two or more snow crystals. Beginning as condensed water vapor, a crystal typically grows around a nucleus of dust. Its shape depends on how the six side facets— 20 or faces—grow in relation to the top and bottom facets. If they grow relatively tall, the crystal appears column-like; if the side facets are short compared to the length of the bottom and top facets, the crystal looks platelike.

Currently Libbrecht is trying to crack the problem 25 of why the crystal facets' growth varies with temperature. He believes this may have something to do with the ice surface's "quasi-liquid" layer, which affects how water molecules stick to the surface.

By manipulating the temperature and humidity 30 within an incubation chamber (and by adding an electric current or various gases at times), Libbrecht creates "designer" snowflakes in his lab. Such experiments are helping him determine how crystals form.

William Wergin, a retired ARS research biologist, 35 and a colleague, Eric Erbe, were using scanning electron microscopy to look at biological problems relating to agriculture. To avoid the laborious procedure that using such equipment usually entails, the two scientists decided to freeze the tissue they were working with and 40 look at it in the frozen state.

"One day it happened to be snowing," says Wergin, "and we were looking for a specimen. We imaged some snowflakes and were very surprised to see what we did." It was the first time anyone had 45 attempted to image snow crystals with scanning electron microscopy, which provides precise detail about the crystals' shape, structural features and metamorphosed conditions (crystals often change once on the ground depending on the surrounding environment).

Wergin called another ARS colleague, hydrologist 50 Albert Rango, to see if the snow crystal magnifications

had any applications for his research. Rango now uses Wergin's electron microscopy data, along with microwave satellite data, in the Snowmelt Runoff 55 Model to predict the amount of water available in a winter snowpack. For western states such as Colorado, Montana, Utah and Wyoming, about 75 percent of the annual water supply comes from snowmelt. Snowmelt water is critical to crop irrigation and hydroelectric 60 power, as well as recreation and domestic water supplies, fisheries management and flood control.

Before employing the scanning electron microscopy results, the forecasted amounts of snowpack water were inaccurate whenever the size and shape of the 65 snow crystals varied much from the norm. "The more we know about crystals," notes Rango, "the easier it will be to use microwave satellite data for predictions of the snow water equivalent."

Currently, forecasts using the model are about 70 90 percent accurate. A 1980 study estimated that improving the prediction by 1 percent would save \$38 million in irrigation and hydropower in the western United States.

Rango is also looking ahead at climate change predictions. "Following the estimates that have been made 75 about what will happen by 2100, things are definitely warming up," he says. Temperature increases will likely result in a reduction in stream flow as overall snow accumulation decreases, winter precipitation runs 80 off as rain, and water evaporates at a quicker rate. The gap between water supply and demand will magnify even more, greatly increasing water's economic value, anticipates Rango.

Not only does the crystal research help gauge 85 snowmelt, it is also useful in predicting avalanches, designing artificial snow, and, perhaps in the near future, examining air pollution. "You can put snow in a scanning electron microscope and tell which elements are present, such as sulfur and nitrogen," says Wergin. 90 "You can then see what kind of pollution is in the area and possibly track the source."

31. It can reasonably be inferred from the passage that the information about the scientific study of snow is presented primarily to:

- A. emphasize the importance of communication among scientists.
- B. explain how snow crystal facets influence the snowpack in some western states.
- C. showcase the varied uses of the scanning electron microscope.
- D. demonstrate some of the practical applications of the study of snow crystals.

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32. According to the passage, the use of scanning electron microscopy can save money by:
- F. encouraging scientists to make estimates of water requirements far into the future.
 - G. allowing forecasters to predict more accurately the quantity of water in the snowpack.
 - H. helping agricultural researchers to identify biological problems.
 - J. increasing the water supply for Colorado, Montana, Utah, and Wyoming by 75 percent.
33. It can reasonably be inferred that the phrase *metamorphosed conditions* (lines 47–48) refers to the:
- A. temperature and humidity at which crystals form.
 - B. process by which snow crystals develop from a speck of dust and water vapor.
 - C. state of snow crystals after they reach the ground.
 - D. major changes in environmental conditions.
34. According to the passage, the addition of electron microscopy data to the Snowmelt Runoff Model allows scientists using the model to include in their predictions detailed information about:
- F. microwave satellite data.
 - G. structural variations of snow crystals.
 - H. locations having the most snowfall.
 - J. biological problems related to agriculture.
35. According to Rango, one reason that water's economic value is likely to increase by the year 2100 is that:
- A. more water will be polluted by then.
 - B. less water will be wasted due to more accurate predictions of the water supply.
 - C. the sulfur and nitrogen content in snow is likely to increase.
 - D. predicted climate changes will reduce overall snow accumulation.
36. According to the passage, snowflakes have infinite variety because:
- F. enormous numbers of snow crystals fall worldwide.
 - G. falling snow crystals meet with varied atmospheric conditions.
 - H. snow crystals fall at various rates, creating unique snowflakes.
 - J. complexities in the atmosphere slow snow crystal development.
37. The passage states that snowflakes differ from snow crystals in that snowflakes:
- A. grow around a nucleus of dust.
 - B. combine to form snow crystals.
 - C. grow in relation to top and bottom facets.
 - D. are composed of more than one crystal.
38. The term "*designer*" snowflakes (line 32) refers directly to the fact that:
- F. no two snowflakes are alike.
 - G. Libbrecht produces the snowflakes in his lab.
 - H. snowflakes are part of the grand design of nature.
 - J. Libbrecht's snowflakes exhibit special beauty.
39. As it is used in line 59, the word *critical* most nearly means:
- A. evaluative.
 - B. faultfinding.
 - C. vital.
 - D. acute.
40. The passage states that research about snow crystals has helped scientists do all of the following EXCEPT:
- F. extract pollutants from snow.
 - G. gauge snowmelt.
 - H. design artificial snow.
 - J. predict avalanches.

END OF TEST 3

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

DO NOT RETURN TO A PREVIOUS TEST.

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SCIENCE TEST

35 Minutes—40 Questions

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

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

Passage I

Two measures of water quality are the number of *Escherichia coli* bacteria present and the *biotic index*, BI (a numerical value based on the type, diversity, and pollution tolerance of aquatic invertebrate animals). Both of these measures can be affected by water flow.

E. coli levels that are above 100 colonies formed per 100 mL of water indicate reduced water quality. Figure 1 shows the *E. coli* levels on 5 collection days at Sites 1 and 2 in a river.

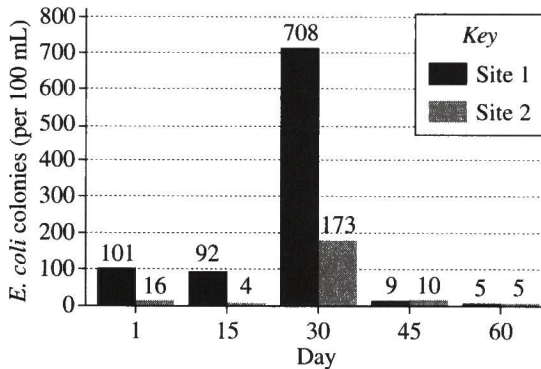


Figure 1

Table 1 shows how water quality rating varies with BI. Table 2 shows the average BI of each site during the collection period.

Table 1	
BI	Water quality rating
≥ 3.6	excellent
2.6 to 3.5	good
2.1 to 2.5	fair
1.0 to 2.0	poor

Table 2	
Location	Average BI
Site 1	6.3
Site 2	2.5

Figure 2 shows the water flow at each site on the 5 collection days.

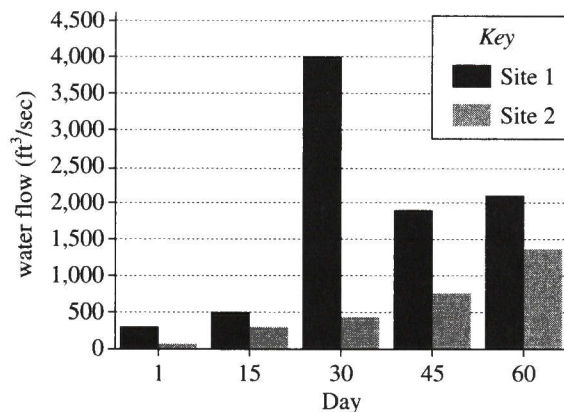


Figure 2

Figures adapted from Stephen C. Landry and Michele L. Tremblay, "State of the Upper Merrimack 1995–1997: A River Quality Report." ©2000 by Upper Merrimack River Local Advisory Committee.

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1. If an *E. coli* level of over 400 colonies formed per 100 mL of water is unsafe for swimming, on which of the following collection days and at which site would it have been unsafe to swim?
 - A. Day 1 at Site 1
 - B. Day 30 at Site 1
 - C. Day 1 at Site 2
 - D. Day 30 at Site 2

2. Based on Figures 1 and 2, consider the average water flow and the average *E. coli* level for Site 1 and Site 2 over the collection period. Which site had the higher average water flow, and which site had the higher average *E. coli* level?

	<u>Higher water flow</u>	<u>Higher <i>E. coli</i> level</u>
F.	Site 1	Site 1
G.	Site 1	Site 2
H.	Site 2	Site 1
J.	Site 2	Site 2

3. According to Table 1, what is the relationship between water quality and biotic index?
 - A. As water quality improves, biotic index increases.
 - B. As water quality improves, biotic index remains the same.
 - C. As water quality degrades, biotic index increases.
 - D. As water quality degrades, biotic index remains the same.

4. As water quality improves, the number of *stone fly larvae* (a type of aquatic invertebrate) increases. Students hypothesized that more stone fly larvae would be found at Site 1 than at Site 2. Are the data presented in Table 2 consistent with this hypothesis?
 - F. Yes; based on BI, Site 1 had a water quality rating of good and Site 2 had a water quality rating of poor.
 - G. Yes; based on BI, Site 1 had a water quality rating of excellent and Site 2 had a water quality rating of fair.
 - H. No; based on BI, Site 1 had a water quality rating of poor and Site 2 had a water quality rating of good.
 - J. No; based on BI, Site 1 had a water quality rating of fair and Site 2 had a water quality rating of excellent.

5. Which set of data best supports the claim that Site 1 has *lower* water quality than Site 2 ?
 - A. Figure 1
 - B. Figure 2
 - C. Table 1
 - D. Table 2

6. Suppose large amounts of fertilizer from adjacent fields begin to enter the river at Site 1. The BI of this site will most likely change in which of the following ways? The BI will:
 - F. increase, because water quality is likely to increase.
 - G. increase, because water quality is likely to decrease.
 - H. decrease, because water quality is likely to increase.
 - J. decrease, because water quality is likely to decrease.

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Passage II

Aluminum water-based paints (AWPs) contain aluminum (Al) flakes that give surfaces a shiny, metallic appearance. If the flakes corrode, a dull coating of aluminum hydroxide forms on them:

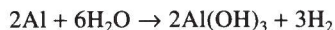


Table 1 shows the volume of H_2 gas produced over time (at 25°C and 1 atm) from 100 mL samples of freshly made AWP 1–3 in 3 separate trials. AWP 1–3 were identical except that each had a different concentration of DMEA, an AWP ingredient that increases pH.

Table 1					
AWP	pH of AWP	Volume (mL) of H_2 produced by:			
		Day 2	Day 4	Day 6	Day 8
1	8	4	33	81	133
2	9	21	187	461	760
3	10	121	1,097	2,711	4,480

The AWP 3 trial was repeated 4 times, but for each trial, the sample had the same concentration of 1 of 4 corrosion inhibitors (see Figure 1).

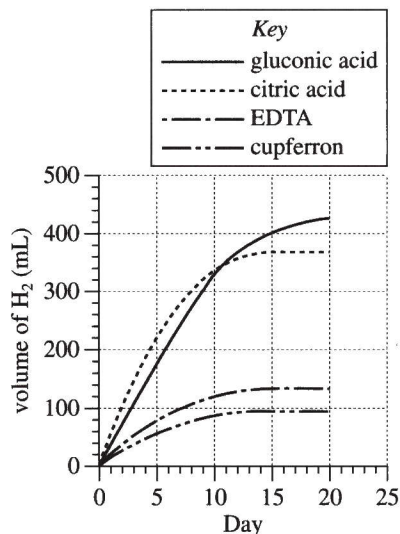
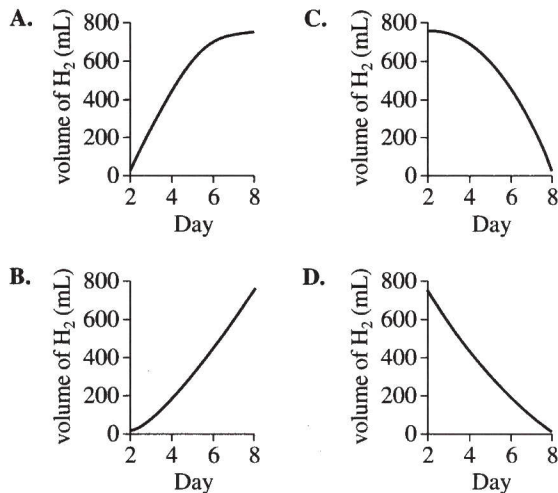


Figure 1

Figure 1 adapted from Bodo Müller, "Corrosion Inhibitors for Aluminum." ©1995 by Division of Chemical Education, Inc., American Chemical Society.

7. Based on Table 1, which of the following graphs best shows how the volume of H_2 produced by AWP 2 changed over time?



8. Based on Table 1, if the volume of H_2 produced by Day 10 from the AWP 1 sample had been measured, it would most likely have been:

- F. less than 133 mL.
G. between 133 mL and 461 mL.
H. between 461 mL and 760 mL.
J. greater than 760 mL.

9. According to Table 1, what volume of H_2 was produced by AWP 1 from the time the volume was measured on Day 6 until the time the volume was measured on Day 8?

- A. 52 mL
B. 81 mL
C. 133 mL
D. 214 mL

10. In the trials represented in Table 1 and Figure 1, by measuring the volume of H_2 , the experimenters were able to monitor the rate at which:

- F. H_2O is converted to Al.
G. Al is converted to H_2O .
H. Al is converted to $\text{Al}(\text{OH})_3$.
J. $\text{Al}(\text{OH})_3$ is converted to Al.

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11. Based on the passage, is DMEA most likely an acid or a base?

- A. An acid, because DMEA decreases pH.
- B. An acid, because DMEA increases pH.
- C. A base, because DMEA decreases pH.
- D. A base, because DMEA increases pH.

12. Consider the volume of H_2 produced by Day 2 from the AWP 3 sample that contained no corrosion inhibitor. Based on Table 1 and Figure 1, the AWP 3 sample containing EDTA produced approximately the same volume of H_2 by which of the following days?

- F. Day 1
- G. Day 4
- H. Day 7
- J. Day 10

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Passage III

Students studied forces by using 2 identical platform scales, Scale A and Scale B, one of which is shown in Figure 1.

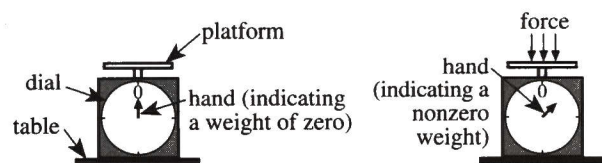


Figure 1

The weight of the platform of each scale was insignificant. When a force (such as that produced by a weight) was exerted on the surface of the platform, the hand rotated clockwise away from the zero point on the dial. The amount of rotation was directly proportional to the strength of the force.

Study 1

Prior to each of Trials 1–3, the students set the dial readings of both Scales A and B to zero. In each of these 3 trials, Scale A was stacked on top of Scale B (see Figure 2). In Trial 1, no weight was placed on the platform of Scale A; in Trial 2, a 5.0 newton (N) weight was placed on the platform of Scale A; and in Trial 3, a 10.0 N weight was placed on the platform of Scale A. The dial readings for the 3 trials are also shown in Figure 2.

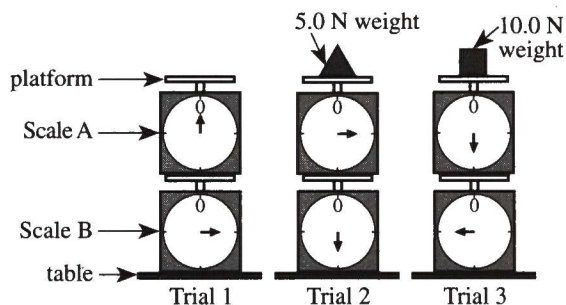


Figure 2

Study 2

The students placed a pencil on the platform of each scale and positioned on top of the pencils a board that spanned the 0.40 m distance between the 2 scales. Prior to each of Trials 4–6, the students set the dial readings of Scales A and B to zero (see Figure 3).

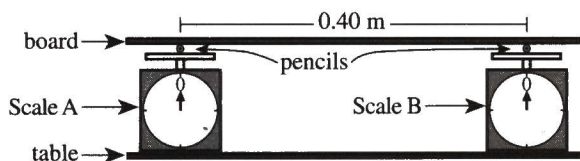


Figure 3

In each of these 3 trials, a 10.0 N weight was placed on the board at various distances from the pencil on Scale B (see Figure 4). In Trial 4, the weight was 0.10 m from the pencil; in Trial 5, the weight was 0.20 m from the pencil; and in Trial 6, the weight was 0.30 m from the pencil. The dial readings for the 3 trials are also shown in Figure 4.

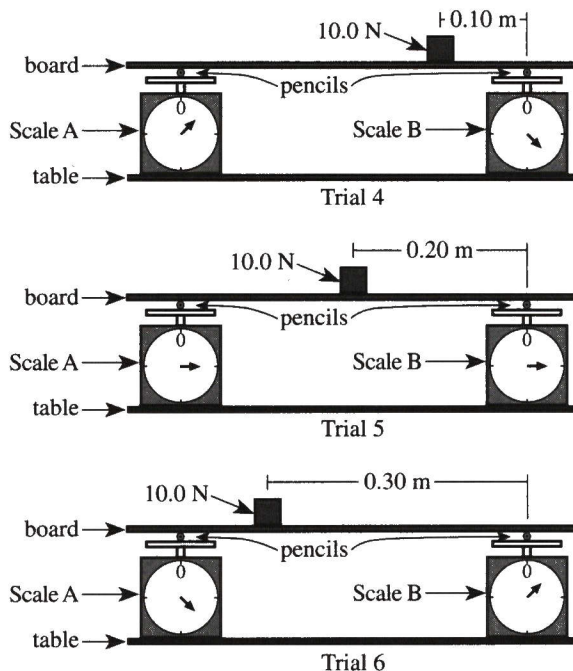


Figure 4

13. In which of the trials in Study 2, if any, was the force of the 10.0 N weight equally distributed between Scales A and B ?
 - A. Trial 4
 - B. Trial 5
 - C. Trial 6
 - D. None of the trials
14. Based on the results of Trials 1 and 2, Scale A and Scale B each weighed:
 - F. 2.5 N.
 - G. 5.0 N.
 - H. 7.5 N.
 - J. 10.0 N.

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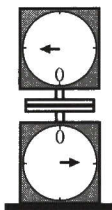
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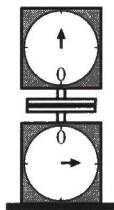
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15. Assume that whenever a weight was placed on a scale's platform, a spring inside the scale was compressed. Assume also that the greater the added weight, the greater the amount of compression. Was the amount of potential energy stored in Scale A's spring greater in Trial 1 or in Trial 3?
- In Trial 1, because the amount of weight on the platform of Scale A was greater in Trial 1.
 - In Trial 1, because the amount of weight on the platform of Scale A was less in Trial 1.
 - In Trial 3, because the amount of weight on the platform of Scale A was greater in Trial 3.
 - In Trial 3, because the amount of weight on the platform of Scale A was less in Trial 3.
16. In a new study, suppose Scale A were placed upside down atop Scale B, so that the platform of Scale A rested directly on the platform of Scale B. Which of the following drawings best represents the results that would most likely be obtained for this arrangement?

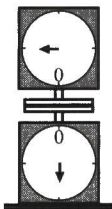
F.



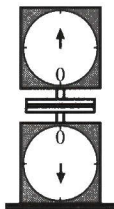
H.



G.



J.



17. The main reason the pencils were placed on the scales in Study 2 was most likely:
- so that the line of contact between each pencil and its platform could be used as a reference line for distance measurements.
 - so that the board would roll from side to side, rather than sliding from side to side over the scales' platforms.
 - to add additional weight to the scales.
 - to provide extra room for air above each scale's platform, so that the air pressure would be the same above and below the platform.
18. In Study 2, as the distance between the 10.0 N weight and the pencil on Scale B increased, the amount of force exerted on the surface of Scale B's platform:
- remained the same.
 - increased only.
 - decreased only.
 - varied, but with no general trend.
19. Which of the following statements most likely describes an important reason for setting the dial readings of both scales to zero after Study 1, prior to each of Trials 4–6?
- To add the weights of the scales to each weight measurement
 - To add the weights of the board and pencils to each weight measurement
 - To subtract the weights of the scales from each weight measurement
 - To subtract the weights of the board and pencils from each weight measurement

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Passage IV

The *octane number* of a fuel is a measure of how smoothly the fuel burns in a gasoline engine. Lower octane fuels *knock* (explode) when burned, which lowers fuel efficiency and can cause engine damage. Heptane knocks considerably when burned and is given an octane number of 0. Isooctane knocks very little and is given an octane number of 100.

Different proportions of heptane and isooctane were mixed to obtain mixtures with octane numbers between 0 and 100 (see Table 1).

Table 1		
Volume of heptane (mL)	Volume of isooctane (mL)	Octane number
0	100	100
10	90	90
25	75	75
50	50	50
90	10	10
100	0	0

Experiment 1

A sample of each fuel mixture listed in Table 1 was burned in a test engine at an engine speed of 600 revolutions per minute (rpm). The number of knocks per minute was determined for each mixture. This was done so that an octane number could be assigned to any fuel by measuring its knock rate.

Experiment 2

Adding tetraethyllead (TEL) to a fuel changes its octane number. Different amounts of TEL were added to 1,000 mL samples of isooctane. Each fuel mixture was tested under the same conditions used in Experiment 1, and the measured knock rate was used to determine the octane number (see Figure 1).

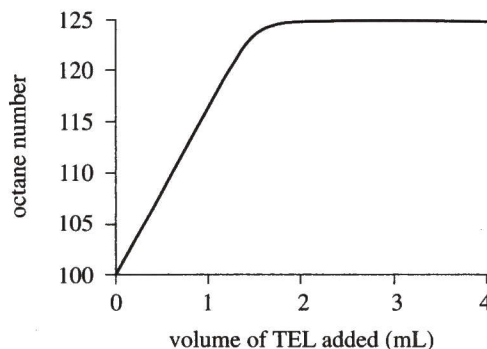


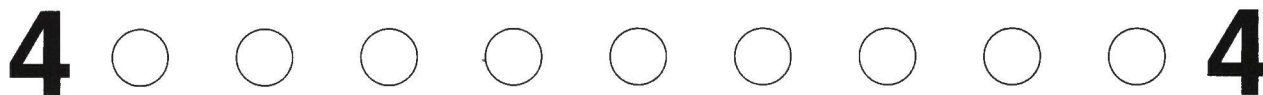
Figure 1

Experiment 3

The *engine octane requirement* (EOR) is the minimum octane number of a fuel required for an engine to operate without becoming damaged. Fuels A and B were burned separately in an engine at different speeds. Table 2 shows the octane number determined for each fuel at each engine speed and the known EOR of the engine at each speed.

Table 2			
Engine speed (rpm)	EOR	Octane number in engine of:	
		Fuel A	Fuel B
1,500	97.4	98.4	96.7
2,000	95.3	96.6	96.1
2,500	93.5	95.0	95.4
3,000	91.9	92.3	93.8
3,500	90.6	90.9	92.5

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20. Based on Experiment 3, as engine speed increases, the minimum octane number of fuel required for an engine to operate without becoming damaged:
- F. increases only.
 - G. decreases only.
 - H. increases, then decreases.
 - J. decreases, then increases.
21. Suppose a trial had been performed in Experiment 3 at an engine speed of 2,200 rpm. At this engine speed, which of the following sets of octane numbers would most likely have been determined for Fuel A and Fuel B ?
- | | Fuel A | Fuel B |
|----|--------|--------|
| A. | 95.0 | 95.4 |
| B. | 96.1 | 95.8 |
| C. | 96.6 | 96.1 |
| D. | 97.6 | 96.4 |
22. Which of the following expressions is equal to the octane number of each fuel mixture listed in Table 1 ?
- F. $\frac{\text{volume of isooctane}}{\text{volume of heptane}} \times 100$
 - G. $\frac{\text{volume of heptane}}{\text{volume of isooctane}} \times 100$
 - H. $\frac{\text{volume of isooctane}}{(\text{volume of heptane} + \text{volume of isooctane})} \times 100$
 - J. $\frac{\text{volume of heptane}}{(\text{volume of heptane} + \text{volume of isooctane})} \times 100$
23. Based on Table 1 and Experiment 2, if 3 mL of TEL were added to a mixture of 100 mL of heptane and 900 mL of isooctane, the octane number of the resulting fuel would most likely be:
- A. less than 55.
 - B. between 55 and 90.
 - C. between 90 and 125.
 - D. greater than 125.
24. Which of the 2 fuels from Experiment 3 would be better to use in an engine that will run at all engine speeds between 1,500 rpm and 3,500 rpm ?
- F. Fuel A, because its octane number was lower than the EOR at each of the engine speeds tested.
 - G. Fuel A, because its octane number was higher than the EOR at each of the engine speeds tested.
 - H. Fuel B, because its octane number was lower than the EOR at each of the engine speeds tested.
 - J. Fuel B, because its octane number was higher than the EOR at each of the engine speeds tested.
25. Based on Table 1, if 2 mL of heptane were mixed with 8 mL of isooctane, the octane number of this mixture would be:
- A. 2.
 - B. 8.
 - C. 20.
 - D. 80.
26. Suppose that 1 mL of TEL is added to 1,000 mL of heptane. Based on Experiment 2, one would predict that the octane number of the TEL/heptane mixture would be:
- F. higher than the octane number of pure heptane, but lower than 115.
 - G. higher than the octane number of pure heptane, and higher than 115.
 - H. lower than the octane number of pure heptane, but higher than 115.
 - J. lower than octane number of pure heptane, and lower than 115.

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Passage V

Introduction

Comets are complex mixtures of ices and dust that orbit the Sun. They can be classified by orbital period as either *long-period comets* or *short-period comets*.

Long-period comets have orbital periods of more than 200 yr and originate within our solar system in the *Oort Cloud*, a spherical shell of many icy bodies located at an average distance of 40,000 A.U. from the Sun (1 A.U. = average distance of Earth from the Sun). Long-period comets approach the Sun from all directions.

Short-period comets have orbital periods of 200 yr or less, and their orbital planes have *inclinations* 30° or less with respect to the *ecliptic plane*, the plane of Earth's orbit around the Sun. Portions of these planes are shown in Figure 1.

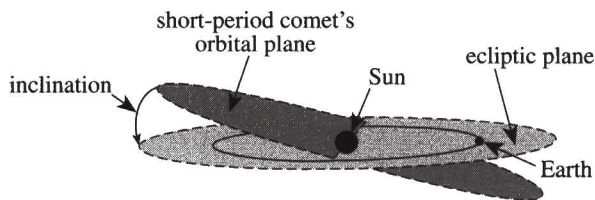


Figure 1

Two scientists present their viewpoints about the origin of short-period comets.

Scientist A

Short-period comets in our solar system originate within a thin ring-shaped region called the *Kuiper Belt* (KB). The KB has a small inclination with respect to the ecliptic plane and is located in the solar system between 30 A.U. and 50 A.U. from the Sun. The KB contains billions of icy bodies with diameters between 10 km and 30 km. These comet-size objects are too small to be clearly discerned at that distance with telescopes located on Earth's surface. Such telescopes have gathered indirect evidence, but not clear images, of much larger icy bodies that are part of the KB. The small inclinations of short-period comets' orbital planes with respect to the ecliptic plane are consistent with an origin in the KB. It has been discovered that other nearby stars have similar regions of icy bodies surrounding them.

Scientist B

The KB does not exist. Short-period comets were once long-period comets. Some long-period comets pass close enough to the giant planets (for example, Jupiter) to be influenced by the gravitational fields of the giant planets and are forced into orbits with orbital periods less than 200 yr. These altered orbits have orbital planes that have small inclinations with respect to the ecliptic plane. Also, most of the studied short-period comets have orbital planes with small inclinations with respect to the orbital planes of the giant planets, which, in turn, have small inclinations with respect to the ecliptic plane.

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27. Which of the following generalizations about comets is most consistent with Scientist B's viewpoint?
- A. Long-period comets cannot become short-period comets.
 - B. Short-period comets cannot become long-period comets.
 - C. Long-period comets can become short-period comets.
 - D. No long-period comets or short-period comets orbit the Sun.
28. Scientist A would most likely suggest that a new telescope more powerful than previous telescopes be used to search which of the following regions of space for objects in the KB?
- F. The region 100,000 A.U. beyond our solar system
 - G. The region 30 A.U. to 50 A.U. from the Sun at an angle of 90° with respect to the ecliptic plane
 - H. The region 30 A.U. to 50 A.U. from the Sun at angles of 0° to 30° with respect to the ecliptic plane
 - J. The region closely surrounding the planet Jupiter
29. Given the information about short-period comets in the introduction, which of the following inclinations with respect to the ecliptic plane would most likely NOT be observed for the orbital planes of short-period comets?
- A. 5°
 - B. 15°
 - C. 30°
 - D. 45°
30. According to Scientist B, which of the following planets in our solar system is most likely capable of changing the orbit of a long-period comet over time?
- F. Mercury
 - G. Earth
 - H. Mars
 - J. Saturn
31. Comet Halley currently has an orbital period of 76 yr. According to the information provided, Scientist B would most likely currently classify Comet Halley as a:
- A. short-period comet that originated in the Oort Cloud.
 - B. short-period comet that originated in the KB.
 - C. long-period comet that originated in the Oort Cloud.
 - D. long-period comet that originated in the KB.
32. Based on Scientist A's viewpoint, the "much larger icy bodies" in the KB most likely have diameters of:
- F. less than 10 km.
 - G. between 10 km and 20 km.
 - H. between 20 km and 30 km.
 - J. greater than 30 km.
33. Suppose a study of 1 nearby star revealed that it had no spherical shell of material similar to the Oort Cloud surrounding it. How would this discovery most likely affect the scientists' viewpoints, if at all?
- A. It would weaken Scientist A's viewpoint only.
 - B. It would strengthen Scientist B's viewpoint only.
 - C. It would strengthen both scientists' viewpoints.
 - D. It would have no effect on either scientist's viewpoint.

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Passage VI

Tomato plants grow poorly in high-salt environments. This effect is caused by 2 processes:

- A net movement of H_2O between the cytoplasm of the plants' cells and the environment via osmosis
- An increase in the cytoplasmic Na^+ concentration

The plant *Arabidopsis thaliana* carries a gene, *AtNHX1*. The product of this gene, *VAC*, facilitates uptake of cytoplasmic Na^+ by the plant's vacuoles.

A researcher created 4 genetically identical lines of tomato plants (L1–L4). An *AtNHX1* gene from *Arabidopsis thaliana* was isolated and 2 identical copies of this gene were incorporated into L1's genome. This process was repeated with L2 and L3 using a different *AtNHX1* allele for each line, so that L1, L2, and L3 had different genotypes for *AtNHX1*. The researcher then did an experiment.

Experiment

Fifty seedlings from each of the 4 lines were grown in 10 L of nutrient solution for 80 days. The 10 L nutrient solution contained H_2O , 12 g of fertilizer, and 3 g of NaCl. The nutrient solution was replaced every 5 days. After 80 days, average height, average mass (without fruit), and average fruit mass (per plant) were measured (see Table 1).

Table 1			
3 g of NaCl/10 L nutrient solution			
Line	Height (cm)	Mass (kg)	Fruit mass (kg)
L1	124	1.2	2.1
L2	128	1.2	2.0
L3	120	1.2	2.1
L4	124	1.2	2.0

This process was repeated except the 10 L nutrient solution contained 60 g of NaCl instead of 3 g of NaCl (see Table 2).

Table 2			
60 g of NaCl/10 L nutrient solution			
Line	Height (cm)	Mass (kg)	Fruit mass (kg)
L1	119	1.1	1.9
L2	121	1.1	1.9
L3	61	0.4	1.1
L4	63	0.5	1.0

The process was repeated again except the 10 L nutrient solution contained 120 g of NaCl instead of 3 g of NaCl (see Table 3).

Table 3			
120 g of NaCl/10 L nutrient solution			
Line	Height (cm)	Mass (kg)	Fruit mass (kg)
L1	118	1.0	1.8
L2	115	1.0	1.7
L3	34	0.2	0
L4	36	0.3	0

Tables 1–3 adapted from Hong-Xia Zhang and Eduardo Blumwald, "Transgenic Salt-Tolerant Tomato Plants Accumulate Salt in Foliage But Not in Fruit." ©2001 by Nature Publishing Group.

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34. One plant produced no fruit and had a height of 21 cm. Which of the following most likely describes this plant?
- F. It was from L2 and was grown in a 10 L nutrient solution containing 60 g of NaCl.
 - G. It was from L2 and was grown in a 10 L nutrient solution containing 120 g of NaCl.
 - H. It was from L4 and was grown in a 10 L nutrient solution containing 60 g of NaCl.
 - J. It was from L4 and was grown in a 10 L nutrient solution containing 120 g of NaCl.
35. During osmosis, water migrates through a semipermeable barrier. The osmosis referred to in the passage occurs through which of the following structures?
- A. Chromosomes
 - B. Nuclear envelope
 - C. Cell membrane
 - D. Rough endoplasmic reticulum
36. For each line, as the concentration of salt in the nutrient solutions increased, average plant mass:
- F. increased only.
 - G. decreased only.
 - H. increased, then decreased.
 - J. decreased, then increased.
37. Which of the following was an independent variable in the experiment?
- A. Whether a line received *AtNHX1*
 - B. Whether a tomato plant was used
 - C. Plant mass without fruit
 - D. Plant height
38. Which of the following best characterizes the genotype of L1 for *AtNHX1* after L1 was genetically modified?
- F. It was heterozygous, since its 2 *AtNHX1* alleles were different.
 - G. It was heterozygous, since its 2 *AtNHX1* alleles were identical.
 - H. It was homozygous, since its 2 *AtNHX1* alleles were different.
 - J. It was homozygous, since its 2 *AtNHX1* alleles were identical.
39. Suppose the data for all of the plants were plotted on a graph with height on the *x*-axis and mass (without fruit) on the *y*-axis. Suppose also that the best-fit line for these data was determined. Which of the following would most likely characterize the slope of this line?
- A. The line would not have a slope, because the line would be vertical.
 - B. The slope of the line would be zero.
 - C. The slope of the line would be negative.
 - D. The slope of the line would be positive.
40. The researchers included 1 of the 4 lines to serve as a control. This line was most likely which one?
- F. L1
 - G. L2
 - H. L3
 - J. L4

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

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Practice Writing Test Prompt 3

Your Signature: _____
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Print Your Name Here: _____

Your Date of Birth:									
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Month			Day			Year			

Form 16WT3

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Vocational Education

For many years, public high schools in the United States emphasized vocational skills—the skills students would need to learn a trade and get a job. Classes in auto repair, office skills, and woodworking, for example, were common. The last few decades have seen career and technical training fall out of favor in public education, replaced gradually by additional academic courses. While many schools maintain a vocational program, these programs are often threatened with elimination when school budgets are strained. Given its uncertain status in many schools, it is worth considering what value vocational training adds to education.

Read and carefully consider these perspectives. Each suggests a particular way of thinking about the value of vocational training in education.

Perspective One

Schools must seek to prepare all students for their futures. Career training provides focus for many students and helps schools reach those who don't excel in academic subjects.

Perspective Two

In every field, the skills workers need today are based on knowledge and communication. As such, schools should focus on academic subjects only.

Perspective Three

No one knows what jobs will be available in the future, so it is not wise to train today's students for any specific career.

Essay Task

Write a unified, coherent essay in which you evaluate multiple perspectives on the value of vocational training in education. In your essay, be sure to:

- analyze and evaluate the perspectives given
- state and develop your own perspective on the issue
- explain the relationship between your perspective and those given

Your perspective may be in full agreement with any of the others, in partial agreement, or wholly different. Whatever the case, support your ideas with logical reasoning and detailed, persuasive examples.