DIRECTIONS: In the five passages that follow, certain words and phrases are underlined and numbered. In the right-hand column, you will find alternatives for the underlined part. In most cases, you are to choose the one that best expresses the idea, makes the statement appropriate for standard written English, or is worded most consistently with the style and tone of the passage as a whole. If you think the original version is best, choose “NO CHANGE.” In some cases, you will find in the right-hand column a question about the underlined part. You are to choose the best answer to the question. You will also find questions about a section of the passage, or about the passage as a whole. These questions do not refer to an underlined portion of the passage, but rather are identified by a number or numbers in a box. For each question, choose the alternative you consider best and fill in the corresponding oval on your answer document. Read each passage through once before you begin to answer the questions that accompany it. For many of the questions, you must read several sentences beyond the question to determine the answer. Be sure that you have read far enough ahead each time you choose an alternative.

PASSAGE I

The Music of the O'odham

For some people, traditional American Indian music is associated and connected with high penetrating vocals accompanied by a steady drumbeat. In tribal communities in the southwestern United States, however, one is likely to hear something similar to the polka-influenced dance music of northern Mexico. The music is called “waila.” Among the O’odham tribes of Arizona, waila has been popular for more than a century. The music is mainly instrumental—the bands generally consist of guitar, bass guitar, saxophones, accordion, and drums.

Unlike some traditional tribal music, waila does not serve a religious or spiritual purpose. It is a social music that performed at weddings, birthday parties.

1. A. NO CHANGE
   B. connected by some of them
   C. linked by association
   D. associated

2. F. NO CHANGE
   G. popular, one might say, for
   H. really quite popular for
   J. popular for the duration of

3. Which of the following alternatives to the underlined portion would NOT be acceptable?
   A. instrumental; in general, the bands
   B. instrumental, the bands generally
   C. instrumental: The bands generally
   D. instrumental; the bands generally

4. F. NO CHANGE
   G. music in which it is performed
   H. music, performing
   J. music, performed

GO ON TO THE NEXT PAGE.
and feasts. The word itself comes from the Spanish word for dance, baile. Cheek to cheek, the dance is performed to the relaxed two-step tempo, and the bands often play long past midnight. As the dancers step to the music, they were also stepping in time to a sound that embodies their unique history and suggests the influence of outside cultures on their music.

5. A. NO CHANGE
   B. word, itself.
   C. word, itself
   D. word itself,

6. F. NO CHANGE
   G. Couples dance cheek to cheek to the relaxed two-step tempo.
   H. A relaxed two-step tempo, the couples dance cheek to cheek,
   J. Cheek to cheek, the two-step temporelaxes dancing couples.

7. A. NO CHANGE
   B. play long past,
   C. play, long past.
   D. play, long past

8. F. NO CHANGE
   G. are also stepping
   H. have also stepped
   J. will also step

9. A. NO CHANGE
   B. they’re
   C. it’s
   D. its’

10. At this point, the writer is considering adding the following true statement:
    The agricultural practices of the O’odham are similar to those of the Maya.
    Should the writer make this addition here?
    F. Yes, because the sentence establishes that the O’odham often borrowed ideas from other groups.
    G. Yes, because the sentence provides important information about the O’odham people.
    H. No, because the sentence is not supported by evidence of a connection between the O’odham and the Maya.
    J. No, because the sentence distracts from the paragraph’s focus on waila’s uses and influences.

11. All of the following would be acceptable placements for the underlined portion EXCEPT:
    A. where it is now.
    B. at the beginning of the sentence (revising the capitalization accordingly).
    C. after the word guitars.
    D. after the word missionaries (ending the sentence with a period).

12. F. NO CHANGE
    G. have been borrowing
    H. were borrowed
    J. borrowed
In the early 1900s the O’odham became acquainted with marching bands and woodwind instruments (which explains the presence of saxophones in waila). Around this time the polka music and button accordion played by German immigrant railroad workers; left their mark on waila.

[4]

It should be no surprise that musicians these days are adding touches of rock, country, and reggae to waila. Some listeners fear that an American musical form may soon be lost. But the O’odham are playing waila with as much energy and devotion as ever. A unique blend of traditions, waila will probably continue changing for as long as the O’odham use it to express their own sense of harmony and tempo.

PASSAGE II

How Old Am I?

Many people might be surprised to learn that the American way of computing a person’s age differs from the traditional Korean way. In Korean tradition, a person is considered to be already one year old at the time of his or her birth.

As a child growing up in two cultures, I found this contest a bit confusing. When I was in the fifth grade, was I ten or eleven years old? To add to the confusion, every New Year’s Day a person according to this Korean counting system, becomes a year older.

13. Given that all of the choices are true, which one is most relevant to the focus of this paragraph?
   A. NO CHANGE
   B. (although fiddles were once widely used in waila bands),
   C. (even though they’re now often constructed of metal),
   D. (which are frequently found in jazz bands also).

14. F. NO CHANGE
   G. workers
   H. workers;
   J. workers,

Question 15 asks about the preceding passage as a whole.

15. Upon reviewing this essay and finding that some information has been left out, the writer composes the following sentence incorporating that information:

   Those same German influences helped spawn a similar musical form in northern Mexico known as norteño.

This sentence would most logically be placed after the last sentence in Paragraph:
   A. 1.
   B. 2.
   C. 3.
   D. 4.

16. F. NO CHANGE
   G. change
   H. dispute
   J. difference

17. A. NO CHANGE
   B. person,
   C. person;
   D. person who,
older, regardless of his or her actual birthday.

Birthdays are important throughout the world. A person who is sixteen years old on his or her birthday in March would become seventeen years old on the following New Year's Day, even though he or she isn't expected to turn seventeen (in "American" years) until that next birthday in March. Perhaps the celebration of New Year's Day in 

Korean culture is heightened because it is thought of as everyone's birthday party.

Today, after many birthdays and New Year's Days, I now find meaningful the difference I once found confusing. Otherwise, this difference points to significant underlying cultural values. The practice of advancing a person's age seems to me to reflect the value a society places on life experience and longevity. Their idea was demonstrated often when my elderly relatives, who took pride in reminding younger folk of their "Korean age." With great enthusiasm, they added on a year every

18. F. NO CHANGE
   G. Most cultures celebrate birthdays.
   H. Birthdays focus attention on a culture's youth.
   J. DELETE the underlined portion.

19. A. NO CHANGE
   B. raised
   C. lifted
   D. lighted

20. Upon reviewing this paragraph, the writer considers deleting the preceding sentence. If the writer were to delete the sentence, the paragraph would primarily lose:
   F. a comment on the added significance of the Korean New Year celebration.
   G. a repetitive reminder of what happens every birthday.
   H. a defense of the case for celebrating every birthday.
   J. an illustration of the Korean counting system.

21. A. NO CHANGE
   B. Though,
   C. In fact,
   D. Then,

22. F. NO CHANGE
   G. on
   H. at
   J. DELETE the underlined portion.

23. A. NO CHANGE
   B. persons' age
   C. person's age
   D. person's age.

24. F. NO CHANGE
   G. One's
   H. Its
   J. This

25. A. NO CHANGE
   B. by
   C. while
   D. as if

26. Which choice would most clearly communicate the elderly relatives' positive attitude toward this practice?
   F. NO CHANGE
   G. Duplicating an accepted practice,
   H. Living with two birthdays themselves,
   J. Obligingly,
New Year's Day. By contrast American society has often been described as one that values the vibrant energy of youth over the wisdom and experience gained with age.  

After a certain age, many Americans I know would balk, refuse, and hesitate at the idea of adding a year or two to what they regard as their actual age. 

Even something as visibly simple or natural as computing a person's age can prove to be not so clear-cut. Traditions like celebrating birthdays reveal how deeply we are affected by the culture we live in.

PASSAGE III

Wearing Jeans in School

In 1970, the school board in Pittsfield, New Hampshire, approved a dress code that prohibited students from wearing certain types of clothing. The school board members believed that wearing "play clothes" to school made the students inefficient toward their school work, while more formal attire established a positive educational climate. When twelve-year-old Kevin Bannister wore a pair of blue jeans to school, he was sent home for violating the dress code.

27. A. NO CHANGE  
   B. whose  
   C. this  
   D. whom

28. If the writer were to delete the phrases "the vibrant energy of" and "the wisdom and experience gained with" from the preceding sentence, the sentence would primarily lose:  
   F. its personal and reflective tone.  
   G. an element of humor.  
   H. details that illustrate the contrast.  
   J. the preference expressed by the writer.

29. A. NO CHANGE  
   B. balk and hesitate  
   C. refuse and balk  
   D. balk

30. F. NO CHANGE  
   G. apparently  
   H. entirely  
   J. fully

31. Given that all of the choices are true, which one would best illustrate the term dress code as it is used in this sentence?  
   A. NO CHANGE  
   B. clothing that was inappropriate.  
   C. clothing, including sandals, bell-bottom pants, and "dungarees" (blue jeans).  
   D. clothing that is permitted in some schools today.

32. F. NO CHANGE  
   G. lazy and bored to tears with  
   H. blow off  
   J. lax and indifferent toward

GO ON TO THE NEXT PAGE.
Kevin and his parents believed that his constitutional rights had been violated. The United States District Court of New Hampshire agreed to hear Kevin's case. His claim was based on the notion of personal liberty—the right of every individual to the control of his or her own person—protected by the Constitution's Fourteenth Amendment. The court agreed with Kevin that a person's right for wearing clothing of his or her own choosing is, in fact, protected by the Fourteenth Amendment.

The court noted, however, that restrictions may be justified in some circumstances, such as in the school setting. So did Kevin have a right to wear blue jeans to school? The court determined that the school board had failed to show that wearing jeans actually inhibited the educational process, which is guided by authority figures.

Furthermore, the board offered no evidence to back up it's claim that such clothing created a negative educational environment. Certainly the school board would be justified in prohibiting students from wearing clothing that was unsanitary, revealing, or obscene.

33. Given that all of the choices are true, which one would most effectively introduce the main idea of this paragraph?

A. NO CHANGE
B. The principal said dungarees and blue jeans were the same thing, so Kevin should have known better.
C. If Kevin’s jeans had been dirty and torn, the principal might have been justified in expelling him.
D. These events occurred in a time of social unrest, and emotions were running high.

34. F. NO CHANGE
G. Court of New Hampshire
H. Court of New Hampshire
J. Court of New Hampshire

35. A. NO CHANGE
B. of wearing
C. to wear
D. wearing

36. F. NO CHANGE
G. court noted, however,
H. court, noted however,
J. court noted however.

37. A. NO CHANGE
B. process, which has undergone changes since the 1970s.
C. process, a process we all know well.
D. process.

38. F. NO CHANGE
G. they're
H. its
J. ones

39. A. NO CHANGE
B. where
C. which
D. in which
The court remained unconvinced, therefore, that when wearing jeans would actually impair the learning process of Kevin or of his fellow classmates.

Kevin Bannister’s case was significant in that it was the first in the United States to address clothing prohibitions of a school dress code. His challenge initiated a review of students’ rights and administrative responsibility in public education.

40. F. NO CHANGE
   G. thus.
   H. moreover,
   J. however,

41. A. NO CHANGE
   B. by wearing
   C. wearing
   D. having worn

42. Which choice would most effectively open this paragraph and convey the importance of this case? F. NO CHANGE
   G. Therefore, Kevin’s case reminds us that you should stand up for your rights, no matter how old you are.
   H. The case for personal liberty means the right to speak up must be taken seriously by the courts.
   J. All in all, clothing is an important part of our identity.

43. A. NO CHANGE
   B. review of students’ rights.
   C. review of students’ rights
   D. review of students’ rights,

44. F. NO CHANGE
   G. on
   H. with
   J. about

Question 45 asks about the preceding passage as a whole.

45. Suppose the writer’s goal had been to write a brief persuasive essay urging students to exercise their constitutional rights. Would this essay fulfill that goal? A. Yes, because the essay focuses on how Kevin encouraged other students to exercise their constitutional rights.
   B. Yes, because the essay focuses on various types of clothing historically worn by students as a freedom of expression.
   C. No, because the essay suggests that the right to wear blue jeans was not a substantial constitutional right in the 1970s.
   D. No, because the essay objectively reports on one case of a student exercising a particular constitutional right.
The Case of the Trick Photographs

You might think that Sir Arthur Conan Doyle, the writer who invented Sherlock Holmes, the most logical of detectives, would have harbored strictly logical beliefs himself. But the author entertained a variety of fanciful ideas, including a belief in the mythical beings known as fairies. Since that belief, he was fooled in 1920 by two schoolgirl cousins.

One day, Elsie Wright and Frances Griffiths returned from a walk in the English countryside with news that they had seen fairies. They had even taken photographs that showed several of the tiny sprites, some dancing in a ring in the grass, some flitting in front of the girl’s faces.

Many people were excited when they heard about this seemingly true and factual proof of the existence of fairies, but Conan Doyle was more excited than most.

To make sure that he wasn’t being deceived, Conan Doyle had the original photographic plates examined by experts, however, they found no evidence of double exposures. He then wrote an enthusiastic article for Strand magazine, being the place in which most of his Sherlock Holmes stories had first appeared, and later wrote a book on the subject titled The Coming of the Fairies.

46. F. NO CHANGE
   G. Because of
   H. Concerning
   J. For

47. If the writer were to delete the opening sentence of this paragraph (beginning the essay with “Sir Arthur Conan Doyle entertained a variety of fanciful…”), the essay would primarily lose:
   A. information that sets up a contrast that follows.
   B. an irrelevant but humorous digression.
   C. information that explains Doyle’s motivations.
   D. an important description of the setting.

48. F. NO CHANGE
   G. girls’ faces.
   H. girls faces.
   J. girls face’s.

49. A. NO CHANGE
   B. this seemingly evident but apparent
   C. what seemed to be an apparent
   D. this apparent

50. F. NO CHANGE
   G. who
   H. which
   J. they

51. A. NO CHANGE
   B. in which the magazine where
   C. in which
   D. being where
Conan Doyle sent a copy of one of the photographs to his friend Harry Houdini, the famous magician and escape artist. Houdini, who devoted considerable effort to exposing hoaxes involving spiritualism and was skeptical about the existence of supernatural beings. When Houdini remained unconvinced by the evidence, Conan Doyle became angry. Though the two remained cordial, but their friendship was damaged due to the fact that they had the disagreement.

Some sixty years later, an elderly Frances Griffiths publicly admitted that she and her cousin had staged the photographs as a practical joke. Shortly after her revelation, computer enhancement revealed the hapless that were used to prop up the cardboard-cutout fairies. Scientific analysis, since photography was a new art, finally closed the Case of the Trick Photographs.

52. F. NO CHANGE  
G. spiritualism, being  
H. spiritualism, was  
J. spiritualism and

53. If the writer were to delete the preceding sentence, the paragraph would primarily lose:  
A. details that provide an explanation for the friendship between Conan Doyle and Houdini.  
B. information that helps set the stage for what happens next in the essay.  
C. a description of the reasons behind Houdini’s skepticism about the supernatural.  
D. nothing at all, since this sentence provides irrelevant information.

54. F. NO CHANGE  
G. cordial and  
H. cordial that  
J. cordial,  

55. A. NO CHANGE  
B. because of the fact that they had a  
C. due to the fact of their  
D. by the

56. F. NO CHANGE  
G. (Do NOT begin new paragraph) After some  
H. (Begin new paragraph) Since some  
J. (Begin new paragraph) Some

57. A. NO CHANGE  
B. her cousin and herself  
C. she and her cousin  
D. her cousin and her

58. Which of the following alternatives to the underlined portion would NOT be acceptable?  
F. that had been used  
G. the girls used  
H. using  
J. used

59. Which choice would best tie the conclusion of this essay to its opening sentence?  
A. NO CHANGE  
B. of the kind a modern-day Sherlock Holmes might use,  
C. which the great Houdini himself would have appreciated,  
D. a methodology that was still in its infancy,
Question 60 asks about the preceding passage as a whole.

60. Suppose the writer had decided to write an essay that summarizes how beliefs in the supernatural have influenced the writing of famous authors. Would this essay fulfill the writer's goal?

F. Yes, because the essay makes the point that Conan Doyle's belief in fairies clearly influenced his Sherlock Holmes stories.

G. Yes, because the essay indicates that Conan Doyle's disagreement with Houdini motivated him to write about the supernatural.

H. No, because the essay argues that the author's belief in fairies and the supernatural did not in any way affect his writing.

J. No, because the essay limits its focus to the particular events surrounding one author's reaction to evidence of the supernatural.

END OF TEST 1

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.
MATHEMATICS TEST
30 Minutes—30 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. For all x, \((3x + 7)^2 = ?\)
   A. \(6x + 14\)
   B. \(6x^2 + 14\)
   C. \(9x^2 + 49\)
   D. \(9x^2 + 21x + 49\)
   E. \(9x^2 + 42x + 49\)

2. What is the slope of the line through \((-5, 2)\) and \((6, 7)\) in the standard \((x, y)\) coordinate plane?
   F. 9
   G. 5
   H. -5
   J. \(\frac{5}{11}\)
   K. \(\frac{5}{11}\)

3. When \(\frac{1}{3} \times + \frac{1}{4} \times = 1\), what is the value of \(\times\)?
   A. \(\frac{1}{7}\)
   B. \(\frac{12}{7}\)
   C. \(\frac{7}{2}\)
   D. 6
   E. 12

4. What is the length, in feet, of the hypotenuse of a right triangle with legs that are 6 feet long and 7 feet long, respectively?
   F. \(\sqrt{13}\)
   G. \(\sqrt{85}\)
   H. 13
   J. 21
   K. 42

5. Hexagon \(ABCD\) shown below was drawn on a grid with unit squares. Each vertex is at the intersection of 2 grid lines. What is the area of the hexagon, in square units?
   A. 18
   B. 19
   C. 20
   D. 22
   E. 25

6. In the figure below, \(\overline{AD}\) is perpendicular to \(\overline{BD}\), \(\overline{AC}\) is perpendicular to \(\overline{BC}\), and \(\overline{AD} \equiv \overline{BC}\). Which of the following congruences is NOT necessarily true?
   F. \(\overline{AC} \equiv \overline{BD}\)
   G. \(\overline{AD} \equiv \overline{AE}\)
   H. \(\overline{AE} \equiv \overline{BE}\)
   J. \(\angle DAB \equiv \angle CBA\)
   K. \(\angle EAB \equiv \angle EBA\)

7. Leticia went into Discount Music to price CDs. All CDs were discounted 23% off the marked price. Leticia wanted to program her calculator so she could input the marked price and the discounted price would be the output. Which of the following is an expression for the discounted price on a marked price of \(p\) dollars?
   A. \(p - 0.23p\)
   B. \(p - 0.23\)
   C. \(p - 23p\)
   D. \(p - 23\)
   E. \(0.23p\)

GO ON TO THE NEXT PAGE.
8. In the figure below, A, D, B, and G are collinear. If \( \angle CAD \) measures 76°, \( \angle BCD \) measures 47°, and \( \angle CBG \) measures 140°, what is the degree measure of \( \angle ACD \)?

F. 12°  
G. 14°  
H. 17°  
J. 36°  
K. 43°

9. Ms. Lewis plans to drive 900 miles to her vacation destination, driving an average of 50 miles per hour. How many miles per hour faster must she drive average, while driving, to reduce her total driving time by 3 hours?

A. 5  
B. 8  
C. 10  
D. 15  
E. 18

10. For all positive integers \( x \), what is the greatest common factor of the 2 numbers \( 216x \) and \( 180x \)?

F. 6  
G. 72  
H. \( x \)  
J. 12x  
K. 36x

11. The table below shows the price of different quantities of standard-sized lemons at Joe's Fruit Stand. What is the least amount of money needed to purchase exactly 20 standard-sized lemons if the bags must be sold intact and there is no tax charged for lemons?

<table>
<thead>
<tr>
<th>Number of lemons:</th>
<th>1 bag of 6</th>
<th>bag of 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total price:</td>
<td>$0.30</td>
<td>$1.20</td>
</tr>
</tbody>
</table>

A. $3.60  
B. $3.90  
C. $4.20  
D. $4.50  
E. $5.00

12. The diameter, \( d \) centimeters, of the metal poles Goodpole Manufacturing produces must satisfy the inequality \( |d - 3| \leq 0.001 \). What is the maximum diameter, in centimeters, such a metal pole may have?

F. 1.4995  
G. 1.5005  
H. 2.999  
J. 3.000  
K. 3.001

13. Which of the following is a factored form of the expression \( 5x^2 - 13x - 6 \)?

A. \((x - 3)(5x + 2)\)  
B. \((x - 2)(5x - 3)\)  
C. \((x - 2)(5x + 3)\)  
D. \((x + 2)(5x - 3)\)  
E. \((x + 3)(5x - 2)\)

14. A bag contains 6 red marbles, 5 yellow marbles, and 7 green marbles. How many additional red marbles must be added to the 18 marbles already in the bag so that the probability of randomly drawing a red marble is \( \frac{3}{5} \)?

F. 12  
G. 16  
H. 18  
J. 24  
K. 36

15. Which of the following trigonometric equations is valid for the side measurement \( x \) inches, diagonal measurement \( y \) inches, and angle measurement \( w^\circ \) in the rectangle shown below?

A. \( \cos w^\circ = \frac{x}{y} \)  
B. \( \cot w^\circ = \frac{x}{y} \)  
C. \( \sec w^\circ = \frac{x}{y} \)  
D. \( \sin w^\circ = \frac{x}{y} \)  
E. \( \tan w^\circ = \frac{x}{y} \)

16. The slope of the line with equation \( y = ax + b \) is greater than the slope of the line with equation \( y = cx + b \). Which of the following statements must be true about the relationship between \( a \) and \( c \)?

F. \( a \leq c \)  
G. \( a < c \)  
H. \( a = c \)  
J. \( a > c \)  
K. \( a \geq c + 1 \)

17. Minh cuts a board in the shape of a regular hexagon and pounds in a nail at an equal distance from each vertex, as shown in the figure below. How many rubber bands will she need in order to stretch a different rubber band across every possible pair of nails?

A. 15  
B. 14  
C. 12  
D. 9  
E. 6

GO ON TO THE NEXT PAGE.
18. There are 280 runners registered for a race, and the runners are divided into 4 age categories, as shown in the table below.

<table>
<thead>
<tr>
<th>Age category:</th>
<th>under 16</th>
<th>16–25</th>
<th>26–35</th>
<th>over 35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of runners:</td>
<td>40</td>
<td>76</td>
<td>112</td>
<td>52</td>
</tr>
</tbody>
</table>

The prize committee has 60 prizes to award and wants the prizes to be awarded in proportion to the number of runners registered in each category. How many prizes should be designated for the 26–35 age category?

F. 15
G. 17
H. 24
J. 36
K. 40
Use the following information to answer questions 19–22.

The youth center has installed a swimming pool on level ground. The pool is a right circular cylinder with a diameter of 24 feet and a height of 6 feet. A diagram of the pool and its entry ladder is shown below.

19. To the nearest cubic foot, what is the volume of water that will be in the pool when it is filled with water to a depth of 5 feet?
(Note: The volume of a cylinder is given by \( \pi r^2 h \), where \( r \) is the radius and \( h \) is the height.)

A. 942  
B. 1,885  
C. 2,262  
D. 9,047  
E. 11,310

20. A plastic cover is made for the pool. The cover will rest on the top of the pool and will include a wedge-shaped flap that forms a 45° angle at the center of the cover, as shown in the figure below. A zipper will go along 1 side of the wedge-shaped flap and around the arc. Which of the following is closest to the length, in feet, of the zipper?

21. Two hoses are used to fill the pool. Twice as many gallons of water per minute flow through one of the hoses as through the other. Both hoses had been on for 12 hours and had filled the pool to the 4-foot mark when the hose with the faster flow stopped working. The hose with the slower flow then finished filling the pool to the 5-foot mark. Which of the following graphs shows the relationship between the time spent filling the pool and the height of the water in the pool?

A.  
B.  
C.  
D.  
E.  

22. The directions for assembling the pool state that the ladder should be placed at an angle of 75° relative to level ground. Which of the following expressions involving tangent gives the distance, in feet, that the bottom of the ladder should be placed away from the bottom edge of the pool in order to comply with the directions?

F. \( \frac{6}{\tan 75°} \)  
G. \( \frac{\tan 75°}{6} \)  
H. \( \frac{1}{6 \tan 75°} \)  
J. \( 6 \tan 75° \)  
K. \( \tan(6 \cdot 75°) \)

GO ON TO THE NEXT PAGE.
23. For a population that grows at a constant rate of \( r \)% per year, the formula \( P(t) = P_0 \left(1 + \frac{r}{100}\right)^t \) models the population \( t \) years after an initial population of \( P_0 \) people is counted.

The population of the city of San Jose was 782,000 in 1990. Assume the population grows at a constant rate of 5% per year. According to this formula, which of the following is an expression for the population of San Jose in the year 2000?

A. \( 782,000(6)^{10} \)
B. \( 782,000(1.05)^{10} \)
C. \( 782,000(1.05)^{10} \)
D. \( (782,000 \times 1.05)^{10} \)
E. \( (782,000 \times 1.05)^{10} \)

26. The inequality \( 3(x + 2) > 4(x - 3) \) is equivalent to which of the following inequalities?

F. \( x < 6 \)
G. \( x < 5 \)
H. \( x < 9 \)
J. \( x < 14 \)
K. \( x < 18 \)

27. In the standard \((x,y)\) coordinate plane, the midpoint of \(AB\) is \((4,-3)\) and \(A\) is located at \((1,-5)\). If \((x,y)\) are the coordinates of \(B\), what is the value of \(x+y\)?

A. 19
B. 8
C. 6
D. -1.5
E. -3

28. For all \( x \) in the domain of the function \( \frac{x+1}{x^3-x} \), this function is equivalent to:

F. \( \frac{1}{x^2} - \frac{1}{x^3} \)
G. \( \frac{1}{x^2} - \frac{1}{x} \)
H. \( \frac{1}{x^2 - 1} \)
J. \( \frac{1}{x^2 - x} \)
K. \( \frac{1}{x} \)

29. In the figure below, line \( l \) is parallel to line \( m \). Transversals \( t \) and \( u \) intersect at point \( A \) on \( l \) and intersect \( m \) at points \( C \) and \( B \), respectively. Point \( X \) is on \( m \), the measure of \( \angle ACX \) is 130°, and the measure of \( \angle BAC \) is 80°. How many of the angles formed by rays of \( l \), \( m \), \( t \), and \( u \) have measure 50°?

![Diagram](https://via.placeholder.com/150)

**GO ON TO THE NEXT PAGE.**
30. Tickets for the Senior Talent Show at George Washington Carver High School are $3 for adults and $2 for students. To cover expenses, a total of $600 must be collected from ticket sales for the show. One of the following graphs in the standard (x,y) coordinate plane, where x is the number of adult tickets sold and y is the number of student tickets sold, represents all the possible combinations of ticket sales that cover at least $600 in expenses. Which graph is it?

F. [Graph F]

G. [Graph G]

H. [Graph H]

J. [Graph J]

K. [Graph K]
Passage I


There was only one source of beauty and light for me my ninth grade year. The only thing I had anticipated at the start of the semester. That was seeing Eugene. In August, Eugene and his family had moved into the only house on the block that had a yard and trees. I could see his place from my bedroom window in El Building. In fact, if I sat on the fire escape I was literally suspended above Eugene’s backyard. It was my favorite spot to read my library books in the summer.

Until that August the house had been occupied by an old couple. Over the years I had become part of their family, without their knowing it, of course. I had a view of their kitchen and their backyard, and though I could not hear what they said, I knew when they were arguing, when one of them was sick, and many other things. I knew all this by watching them at meal times. I could see their kitchen table, the sink, and the stove. During good times, he sat at the table and read his newspapers while she fixed the meals. If they argued, he would leave and the old woman would sit and stare at nothing for a long time. When one of them was sick, the other would come and get things from the kitchen and carry them out on a tray. The old man had died in June. The house had stood empty for weeks. I had had to resist the temptation to climb down into the yard and water the flowers the old lady had taken such good care of.

By the time Eugene’s family moved in, the yard was a tangled mass of weeds. The father had spent several days mowing, and when he finished, from where I sat, I didn’t see the red, yellow, and purple clusters that meant flowers to me. I didn’t see this family sit down at the kitchen table together. It was just the mother, a red-headed tall woman who wore a white uniform; the father was gone before I got up in the morning and was never there at dinner time. I only saw him on weekends when they sometimes sat on lawn-chairs under the oak tree, each hidden behind a section of the newspaper; and there was Eugene. He was tall and blond, and he wore glasses. I liked him right away because he sat at the kitchen table and read books for hours. That summer, before we had even spoken one word to each other, I kept him company on my fire escape.

Once school started I looked for him in all my classes, but P. S. 13 was a huge place and it took me days and many discreet questions to discover Eugene. After much maneuvering I managed "to run into him" in the hallway where his locker was—on the other side of the building from mine—and in study hall at the library where he first seemed to notice me, but did not speak; and finally, on the way home after school one day when I decided to approach him directly, though my stomach was doing somersaults.

I was ready for rejection, snobbery, the worst. But when I came up to him and blurted out, "You’re Eugene. Right?" he smiled, pushed his glasses up on his nose, and nodded. I saw then that he was blushing deeply. Eugene liked me, but he was shy. I did most of the talking that day. He nodded and smiled a lot. In the weeks that followed, we walked home together. He would linger at the corner of El Building for a few minutes then walk down to his house.

I did not tell Eugene that I could see inside his kitchen from my bedroom. I felt dishonest, but I liked my secret sharing of his evenings, especially now that I knew what he was reading since we chose our books together at the school library.

I also knew my mother was unhappy in Paterson, New Jersey, but my father had a good job at the blue-jeans factory in Passaic and soon, he kept assuring us, we would be moving to our own house there. I had learned to listen to my parents’ dreams, which were spoken in Spanish, like the stories about life in Puerto Rico before I was born. I had been to the island once as a little girl. We had not been back there since then, though my parents talked constantly about buying a house on the beach someday, retiring on the island—that was a common topic among the residents of El Building. As for me, I was going to go to college and become a teacher.

But after meeting Eugene I began to think of the present more than of the future. What I wanted now was to enter that house I had watched for so many years. I wanted to see the other rooms where the old people had lived, and where the boy spent his time. Most of all, I wanted to sit at the kitchen table with Eugene like two adults, like the old man and his wife had done, maybe drink some coffee and talk about books.
1. The main theme of this passage concerns the:
   A. difficulty of first starting and then maintaining a friendship.
   B. process of making a new friend and how the friendship changes the narrator.
   C. problems the narrator has dealing with the loss of her former neighbors.
   D. differences in the lives led by two pairs of adults who at different times lived in the same house.

2. Which of the following questions is NOT answered by information in the passage?
   F. Has the narrator ever walked around inside Eugene’s house?
   G. What hobby or interest do Eugene and the narrator share?
   H. What makes Eugene’s house different from other houses on the block?
   J. What careers other than teaching has the narrator considered pursuing?

3. The narrator draws which of the following comparisons between the old couple and Eugene’s parents?
   A. The old couple were more socially outgoing and had many more friends than Eugene’s parents.
   B. Eugene’s parents are just as interested in tending the lawn and flowers as the old couple were.
   C. Eugene’s parents are less nurturing of each other and spend less time together than the old couple did.
   D. Just like the old man and old woman, both of Eugene’s parents appear to have jobs outside the home.

4. In terms of developing the narrative, the last two paragraphs (lines 67–87) primarily serve to:
   F. provide background details about the narrator and her family in order to highlight the narrator’s unique and shifting perspective.
   G. describe the narrator’s family in order to establish a contrast between her parents and Eugene’s parents.
   H. portray the narrator’s family in order to show how her friendship with Eugene affected the various members of her family.
   J. depict the hopes and dreams of the narrator’s parents in order to show how her parents’ aspirations changed over time.

5. It can most reasonably be inferred from the passage that when the narrator says, “I didn’t see the red, yellow, and purple clusters that meant flowers to me” (lines 30–31), she is most nearly indicating that:
   A. from her current position, she couldn’t see the old woman’s flowers, which were still growing near the house.
   B. the flowers grown by the old woman had died because the narrator had stopped watering them.
   C. the flowers grown by the old woman had been cut down when Eugene’s father mowed the lawn.
   D. the weeds that had grown up in the old couple’s lawn had intertwined with the flowers, making the flowers hard to see.

6. According to the narrator, which of the following statements was true about Eugene at the moment when she first talked to him?
   F. Due to the size of the school, he had not even noticed the narrator until she started talking to him.
   G. He had searched unsuccessfully for the narrator’s locker several different times and had been too shy to ask someone where it was.
   H. He had first noticed the narrator in study hall but had been uninterested in her until she introduced herself.
   J. He had apparently taken notice of the narrator at school and had come to like her but felt nervous about introducing himself.

7. When the narrator says, “I began to think of the present more than of the future” (lines 80–81), she most likely means that meeting Eugene led her to:
   A. shift some of her attention away from her career plans and onto the developing friendship.
   B. think more about her own work interests than about the career her parents thought she should pursue.
   C. put off her plans of returning to Puerto Rico for a visit in favor of continuing to prepare for college.
   D. want to spend more time with him instead of helping her parents plan a vacation to Puerto Rico.

8. The narrator most nearly portrays her parents’ dreams as:
   F. close to being realized because of her father’s good job.
   G. somewhat uncommon among the other residents of the family’s building.
   H. ones she has heard about many times but that seem far off and remote to her.
   J. ones she shares with her parents and longs to fulfill.

9. The narrator claims that she felt close to the old couple because she had:
   A. listened in so many of their conversations over the years.
   B. helped take care of the old woman’s flowers after the woman’s husband had died.
   C. been able to watch them as they moved through their entire house.
   D. regularly observed them during their mealtimes.

10. Which of the following best describes the narrator’s feelings about secretly observing Eugene at his home?
   F. Joy tinged with suspicion
   G. Enjoyment mixed with guilt
   H. Happiness overwhelmed by a sense of betrayal
   J. Pleasure lessened by having actually met him
As fascism and communism triumphed in Europe and Asia, ER and FDR were certain that there was a middle way, what ER called an American "revolution without bloodshed." Her abiding conviction, however, was that nothing good would happen to promote the people’s interest unless the people themselves organized to demand government response. A people’s movement required active citizen participation, and ER’s self-appointed task was to agitate and inspire community action, encourage united democratic movements for change.

Between 1933 and 1938, while the Depression raged and the New Deal unfolded, ER worked with the popular front. She called for alliances of activists to fight poverty and racism at home, and to oppose isolationism internationally.

Active with the women’s peace movement, ER spoke regularly at meetings of the Women’s International League for Peace and Freedom, and the Conference on the Cause and Cure of War. She departed, however, from pacifist and isolationist positions and encouraged military preparedness, collective security, and ever-widening alliances.

Between 1933 and 1938 ER published countless articles and six books. She wrote in part for herself, to clear her mind and focus her thoughts. But she also wrote to disagree with her husband. From that time to this, no other First Lady has actually rushed for her pen to jab her husband’s public decisions. But ER did so routinely, including in her 1938 essay This Troubled World, which was a point-by-point rejection of FDR’s major international decisions.

To contemplate ER’s life of example and responsibility is to forestall gloom. She understood, above all, that politics is not an isolated individualist adventure. She sought alliances, created community, worked with movements for justice and peace. Against great odds, and under terrific pressure, she refused to withdraw from controversy. She brought her network of agitators and activists into the White House, and never considered a political setback a permanent defeat. She enjoyed the game, and weathered the abuse.

11. As she is revealed in the passage, ER is best described as:
A. socially controversial but quietly cooperative.
B. politically courageous and socially concerned.
C. morally strong and deeply traditional.
D. personally driven but calmly moderate.
12. The author presents ER’s accomplishments as exceptional because ER:
   F. brought politically unpopular views to the forefront of the nation’s politics.
   G. was the first public figure to introduce political roles for women.
   H. was a political pioneer struggling alone for social reform.
   J. replaced community action with more powerful White House networks.

13. According to the passage, ER believed that social reform should include all of the following EXCEPT:
   A. promoting community action.
   B. developing universal education.
   C. supporting affordable housing.
   D. establishing involved theories.

14. Based on the passage, ER’s approach to social reform can best be characterized as:
   F. passionate and theoretical.
   G. patient and flexible.
   H. simplistic and isolationist.
   J. progressive and determined.

15. It can reasonably be inferred from the passage that at the time ER began working for social reform, the United States was:
   A. deeply committed to reforms in education and health care.
   B. experiencing a time of national prosperity that contributed to ER’s ideas concerning the public welfare.
   C. concentrating on affairs at home due to isolationist policies and the spread of democracy overseas.
   D. unsupportive of the idea that the government was responsible for the welfare of its poor and neglected.

16. According to the last paragraph, which of the following statements would the author most likely make with regard to ER’s vision and ideals?
   F. ER considered politics a game and played only when she knew she could win.
   G. ER worked with agitators and remained dedicated to the pursuit of justice and peace in victory and defeat.
   H. ER placed herself in the position of president, making decisions that determined White House policy.
   J. ER saw herself as the country’s role model and personally responsible for bringing about change.

17. In terms of the passage as a whole, one of the main functions of the third paragraph (lines 13–19) is to suggest that:
   A. ER’s successes in various professional pursuits helped prepare her to take action in the political world.
   B. ER had avoided the political spotlight in her personal pursuits.
   C. ER had competing and conflicting interests during her first year as first lady.
   D. while ER had many personal accomplishments, little could have prepared her for life as the first lady.

18. According to the passage, the primary principle underlying ER’s goals was that:
   F. every person deserved a dignified and decent life.
   G. as first lady, she could talk about things that had never been discussed before.
   H. through radio and columns, she could show she was interested in every person.
   J. she must lead a bloodless American revolution.

19. The passage states that ER believed the relationship between a people and their government should be:
   A. begun and carried out as if it were an isolated, individualist adventure.
   B. formed and modeled by the White House.
   C. based on organized, widespread citizen participation.
   D. controlled through radio broadcasts and formal channels.

20. In the context of the passage, the author’s statement that ER “enjoyed the game, and weathered the abuse” (line 93) most nearly means that ER:
   F. enjoyed her individualist adventure in politics even if criticized.
   G. preferred to be a team player rather than take the lead.
   H. embraced the political life and accepted criticism as part of her work.
   J. understood political games and so did not take politics or criticism very seriously.
Passage III

HUMANITIES: This passage is adapted from the essay "The Interior Life" by Annie Dillard, which appeared in her book An American Childhood (© 1987 by Annie Dillard).

The interior life is often stupid. Its egoism blinds it and deafens it; its imagination spins out ignorant tales, fascinated. It fancies that the western wind blows on the Self, and leaves fall at the feet of the Self for a reason.

5 And people are watching. A mind risks real ignorance for the sometimes paltry prize of an imagination enriched. The trick of reason is to get the imagination to seize the actual world—if only from time to time.

When I was five, I would not go to bed willingly 10 because something came into my room. My sister Amy, two years old, was asleep in the other bed. What did she know? She was innocent of evil. There was no messiness in her, no roughness for things to cling to, only a charming and charmed innocence that seemed 15 then to protect her, an innocence I needed but couldn't muster. Since Amy was asleep, furthermore, and since when I needed someone most I was afraid to stir enough to wake her, she was useless.

I lay alone and was almost asleep when the thing 20 entered the room by flattening itself against the open door and sliding in. It was a transparent, luminous oblong. I could see the door whiten at its touch; I could see the blue wall turn pale where it raced over it, and see the maple headboard of Amy's bed glow. It was a 25 swift spirit; it was an awareness. It made noise. It had two joined parts, a head and a tail. It found the door, wall, and headboard; and it wiped them, charging them with its luminous glance. After its fleet, searching passage, things looked the same, but weren't.

30 I dared not blink or breathe. If it found another awareness, it would destroy it.

Every night before it got to me it gave up. It hit my wall's corner and couldn't get past. It shrank completely into itself and vanished. I heard the rising roar it made when it died or left. I still couldn't breathe. I knew that it could return again alive that same night.

Sometimes it came back, sometimes it didn't. Most often, restless, it came back. The light stripe slipped in the door, ran searching over Amy's wall, 40 stopped, stretched lunatic at the first corner, raced walking toward my wall, and vanished into the second corner with a cry. So I wouldn't go to bed.

It was a passing car whose windshield reflected the corner streetlight outside. I figured it out one night.

45 Figuring it out was as memorable as the oblong itself. Figuring it out was a long and forced ascent to the very rim of being, to the membrane of skin that both separates and connects the inner life and the outer world. I climbed deliberately from the depths like a diver who releases the monster in his arms and hauls himself hand over hand up an anchor chain till he meets the ocean's sparkling membrane and bursts through it; he sight the sunlit, becalmed hull of his boat, which had bulked so ominously from below.

55 I recognized the noise it made when it left. That is, the noise it made called to mind, at last, my daytime sensations when a car passed—the sight and noise together. A car came roaring down hushed Edgerton Avenue in front of our house, stopped, and passed on shrieking as its engine shifted up the gears. What, precisely, came into the bedroom? A reflection from the car's oblong windshield. Why did it travel in two parts? The window sash split: the light and cast a shadow.

Night after night I labored up the same long chain 60 of reasoning, as night after night the thing burst into the room where I lay awake.

There was a world outside my window and contiguous to it. Why did I have to keep learning this same thing over and over? For I had learned it a summer ago, 65 when men with jackhammers broke up Edgerton Avenue. I had watched them from the yard. When I lay to nap, I listened. One restless afternoon I connected the new noise in my bedroom with the jackhammer men I had been seeing outside. I understood abruptly that these worlds met, the outside and the inside. "Outside," then, was conceivably just beyond my windows.

The world did not have me in mind. It was a coincidental collection of things and people, of items, and I myself was one such item—a child walking up the sidewalk, whom anyone could see or ignore. The things in the world did not necessarily cause my overwhelming feelings; the feelings were inside me, beneath my skin, behind my ribs, within my skull. They were even, to some extent, under my control.

85 I could be connected to the outer world by reason, if I chose, or I could yield to what amounted to a narrative fiction, to a show in light projected on the room's blue walls.

21. Which of the following statements best describes the structure of this passage?

A. It begins and ends with a series of assertions that surround a story used by the narrator to support and elaborate on those assertions.

B. It contains a highly detailed anecdote that the narrator uses to show how the claims she makes in the first paragraph are wrong.

C. It compares and contrasts the narrator's perspective on an incident in her life with the perspectives of several other people, such as her parents.

D. It consists mainly of a story about a recent event in the narrator's life that she feels taught her an interesting but ultimately insignificant lesson.
22. In terms of mood, which of the following best describes lines 9–44?

F. A steadily increasing feeling of tension  
G. A consistently high level of tension  
H. A growing feeling of tension that is finally broken  
J. A feeling of tension frequently undermined by the narrator’s use of irony and humor

23. The narrator develops the third paragraph (lines 19–29) mainly through:

A. detached philosophical musings on the nature of the object she sees.  
B. a detailed description of what she did to try to keep the object out of her room.  
C. sensory details vividly depicting the object and its movements.  
D. imaginative speculation on what might be causing the object to appear.

24. The narrator indicates that one reason she did not wake her sister Amy when “something” came into their room was because:

F. Amy had previously asked the narrator to stop waking her up during the night.  
G. the narrator knew she could muster her own charmed innocence.  
H. Amy had already figured out what the thing was before going to sleep.  
J. the narrator was afraid of alerting the thing to her own presence.

25. It can reasonably be inferred from the passage that the narrator regards her initial discovery of the truth about the object entering her bedroom as:

A. deflating, because the object turned out to be so ordinary.  
B. disappointing, because she felt she should have solved the mystery many years ago.  
C. satisfying, because she could at last ignore the object and go to sleep.  
D. significant, because solving the mystery led to important insights.

26. It can most reasonably be inferred that for the narrator, the image of the diver bursting through “the ocean’s sparkling membrane” (line 52) symbolizes her:

F. fear of monsters and of the object in her bedroom.  
G. crossing of the boundary separating her inner and outer lives.  
H. struggle to maintain the separation between her inner and outer worlds.  
J. bitterness at entering reality and leaving behind her comforting memories.

27. As it is used in line 87, the phrase “a show in light” most nearly refers to:

A. a fictional story the narrator has read.  
B. a movie the narrator saw at a theater.  
C. the work of reason in linking a person to the outer world.  
D. a fantasy created by the mind.

28. The narrator uses the images in lines 3–5 primarily to depict the interior life’s tendency to engage in:

F. deceptive self-absorption.  
G. vital self-examination.  
H. useful analysis of nature.  
J. fierce debates with itself.

29. Which of the following statements best paraphrases lines 5–8?

A. The imagination lacks value and should be ignored in favor of paying attention to the actual world.  
B. Reason can enhance the imagination but at the expense of experience in the actual world.  
C. Rather than become isolated, the imagination should connect to the actual world at least occasionally.  
D. Reason, not the imagination, is the best way to appreciate and enrich the actual world.

30. By her statements in lines 77–80, the narrator is most nearly asserting that:

F. in her world, adults are generally considered more important than children.  
G. she, like everyone and everything else, was a small part of a larger world.  
H. it still mattered greatly whether people saw or ignored her.  
J. she was less valuable than other people in her world.

END OF TEST 3

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

DO NOT RETURN TO A PREVIOUS TEST.
Passage 1

Many bacteria contain plasmids (small, circular DNA molecules). Plasmids can be transferred from 1 bacterium to another. For this to occur, the plasmid replicates (produces a linear copy of itself). The relative position of the genes is the same on the original plasmid and on the linear copy, except that the 2 ends of the linear copy do not immediately connect.

While replication is occurring, 1 end of the linear copy leaves the donor bacterium and enters the recipient bacterium. Thus, the order in which the genes are replicated is the same as the order in which they are transferred. Unless this process is interrupted, the entire plasmid is transferred, and its 2 ends connect in the recipient bacterium.

Four students studied the way in which 6 genes (F, X, R, S, A, and G) on a specific plasmid were donated by a type of bacterium (see the figure). The students determined that the entire plasmid is transferred in 90 min and that the rate of transfer is constant. They also determined that the genes are evenly spaced around the plasmid, so 1 gene is transferred every 15 min. They disagreed, however, about the order in which the genes are replicated and thus transferred. Four models are presented.

Student 1

Replication always begins between Gene F and Gene X. Gene X is replicated first and Gene F is replicated last.

Student 2

Replication always begins between Gene F and Gene X. However, the direction of replication varies. If Gene F is replicated first, Gene X is replicated last. Conversely, if Gene X is replicated first, Gene F is replicated last.

Student 3

Replication can begin between any 2 genes. Replication then proceeds around the plasmid in a clockwise direction (with respect to the figure). Thus, if Gene S is replicated first, Gene A is replicated second, and Gene R is replicated last.

Student 4

Replication can begin between any 2 genes. Likewise, replication can proceed in either direction. So the order of replication varies.

1. Based on the information presented, if the transfer of the linear copy was interrupted 50 min after transfer began, how many complete genes would have been transferred to the recipient bacterium?
   A. 2
   B. 3
   C. 4
   D. 5

2. Based on the model presented by Student 3, if all 6 genes are replicated and the first gene replicated is Gene G, the third gene replicated would be:
   F. Gene F
   G. Gene A
   H. Gene S
   J. Gene X
3. Which students believe that any of the 6 genes on the plasmid can be the first gene transferred to a recipient bacterium?
   A. Students 2 and 3
   B. Students 2 and 4
   C. Students 3 and 4
   D. Students 2, 3, and 4

4. Suppose that the model presented by Student 1 is correct and that the transfer of genes between 2 bacteria was interrupted after 45 min. Based on the information provided, which of the following genes would NOT have been transferred from the donor bacterium to the recipient bacterium?
   F. Gene G
   G. Gene X
   H. Gene R
   J. Gene S

5. Suppose that Student 2's model is correct and that the transfer of genes between 2 bacteria was interrupted after 30 min. Under these conditions, which of the following genes would definitely NOT be transferred from the donor bacterium to the recipient bacterium?
   A. Gene A
   B. Gene R
   C. Gene G
   D. Gene X

6. Suppose that all 6 genes are transferred from a donor bacterium to a recipient bacterium. Under this condition, which student(s) would argue that Gene A could be the last gene transferred?
   F. Student 2 only
   G. Student 4 only
   H. Students 2 and 4 only
   J. Students 3 and 4 only

7. Suppose that the transfer of genes between 2 bacteria was interrupted, that the last gene transferred was Gene A, and that no incomplete copies of a gene were transferred. Based on this information, Student 1 would say that transfer was most likely interrupted how many minutes after the transfer began?
   A. 15
   B. 30
   C. 45
   D. 60
Passage II

Color images of the surface of Io, one of Jupiter’s moons, show plumes of gas that resemble Earth’s geysers and active volcanoes that emit flows of molten material. The materials ejected from Io’s volcanoes and plumes rapidly solidify at Io’s cold surface temperatures. Scientists believe that these materials may be one of several allotropes (forms) of sulfur (S), or a sulfur compound. The following studies were performed to determine the composition of these materials.

Study 1

In a laboratory, scientists measured the reflectances (the fraction of light striking a surface that is reflected by that surface) of 4 allotropes of S (red, white, orange, and brown) and of a sulfur compound (sulfur dioxide [SO₂]). Reflectances were measured at visible-light wavelengths between 0.35 μm (micrometers) and 0.60 μm. Figure 1 shows the data for the various S allotropes and for SO₂.

![Figure 1](image)

Io’s whole-disk reflectance (the reflectance of Io’s entire visible surface measured all at once) was measured at 2 different times. Figure 2 shows these data along with reflectance data calculated using a computer model. This model shows what combination of materials from Figure 1 would produce the closest match to the measured reflectance data. According to the model, the overall composition of Io’s surface is 15% SO₂, 50% orange S, 20% red S, and 15% white S.

![Figure 2](image)

Study 2

At 2 different times, reflectances were measured of the crater floors of 2 volcanoes on Io: Pele and Surt. Figure 3 shows the reflectance data.

![Figure 3](image)
8. At the wavelengths used in Study 1, as the wavelength of the light increases, the reflectances of the S allotropes and of SO$_2$ do which of the following?

S allotropes

F. Increase only
G. Increase only, then decrease
H. Decrease only
J. Decrease only, then increase

SO$_2$

Increase only
Increase, then decrease
Decrease only
Increase, then decrease

9. According to Study 3, compared with the corresponding average reflectance for small plumes, large plumes on Io have an average reflectance at a given wavelength that is:
A. always higher.
B. always the same.
C. always lower.
D. sometimes higher and sometimes lower.

10. According to Study 1, the reflectance of white S at a wavelength of 0.40 µm is closest to which of the following?
F. 0.0
G. 0.1
H. 0.2
J. 0.3

11. According to Study 1 and Study 2, the crater floor of the volcano Pele has reflectances most similar to which of the following S allotropes?
A. White S
B. Orange S
C. Red S
D. Brown S

12. If the averaged reflectances for large plumes and for small plumes had been measured at a wavelength of 0.61 µm in Study 3, those reflectances would have been closest to which of the following?

<table>
<thead>
<tr>
<th>Large plumes</th>
<th>Small plumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. 0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>G. 0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>H. 0.5</td>
<td>0.9</td>
</tr>
<tr>
<td>J. 0.9</td>
<td>0.5</td>
</tr>
</tbody>
</table>

13. According to Study 1, white S has a reflectance of 0.98 at a wavelength of 0.60 µm. This means that white S reflects:
A. 2% of the 0.60 µm wavelength light that strikes its surface.
B. 98% of the 0.60 µm wavelength light that strikes its surface.
C. 2% of all the visible light that strikes its surface.
D. 98% of all the visible light that strikes its surface.

GO ON TO THE NEXT PAGE.
Passage III

An electrical circuit contained a 12-volt (V) battery, a resistor (a device that resists the flow of electricity), a capacitor (a device that stores electrical charge and electrical energy), a voltmeter (an instrument for measuring voltage), and a switch, as shown in Figure 1.

![Figure 1](image)

Some students studied the behavior of the circuit.

**Experiment 1**

The students used a $1 \times 10^7$ ohm ($\Omega$) resistor and a capacitor with a capacitance of $1 \times 10^{-6}$ farad (F). (Capacitance is a measure of the maximum amount of electrical charge and electrical energy a capacitor can store.) The capacitor was initially uncharged. At time zero, the students simultaneously closed the switch and started a stopwatch. At time zero and at 12 sec intervals thereafter, they recorded the voltage across the capacitor. Their results are shown in Table 1.

<table>
<thead>
<tr>
<th>Time (sec)</th>
<th>Voltage across capacitor (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>12</td>
<td>8.4</td>
</tr>
<tr>
<td>24</td>
<td>10.9</td>
</tr>
<tr>
<td>36</td>
<td>11.7</td>
</tr>
<tr>
<td>48</td>
<td>11.9</td>
</tr>
<tr>
<td>60</td>
<td>12.0</td>
</tr>
</tbody>
</table>

**Experiment 2**

Using the $1 \times 10^7 \Omega$ resistor and several different capacitors, the students determined the length of time from when the switch was closed until the voltage across the capacitor reached 6 V. Their results are shown in Table 2.

<table>
<thead>
<tr>
<th>Capacitance ($\times 10^{-6}$ F)</th>
<th>Time to reach 6 V across capacitor (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>8.3</td>
</tr>
<tr>
<td>0.6</td>
<td>4.2</td>
</tr>
<tr>
<td>0.3</td>
<td>2.1</td>
</tr>
<tr>
<td>0.1</td>
<td>0.7</td>
</tr>
</tbody>
</table>

**Experiment 3**

The students conducted the same procedure described in Experiment 2, except that they used a constant capacitance of $1 \times 10^{-6}$ F and several different resistors. Their results are shown in Table 3.

<table>
<thead>
<tr>
<th>Resistance ($\times 10^7$ $\Omega$)</th>
<th>Time to reach 6 V across capacitor (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>5.2</td>
</tr>
<tr>
<td>0.50</td>
<td>3.5</td>
</tr>
<tr>
<td>0.25</td>
<td>1.7</td>
</tr>
</tbody>
</table>

14. In Experiment 1, the time constant of the circuit was the time required for the voltage across the capacitor to reach approximately 7.6 V. The time constant of the circuit used in Experiment 1 was:

- [F] less than 12 sec.
- [G] between 12 sec and 24 sec.
- [H] between 24 sec and 36 sec.
- [J] greater than 36 sec.

15. If, in Experiment 2, a $1.5 \times 10^{-6}$ F capacitor had been used, the time required for the voltage across the capacitor to reach 6 V would have been closest to:

- [A] 4.2 sec.
- [B] 7.0 sec.
- [C] 10.5 sec.
- [D] 15.0 sec.
16. The main purpose of Experiment 3 was to determine how varying the:
   F. battery's voltage affected the resistor's resistance at a given time.
   G. capacitor's capacitance affected the time required for the voltage across the capacitor to reach a set value.
   H. capacitor's capacitance affected the voltage across the battery at a given time.
   J. resistor's resistance affected the time required for the voltage across the capacitor to reach a set value.

17. Based on Figure 1, to measure the voltage across the resistor only, which of the following circuits should one use?

A. ![Circuit A]

B. ![Circuit B]

C. ![Circuit C]

D. ![Circuit D]

18. Consider a circuit like that shown in Figure 1. Based on Experiments 2 and 3, the voltage across the capacitor will reach a given value in the shortest amount of time if the circuit contains which of the following capacitances and resistances, respectively?
   F. $0.1 \times 10^{-6} \text{ F}$, $0.3 \times 10^{7} \Omega$
   G. $0.1 \times 10^{-6} \text{ F}$, $1.0 \times 10^{7} \Omega$
   H. $1.2 \times 10^{-6} \text{ F}$, $0.3 \times 10^{7} \Omega$
   J. $1.2 \times 10^{-6} \text{ F}$, $1.0 \times 10^{7} \Omega$

19. Consider the following hypothesis: In a circuit arranged as in Figure 1 containing a battery, a capacitor, and a constant resistance, as capacitance increases, the time required to reach a given voltage across the capacitor increases. Do the experiments support this hypothesis?
   A. Yes; in Experiment 1, as capacitance increased, the time required to reach a given voltage increased.
   B. Yes; in Experiment 2, as capacitance increased, the time required to reach a given voltage increased.
   C. No; in Experiment 1, as capacitance increased, the time required to reach a given voltage decreased.
   D. No; in Experiment 2, as capacitance increased, the time required to reach a given voltage decreased.
Passage IV

A bomb calorimeter is used to determine the amount of heat released when a substance is burned in oxygen (Figure 1). The heat, measured in kilojoules (kJ), is calculated from the change in temperature of the water in the bomb calorimeter. Table 1 shows the amounts of heat released when different foods were burned in a bomb calorimeter. Table 2 shows the amounts of heat released when different amounts of sucrose (table sugar) were burned. Table 3 shows the amounts of heat released when various chemical compounds were burned.

<table>
<thead>
<tr>
<th>Amount of sucrose (g)</th>
<th>Heat released (kJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>1.6</td>
</tr>
<tr>
<td>0.5</td>
<td>8.0</td>
</tr>
<tr>
<td>1.0</td>
<td>16.0</td>
</tr>
<tr>
<td>2.0</td>
<td>32.1</td>
</tr>
<tr>
<td>4.0</td>
<td>64.0</td>
</tr>
</tbody>
</table>

**Table 1**

<table>
<thead>
<tr>
<th>Food</th>
<th>Mass (g)</th>
<th>Change in water temperature (°C)</th>
<th>Heat released (kJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread</td>
<td>1.0</td>
<td>8.3</td>
<td>10.0</td>
</tr>
<tr>
<td>Cheese</td>
<td>1.0</td>
<td>14.1</td>
<td>17.0</td>
</tr>
<tr>
<td>Egg</td>
<td>1.0</td>
<td>5.6</td>
<td>6.7</td>
</tr>
<tr>
<td>Potato</td>
<td>1.0</td>
<td>2.7</td>
<td>3.2</td>
</tr>
</tbody>
</table>

20. According to Tables 1 and 2, as the mass of successive sucrose samples increased, the change in the water temperature produced when the sample was burned most likely:

- F. increased only.
- G. decreased only.
- H. increased, then decreased.
- J. remained the same.
21. Which of the following graphs best illustrates the relationship between the heat released by the foods listed in Table 1 and the change in water temperature?

A. ![Graph A]

B. ![Graph B]

C. ![Graph C]

D. ![Graph D]

22. Based on the data in Table 2, one can conclude that when the mass of sucrose is decreased by one-half, the amount of heat released when it is burned in a bomb calorimeter will:

F. increase by one-half.

G. decrease by one-half.

H. increase by one-fourth.

J. decrease by one-fourth.

23. Which of the following lists the foods from Tables 1 and 2 in increasing order of the amount of heat released per gram of food?

A. Potato, egg, bread, sucrose, cheese

B. Sucrose, cheese, bread, egg, potato

C. Bread, cheese, egg, potato, sucrose

D. Sucrose, potato, egg, bread, cheese

24. Based on the information in Tables 1 and 2, the heat released from the burning of 5.0 g of potato in a bomb calorimeter would be closest to which of the following?

F. 5 kJ

G. 10 kJ

H. 15 kJ

J. 20 kJ
Density is defined as the mass of a substance divided by its volume:

\[ \text{density} = \frac{\text{mass}}{\text{volume}} \]

Table 1 lists the phases and the densities, in grams per cubic centimeter (g/cm³), of various pure substances at 25°C and 1 atmosphere (atm) of pressure.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Phase</th>
<th>Density (g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>solid</td>
<td>5.73</td>
</tr>
<tr>
<td>Glucose</td>
<td>solid</td>
<td>1.56</td>
</tr>
<tr>
<td>Iron</td>
<td>solid</td>
<td>7.86</td>
</tr>
<tr>
<td>Lead</td>
<td>solid</td>
<td>11.34</td>
</tr>
<tr>
<td>Zinc</td>
<td>solid</td>
<td>7.14</td>
</tr>
<tr>
<td>Ethanol</td>
<td>liquid</td>
<td>0.79</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td>liquid</td>
<td>0.71</td>
</tr>
<tr>
<td>Glycerol</td>
<td>liquid</td>
<td>1.26</td>
</tr>
<tr>
<td>Mercury</td>
<td>liquid</td>
<td>13.59</td>
</tr>
<tr>
<td>Freon-12</td>
<td>gas</td>
<td>0.00495</td>
</tr>
<tr>
<td>Krypton</td>
<td>gas</td>
<td>0.00343</td>
</tr>
<tr>
<td>Methane</td>
<td>gas</td>
<td>0.00065</td>
</tr>
</tbody>
</table>

Figure 1 shows how the density of liquid water changes with temperature.

Figure 2 shows how the density of solid water changes with temperature.

25. According to Figure 1, as the temperature of liquid water decreases from 10°C to 0°C, the density:
   A. increases only.
   B. decreases only.
   C. decreases, then increases.
   D. increases, then decreases.

26. A student claimed that “If the masses of 1 cm³ of any solid and 1 cm³ of any liquid are compared, the mass of the solid will be greater.” Do the data in Table 1 support his claim?
   F. No; lead has a higher density than any of the liquids listed.
   G. No; mercury has a higher density than any of the solids listed.
   H. Yes; lead has a higher density than any of the liquids listed.
   J. Yes; mercury has a higher density than any of the solids listed.

27. Which of the following hypotheses about the relationship between the temperature and the density of a solid is best supported by the data in Figure 2? As the temperature of a solid increases, the density of the solid:
   A. increases only.
   B. decreases only.
   C. increases, then decreases.
   D. decreases, then increases.
28. Equal amounts of ethyl ether, mercury, and water (density = 0.9971 g/cm³) at 25°C are poured into a single beaker. Three distinct layers of liquid form in the beaker. Based on the data in Table 1, which of the following diagrams represents the order, from top to bottom, of the liquids in the beaker?

F. Ethyl ether
   Water
   Mercury

G. Ethyl ether
   Mercury
   Water

H. Mercury
   Water
   Ethyl ether

J. Water
   Ethyl ether
   Mercury

29. According to Figure 1, 100 g of water at 4°C would exactly fill a container having which of the following volumes?
   A. 1 cm³
   B. 10 cm³
   C. 100 cm³
   D. 1,000 cm³
Passage VI

The clearing of rain forests results in forest fragmentation (the breakup of large forest tracts into small patches). Researchers predicted that fragmentation would result in a decrease in animal populations and aboveground tree biomass (AGTB) in the resulting fragments. They did 4 studies to test this prediction.

Study 1

The researchers monitored the AGTB of twenty-five 100 m x 100 m forest plots near areas that had recently been cleared of vegetation. The distance from the center of each plot to the nearest clearing was measured. Figure 1 shows the average change per plot in AGTB in metric tons per year (t/yr) over 17 yr.

![Figure 1]

Study 2

Twenty-five 100 m x 100 m forest plots were monitored as in Study 1. The center of each of these plots was at least 500 m from the nearest clearing. The average change in AGTB over 17 yr for these 25 plots was 0 t/yr.

![Figure 2]

Study 4

Researchers trapped and released birds in 10 forest fragments adjacent to areas that had recently been cleared of vegetation. Three types of birds were monitored: insectivores, frugivores (fruit eaters), and hummingbirds. Figure 3 shows the number of captures per 1,000 hours (hr) of trapping. (Note: Year 0 represents results prior to fragmentation.)

![Figure 3]

Figures adapted from William F. Laurance et al., "Biomass Collapse in Amazonian Forest Fragments." ©1998 by the American Association for the Advancement of Science.
30. In Study 4, as time increased from Year 0 to Year 6, the captures/1,000 hr of frugivores:
   F. decreased only
   G. increased only
   H. decreased, then increased
   J. increased, then decreased

31. Based on the results of Study 4, how did fragmentation most likely affect the population sizes of insectivores and hummingbirds in the fragments studied?
   A. Fragmentation increased the population sizes of both insectivores and hummingbirds.
   B. Fragmentation decreased the population sizes of both insectivores and hummingbirds.
   C. Fragmentation increased the population size of insectivores and decreased the population size of hummingbirds.
   D. Fragmentation decreased the population size of insectivores and increased the population size of hummingbirds.

32. Based on the results of Study 1, if the distance from the center of a 100 m x 100 m plot were 75 m from the nearest clearing, the expected average change in AGTB at the plot over 17 yr would be closest to which of the following values?
   F. -1.1 t/yr
   G. -2.6 t/yr
   H. +1.1 t/yr
   J. +2.6 t/yr

33. After examining the results of Study 2, a student concluded that the AGTB at each of the 25 plots remained constant. Which of the following alternative explanations is also consistent with the results?
   A. The AGTB at all 25 plots increased.
   B. The AGTB at all 25 plots decreased.
   C. The AGTB at some of the plots increased and the AGTB at some of the plots decreased.
   D. The AGTB at plots bounded by forest increased and the AGTB at plots bounded by clearings remained constant.

34. Which of the following sets of results from the studies is least consistent with the prediction proposed by the researchers?
   F. The results of Study 1 for AGTB
   G. The results of Study 3 for AGTB
   H. The results of Study 4 for frugivores
   J. The results of Study 4 for hummingbirds

35. In Study 4, the researchers trapped birds for 10,000 hr per year. Thus, how many insectivores were trapped in Year 2?
   A. 80
   B. 100
   C. 800
   D. 1,000

END OF TEST 4
STOP! DO NOT RETURN TO ANY OTHER TEST.
Atlas Test Prep

PSAT Practice Exam

DO NOT OPEN THIS BOOKLET UNTIL INSTRUCTED TO DO SO.

DO NOT WRITE IN THIS BOOKLET.
Reading Test

30 MINUTES, 28 QUESTIONS

Turn to Section 1 of your answer sheet to answer the questions in this section.

Questions 1-9 are based on the following passage.

This passage is adapted from Jane Austen, Emma, originally published in 1815.

Emma Woodhouse, handsome, clever, and rich, with a comfortable home and happy disposition, seemed to unite some of the best blessings of existence; and had lived nearly twenty-one years in the world with very little to distress or vex her.

She was the youngest of the two daughters of a most affectionate, indulgent father, and had, in consequence of her sister's marriage, been mistress of his house from a very early period. Her mother had died too long ago for her to have more than an indistinct remembrance of her caresses, and her place had been supplied by an excellent woman as governess, who had fallen little short of a mother in affection.

Sixteen years had Miss Taylor been in Mr. Woodhouse's family, less as a governess than a friend, very fond of both daughters, but particularly of Emma. Between them it was more the intimacy of sisters. Even before Miss Taylor had ceased to hold the nominal office of governess, the mildness of her temper had hardly allowed her to impose any restraint; and the shadow of authority being now long passed away, they had been living together as friend and friend very mutually attached, and Emma doing just what she liked; highly esteeming Miss Taylor's judgment, but directed chiefly by her own.

The real evils indeed of Emma's situation were the power of having rather too much her own way, and a disposition to think a little too well of herself; these were the disadvantages which threatened alloy to her many enjoyments. The danger, however, was at present so unperceived, that they did not by any means rank as misfortunes with her.

Sorrow came—a gentle sorrow—but not at all in the shape of any disagreeable consciousness.—Miss Taylor married. It was Miss Taylor's loss which first brought grief. It was on the wedding-day of this beloved friend that Emma first sat in mournful thought of any continuance. The wedding over and the bride-people gone, her father and herself were left to dine together, with no prospect of a third to cheer a long evening. Her father composed himself to sleep after dinner, as usual, and she had then only to sit and think of what she had lost.

The event had every promise of happiness for her friend. Mr. Weston was a man of unexceptionable character, easy fortune, suitable age and pleasant manners; and there was some satisfaction in considering with what self-denying, generous friendship she had always wished and promoted the match; but it was a black morning's work for her. The want of Miss Taylor would be felt every hour of every day. She recalled her past kindness—the kindness, the affection of sixteen years—how she had taught and how she had played with her from five years old—and how she had devoted all her powers to attach and amuse her in health—and how nursed her through the various illnesses of childhood. A large
The main purpose of the passage is to
A) describe a main character and a significant change in her life.
B) provide an overview of a family and a nearby neighbor.
C) discuss some regrettable personality flaws in a main character.
D) explain the relationship between a main character and her father.
Questions 10-19 are based on the following passage and supplementary material.

This passage is adapted from Marina Gorbis, *The Nature of the Future: Dispatches from the Socialstructed World*. ©2013 by Marina Gorbis.

Visitors to the Soviet Union in the 1960s and 1970s always marveled at the gap between what they saw in state stores—shelves empty or filled with things no one wanted—and what they saw in people’s homes: nice furnishings and tables filled with food. What filled the gap? A vast informal economy driven by human relationships, dense networks of social connections through which people traded resources and created value. The Soviet people didn’t plot how they would build these networks. No one was teaching them how to maximize their connections the way social marketers eagerly teach us today. Their networks evolved naturally, out of necessity; that was the only way to survive.

Today, all around the world, we are seeing a new kind of network of relationship-driven economics emerging, with individuals joining forces sometimes to fill the gaps left by existing institutions—corporations, governments, educational establishments—and sometimes creating new products, services, and knowledge that no institution is able to provide. Empowered by computing and communication technologies that have been steadily building village-like networks on a global scale, we are infusing more and more of our economic transactions with social connectedness.

The new technologies are inherently social and personal. They help us create communities around interests, identities, and common personal challenges. They allow us to gain direct access to a worldwide community of others. And they take anonymity out of our economic transactions. We can assess those we don’t know by checking their reputations as buyers and sellers on eBay or by following their Twitter streams. We can look up their friends on Facebook and watch their YouTube videos. We can easily get people’s advice on where to find the best shoemaker in Brazil, the best

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6. As used in line 54, “want” most nearly means
   A) desire.
   B) lack.
   C) requirement.
   D) request.

7. It can most reasonably be inferred that after Miss Taylor married, she had
   A) less patience with Mr. Woodhouse.
   B) fewer interactions with Emma.
   C) more close friends than Emma.
   D) an increased appreciation for Emma.

8. Which choice provides the best evidence for the answer to the previous question?
   A) Line 37 (“Miss . . . married”)
   B) Lines 47-48 (“The event . . . friend”)
   C) Lines 60-65 (“A large . . . recollection”)
   D) Lines 73-79 (“How . . . solitude”)

9. Which situation is most similar to the one described in lines 83-91 (“The evil . . . time”)?
   A) A mother and her adult son have distinct tastes in art and music that result in repeated family arguments.
   B) The differences between an older and a younger friend are magnified because the younger one is more active and athletic.
   C) An older and a younger scientist remain close friends despite the fact that the older one’s work is published more frequently.
   D) The age difference between a high school student and a college student becomes a problem even though they enjoy the same diversions.
programmer in India, and the best apple farmer in our local community. We no longer have to rely on bankers or venture capitalists as the only sources of funding for our ideas. We can raise funds directly from individuals, most of whom we don’t even know, through websites that allow people to post descriptions of their projects and generate donations, investments, or loans.

We are moving away from the dominance of the depersonalized world of institutional production and creating a new economy around social connections and social rewards—a process I call socialstructing. Others have referred to this model of production as social, commons-based, or peer-to-peer. Not only is this new social economy bringing with it an unprecedented level of familiarity and connectedness to both our global and our local economic exchanges, but it is also changing every domain of our lives, from finance to education and health. It is rapidly ushering in a vast array of new opportunities for us to pursue our passions, create new types of businesses and charitable organizations, redefine the nature of work, and address a wide range of problems that the prevailing formal economy has neglected, if not caused.

Socialstructing is in fact enabling not only a new kind of global economy but a new kind of society, in which amplified individuals—individuals empowered with technologies and the collective intelligence of others in their social network—can take on many functions that previously only large organizations could perform, often more efficiently, at lower cost or no cost at all, and with much greater ease. Socialstructing is opening up a world of what my colleagues Jacques Vallée and Bob Johansen describe as the world of impossible futures, a world in which a large software firm can be displaced by weekend software hackers, and rapidly orchestrated social movements can bring down governments in a matter of weeks. The changes are exciting and unpredictable. They threaten many established institutions and offer a wealth of opportunities for individuals to empower themselves, find rich new connections, and tap into a fast-evolving set of new resources in everything from health care to education and science.

Much has been written about how technology distances us from the benefits of face-to-face communication and quality social time. I think those are important concerns. But while the quality of our face-to-face interactions is changing, the countervailing force of socialstructing is connecting us at levels never seen before, opening up new opportunities to create, learn, and share.

The following graph, from a 2011 report from the International Data Corporation, projects trends in digital information use to 2015 (E=Estimated).
10. As used in line 10, “plot” most nearly means
A) mark.
B) form.
C) plan.
D) claim.

11. The references to the shoemaker, the programmer, and the apple farmer in lines 37-40 (“We can easily...community”) primarily serve to
A) illustrate the quality of products and services in countries around the world.
B) emphasize the broad reach of technologies used to connect people.
C) demonstrate that recommendations made online are trustworthy.
D) call attention to the limits of the expansion of the global economy.

12. The passage’s discussion of life in the Soviet Union in the 1960s and 1970s primarily serves to
A) introduce the concept of social networking.
B) demonstrate that technology has improved social connections.
C) list differences between the Soviet Union and other countries.
D) emphasize the importance of examining historical trends.

13. As used in line 45, “post” most nearly means
A) publish.
B) transfer.
C) assign.
D) denounce.

14. The author indicates that, in comparison to individuals, traditional organizations have tended to be
A) more innovative and less influential.
B) larger in size and less subject to regulations.
C) less reliable and less interconnected.
D) less efficient and more expensive.

15. Which choice provides the best evidence for the answer to the previous question?
A) Lines 22-26 (“Empowered...connectedness”)
B) Lines 40-42 (“We no longer...ideas”)
C) Lines 47-50 (“We are moving...social structuring”)
D) Lines 66-72 (“amplified...ease”)

16. The author recognizes counterarguments to the position she takes in the passage by
A) acknowledging the risks and drawbacks associated with new technologies and social networks.
B) admitting that some people spend too much time unproductively on the Internet.
C) drawing an analogy between conditions today and conditions in the Soviet Union of the 1960s and 1970s.
D) conceding that the drawbacks of social structuring may prove over time to outweigh the benefits.

17. Which choice provides the best evidence for the answer to the previous question?
A) Lines 35-37 (“We can look...videos”)
B) Lines 74-76 (“a world...hackers”)
C) Lines 79-84 (“They...science”)
D) Lines 85-87 (“Much...time”)
Which statement best summarizes the information presented in the graph?

A) Far more people around the world own computers and cell phones today than in 2005.
B) The number of people sharing digital information has more than tripled since 2005.
C) The volume of digital information created and shared has increased tremendously in recent years.
D) The amount of digital information created and shared is likely to be almost 8 zettabytes in 2015.

According to the graph, which statement is true about the amount of digital information projected to be created and shared globally in 2012?

A) Growth in digital information creation and sharing was projected to be wildly out of proportion to growth in 2011 and 2013.
B) The amount of digital information created and shared was projected to begin a new upward trend.
C) The amount of digital information created and shared was projected to peak.
D) The amount of digital information created and shared was projected to pass 2 zettabytes for the first time.
Understanding how hibernators, including ground squirrels, marmots and bears, survive their long winter’s naps may one day offer solutions for problems such as heart disease, osteoporosis and muscular dystrophy.

Nearly everything about the way an animal’s body works changes when it hibernates, and preparations start weeks or months in advance. The first order of business is to fatten up.

“Fat is where it’s at for a hibernator,” says Matthew Andrews, a molecular biologist at the University of Minnesota Duluth who studies 13-lined ground squirrels. “You bring your own lunch with you.” Packing lunch is necessary because the animals go on the world’s strictest diet during the winter, surviving entirely off their white fat. “They have their last supper in October; they don’t eat again until March,” Andrews says.

Bigger fat stores mean a greater chance of surviving until spring. “If they go in really chunky, nice and roly-poly, that’s going to be a good hibernator,” he says.

Bears also watch their waistlines expand in the months before settling in for the season. The brown bears cardiologist Ole Fröbert studies pack on the pounds by chowing down on up to 40 kilograms of blueberries a day. Such gluttony among humans could have severe consequences: Obesity is associated with a greater risk of heart attack and diabetes, among other ailments.

To see how fattening up affects Scandinavian brown bears, Fröbert and his colleagues ventured into the wilds of Sweden following signals given off by radio transmitters or GPS devices on tagged bears. Bears can be dangerous close-up. Even hibernating bears can rouse to action quickly, so scientists tracking down bears in the winter use darts to tranquilize the animals from a distance. Scientists studying the bears in the summer tranquilize them from a helicopter.

Once a bear is under the tranquilizer’s influence (which takes about five minutes), the scientists have 60 minutes max to get the animal from its den, weigh and measure it, draw blood samples and do minor surgeries to collect fat and other tissues. The bear is returned to its den by minute 61.

Precious materials collected during this high-pressure encounter need to be analyzed within 24 hours, so the researchers often test for levels of cholesterol or certain proteins in the blood while working in the snow or at a nearby research station. A pilot sometimes flies samples from field sites to a lab in Denmark in order to meet the deadline.

Recent analyses revealed that Scandinavian brown bears spend the summer with plasma cholesterol levels considered high for humans; those values then increase substantially for hibernation, Fröbert and his colleagues reported. These “very, very fat” bears with high cholesterol also get zero exercise during hibernation. Lolling about in the den pinches off blood vessels, contributing to sluggish circulation. “That cocktail would not be advisable in humans,” Fröbert says. It’s a recipe for hardened arteries, putting people at risk for heart attacks and strokes.

Even healthy young adult humans can develop fatty streaks in their arteries that make the blood vessels less flexible, but the bears don’t build up such artery-hardening streaks. “Our bears, they had nothing,” Fröbert says. It’s not yet clear how the bears keep their arteries flexible, but Fröbert hopes to find some protective molecule that could stave off hardened arteries in humans as well.

<table>
<thead>
<tr>
<th>Total Plasma Cholesterol in Seven Bears</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milligrams/deciliter</td>
</tr>
<tr>
<td>hibernation</td>
</tr>
<tr>
<td>541</td>
</tr>
<tr>
<td>387</td>
</tr>
<tr>
<td>232</td>
</tr>
<tr>
<td>maximum desirable level for humans</td>
</tr>
<tr>
<td>active</td>
</tr>
</tbody>
</table>

Unauthorized copying or reuse of any part of this page is illegal.
The passage is written from the perspective of someone who is
A) actively involved in conducting hibernator research.
B) a participant in a recent debate in the field of cardiology.
C) knowledgeable about advances in hibernator research.
D) an advocate for wildlife preservation.

It is reasonable to conclude that the main goal of the scientists conducting the research described in the passage is to
A) learn how the hibernation patterns of bears and squirrels differ.
B) determine the role that fat plays in hibernation.
C) illustrate the important health benefits of exercise for humans.
D) explore possible ways to prevent human diseases.

Which choice provides the best evidence for the answer to the previous question?
A) Lines 1-5 (“Understanding...dystrophy”)
B) Lines 10-13 (“Fat...squirrels”)
C) Lines 31-35 (“To...bears”)
D) Lines 42-46 (“Once...tissues”)

What main effect do the quotations by Andrews in lines 10-18 have on the tone of the passage?
A) They create a bleak tone, focusing on the difficulties hibernators face during the winter.
B) They create a conversational tone, relating scientific information in everyday language.
C) They create an ominous tone, foreshadowing the dire results of Andrews's research.
D) They create an absurd tone, using images of animals acting as if they were human.

As used in line 19, "stores" most nearly means
A) preservatives.
B) reserves.
C) stacks.
D) shelters.

Based on the passage, what is Fröbert’s hypothesis regarding why bears’ arteries do not harden during hibernation?
A) The bears’ increased plasma cholesterol causes the arteries to be more flexible.
B) Sluggish circulation pinches off the blood vessels rather than hardening the arteries.
C) Bears exercise in short, infrequent bursts during hibernation, which staves off hardened arteries.
D) Bears possess a molecule that protects against hardened arteries.
Which choice provides the best evidence for the answer to the previous question?
A) Lines 19-20 (“Bigger . . . spring”)
B) Lines 24-27 (“The brown . . . day”)
C) Lines 69-72 (“Even . . . streaks”)
D) Lines 73-76 (“It’s . . . well”)

What information discussed in paragraph 10 (lines 58-68) is represented by the graph?
A) The information in lines 58-62 (“Recent . . . reported”)
B) The information in lines 62-64 (“These . . . hibernation”)
C) The information in lines 64-65 (“Lolling . . . circulation”)
D) The information in lines 67-68 (“It’s . . . strokes”)

Which statement about the effect of hibernation on the seven bears is best supported by the graph?
A) Only one of the bears did not experience an appreciable change in its total plasma cholesterol level.
B) Only one of the bears experienced a significant increase in its total plasma cholesterol level.
C) All of the bears achieved the desirable plasma cholesterol level for humans.
D) The bear with the lowest total plasma cholesterol level in its active state had the highest total plasma cholesterol level during hibernation.

STOP
If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.
No Test Material On This Page
A Nod to Nodding Off

With 30 percent of United States workers not getting enough sleep at night, according to the *Wall Street Journal*, US companies lose a yearly sum of $63.2 billion annually due to the drop in employee productivity resulting from sleep deprivation. Sleep-deprived workers generally have lower morale and are less able to retain information than their better-rested colleagues.
[1] One of the big reasons behind workers’ lack of sleep is the work itself. [2] To combat the problem of sleep deprivation in a demanding work environment, some companies have begun allowing workers to take naps. [3] The hours the average American spend working have increased dramatically since the 1970s, making it hard for many workers to get a good night’s sleep. [4] Although employees who sleep on the job are often considered lazy and unproductive, napping in the workplace has been shown to improve workers’ efficiency and quality of life. [5] As long as companies continue to demand long hours from workers, and managers should champion napping as a means to keep employees happy, healthy, and functional.

---

2

A) NO CHANGE
B) main things leading up to
C) huge things about
D) primary causes of

3

A) NO CHANGE
B) have spent
C) spends
D) are spent

4

A) NO CHANGE
B) workers; managers
C) workers, managers,
D) workers, managers

5

To make this paragraph most logical, sentence 3 should be placed
A) where it is now.
B) before sentence 1.
C) after sentence 1.
D) after sentence 4.
Such a proposition may seem counterintuitive, but, in fact, allowing employees to nap could save companies hours of lost productivity. Studies reveal that napping improves memory and boosts wakefulness for the remainder of the day. Napping can also have a positive effect on mood and overall job satisfaction, while constant drowsiness reduces reaction time and hampers one’s ability to concentrate. Employee naps might also lead to reduced health care costs for companies, since regular napping leads to long-term health benefits, and it improves workers’ average weekly attendance.

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

Even fifteen-minute power naps improve alertness, creativity, and concentration.

Should the writer make this addition here?
A) Yes, because it demonstrates that the benefits of napping can be gained without sacrificing large amounts of work time.
B) Yes, because it explains the methodology of the studies mentioned in the previous sentence.
C) No, because a discussion of the type of nap workers take is not important to the writer’s main point in the paragraph.
D) No, because it contradicts the writer’s discussion of napping in the previous sentences.

Which choice provides a supporting example that reinforces the main point of the sentence?
A) NO CHANGE
B) including a lower risk of cardiovascular problems such as heart attack and stroke.
C) which are essential in an era of rising health care costs.
D) in addition to making employees more efficient.
Napping at work has already won corporate advocates in the worlds of technology, finance, and news media, and some businesses are beginning to set aside special nap rooms. A few companies, such as Google, have even invested in high-tech nap pods that block out light, play soothing music, and gently waking nappers.

Zephrin Lasker, CEO of the mobile-advertising firm Pontiflex, has observed that employees are happier and more productive since he created a nap room in the company's Brooklyn headquarters. Ryan Hodson of Kodiak Capital Group and Arianna Huffington of the Huffington Post Media Group have promoted napping throughout their workers and have been effusive about the results. In light of the benefits not only to employees' efficiency and again to their health and sense of well-being, these executives' enthusiasm is not surprising. These executives are among the most successful leaders in their respective fields.

8. A) NO CHANGE  
B) gently wake  
C) gently to wake  
D) gentle waking of

9. A) NO CHANGE  
B) among  
C) between  
D) into

10. A) NO CHANGE  
B) but it benefits  
C) as also to  
D) but also to

11. The writer wants a concluding sentence that restates the main argument of the passage. Which choice best accomplishes this goal?  
A) NO CHANGE  
B) Clearly, employers should consider reducing employees' hours when they are overworked.  
C) Companies should consider employee schedules carefully when implementing a napping policy.  
D) More businesses should follow their lead and embrace napping on the job.
Questions 12-22 are based on the following passage and supplementary material.

Vanishing Honeybees: A Threat to Global Agriculture

Honeybees play an important role in the agriculture industry by pollinating crops. An October 2006 study found that as much as one-third of global agriculture depends on animal pollination, including honeybee pollination—to increase crop output. The importance of bees highlights the potentially disastrous affects of an emerging, unexplained crisis: entire colonies of honeybees are dying off without warning.

They know it as colony collapse disorder (CCD), this phenomenon will have a detrimental impact on global agriculture if its causes and solutions are not determined. Since the emergence of CCD around 2006, bee mortality rates have exceeded 25 percent of the population each winter. There was one sign of hope: during the 2010–2012 winter seasons, bee mortality rates decreased slightly, and beekeepers speculated that the colonies would recover. Yet in the winter of 2012–2013, the portion of the bee population lost fell nearly 10 percent in the United States, with a loss of 31 percent of the colonies that pollinate crops.

12. A) NO CHANGE  
   B) pollination: this is  
   C) pollination,  
   D) pollination;

13. A) NO CHANGE  
   B) highlights the potentially disastrous effects  
   C) highlight the potentially disastrous effects  
   D) highlight the potentially disastrous affects

14. A) NO CHANGE  
   B) Known as colony  
   C) It is known as colony  
   D) Colony

15. Which choice offers the most accurate interpretation of the data in the chart?  
   A) NO CHANGE  
   B) been above the acceptable range.  
   C) not changed noticeably from year to year.  
   D) greatly increased every year.

16. Which choice offers an accurate interpretation of the data in the chart?  
   A) NO CHANGE  
   B) portion of bees lost was double what it had been the previous year, rising to  
   C) number of losses, which had fallen within the acceptable range the previous year, rose to  
   D) portion of total colonies lost rose almost 10 percentage points, with a loss of
Managed Honey Bee Colony Losses in the US

Winter seasons

Percent total-colony winter loss


0% 5% 10% 15% 20% 25% 30% 35% 40%

acceptable range

Studies have offered several possible reasons that bees are vanishing. One reason that is often cited is the use of pesticides called neonicotinoids, which are absorbed by plants and linger much longer than do topical pesticides. Chemicals such as herbicides and fungicides may also play a role, contaminating the pollen that bees typically feed on and inhibiting healthy insect maturation.

Adapted from Dennis van Engelsdorp et al., “Preliminary Results: Honey Bee Colony Losses in the United States, Winter 2012-2013.” ©2013 by the Bee Informed Partnership.

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

Prolonged exposure to neonicotinoids has been shown to increase bees’ vulnerability to disease and parasitic mites.

Should the writer make this addition here?

A) Yes, because it provides support for the claim made in the previous sentence.
B) Yes, because it introduces a new idea that will become important later in the passage.
C) No, because it would be better placed elsewhere in the passage.
D) No, because it contradicts the main idea of the passage.
Given the role that honeybees play in agriculture, the impact of this loss of hives on fruit, vegetable, seed, and nut crops is not to be scoffed at. A reduction in bee numbers leads to less pollination, which in turn leads to smaller harvests and higher food prices. Some farmers have resorted to renting hives from beekeepers to pollinate their crops; when there is a shortage of bees this being an expensive proposition. Other farmers have increased their dependence on costly hand-pollination by human workers. Furthermore, there may be sociological repercussions. Agroecologist Alexandra-Maria Klein has suggested that rising produce prices could lead to an increase in obesity as people turn to cheaper, less wholesome fare.

Though the precise causes of CCD are yet unclear, some commonsense measures may be taken. A decrease in the use of certain pesticides, herbicides, and fungicides, as well as greater attention to the nutrition, habitat, and genetic diversity of managed hives, could begin a shift in a favorable direction.

The writer wants a conclusion that addresses the future of efforts to combat CCD. Which choice results in the passage having the most appropriate concluding sentence?

A) NO CHANGE
B) Still, bee colonies have experienced such devastating losses that the consequences of the issue have been felt worldwide.
C) Although CCD is a relatively new phenomenon, scientists have been studying other aspects of honeybees for over a century.
D) Genetic variation in bee colonies generally improves bees’ productivity, disease resistance, and ability to regulate body temperature.
Lunar Farming

Late last autumn, Giuseppe Ferrua stood on the hillside overlooking Italy’s Serchio River valley, a landscape of low mountains dotted with vineyards. Ferrua grows grapes and olives, and he does so according to the phases of the Moon. He didn’t always farm this way. When he began, he exercised modern, one-size-fits-all farming methods but says he soon became convinced that “plants are completely prone to elements in the cosmos, the rhythms of day and night.”

Following the lunar calendar, this type of farming is driven by the belief that the Moon influences levels of moisture in the soil, just as the Moon’s gravitational pull affects great bodies of water. Lunar farmers believe, for example, that from the new Moon to quarter Moon phases, when the Moon is waxing, a soil’s moisture content increases, whereas drier periods occur during the waning phase. Although moisture influences seed germination, a lunar guide on when to plant and weed can be advantageous to a grower.
Nature has been around forever. First-century Roman naturalist Pliny the Elder stated in his *Natural History* that the Moon “replenishes the Earth; when she approaches it, she fills all bodies, while, when she recedes, she empties them.” Chinese and Egyptian people performed agricultural tasks according to the lunar calendar for millennia, and, to this day, the vaunted *Old Farmer’s Almanac* includes regional lunar calendars and advice on when to conduct farm chores. The almanacs’ editor, Janice Stillman, says, “That information is of value to our readers who practice these traditional methods—and claim great success.”
Lunar farming has its skeptics, who are not sure of the method’s efficacy. Recalling advice he received on the best lunar time to plant potatoes, an English farmer says his first reaction was “Hoopla.” Current mainstream agriculture does not factor the Moon into their practices, so the concept might seem quaint or irrational. Additionally, lunar farming is based in astrology as opposed to astronomy, and no extensive scientific studies have yet been conducted that measure the Moon’s overall influence on farming. So supporters continue to wait for their practices to be verified scientifically.

Stillman says, “We are of the mind that you accept or believe by choice.” Indeed, despite his doubts, the skeptical English farmer wound up planting his potatoes according to the lunar cycle and claims they were “the best I have tasted.” Agricultural professor Jennifer Coffman has a similar response to Ferrua’s bounty in Italy. “Smell this rosemary,” she says. “Smell how amazingly fragrant that is.” At this stage, one could say that the evidence must be experienced to be believed.

30. Which choice best performs the revision? A) NO CHANGE B) skeptics, who have yet to be convinced. C) skeptics—those who doubt the method. D) skeptics.

31. Which choice best completes the sentence? A) NO CHANGE B) those C) it’s D) its

32. The writer wants to conclude the paragraph effectively while also reinforcing the point that skepticism toward lunar farming still exists. Which choice best accomplishes this goal? A) NO CHANGE B) and therefore no sound scientific data on the subject exist to date. C) yet many continue to practice lunar farming. D) leading many to conclude that the practice is based in folklore, not fact.

33. Which choice gives an additional supporting example that emphasizes the importance of the senses in judging the success of the lunar farming method? A) NO CHANGE B) She has taken photographs of the grapevines and landscape. C) She takes careful notes about Ferrua’s farming methods, asking Ferrua to clarify how he prepares the soil. D) She dips bread into Ferrua’s olive oil as he explains a soil preparation he does in the fall.
Questions 34–44 are based on the following passage.

Recipes for History: The Szathmary Cookbook Collection

In 1990, chef Louis Szathmary, a voracious collector of cookbooks, donated approximately 20,000 culinary artifacts to the University of Iowa library. The gift included more than 100 manuscript recipe books—collections of recipes handwritten by the people who used them. The manuscripts, some of which date back to the seventeenth century, are an invaluable resource for food historians as well as the general public.

Because of the astonishing size and range of Szathmary’s donation to the University of Iowa, making this cornucopia of information available to readers was a challenge. Working in conjunction with the library, the University of Iowa Press published volumes as varied as The P.E.O. Cookbook, written in rural Iowa in 1908, and Ladie Borlase’s Receiptes Booke, written in the English countryside from 1665 to 1822. Librarians were happy to show the Szathmary collection to people who were able to visit the library, so the manuscripts, too delicate to be checked out to library patrons, remained largely unexplored.
This all started to change in 2012, when the university expanded its DIY History Project (“DIY” stands for “do it yourself”) to include the manuscripts. The project enlists volunteers to transcribe the recipes: working from our home computers, the volunteers type up the scanned handwritten recipes. After a page is transcribed and proofread, it is digitized and becomes part of a searchable online archive. Volunteer transcribers need no particular expertise; prosaic directives are provided on the DIY History website. Transcribing is easy. The ingredients (one recipe requires something called “ringon root”) and measurements (a “ditto” of baking soda), moreover, can be puzzling. The goal is to digitize all the manuscripts in the Szathmary collection, making them available to anyone with access of a computer and the Internet.
[1] The library is working hard to publicize the project and encourage the public to try the recipes. [2] It has formed a club dedicated to cooking manuscript recipes. [3] Some recipes don’t fare well in the twenty-first century (one club member called her 1800s gingerbread a “molasses-laden brick”), while others had worked just fine. [4] In another instance of library outreach, a competition at the 2013 Iowa State Fair, contestants baked desserts in three categories—almond cheesecake, summer mince pie, and Marlborough pie—using recipes from the Szathmary collection.

The efforts of the library and the volunteers are clearly bearing fruit. By January 2014, more than 38,000 manuscript pages had been transcribed, thanks to the volunteers who answered DIY History’s call to “help build the historical record by doing it yourself.”

42. A) NO CHANGE  
   B) work  
   C) worked  
   D) could have worked

43. A) NO CHANGE  
   B) almond, cheesecake summer, mince,  
   C) almond cheesecake summer, mince  
   D) almond, cheesecake, summer, mince,

44. The writer plans to add the following sentence to this paragraph.
   The judges reported that the entries were delicious.

To make this paragraph most logical, the sentence should be placed
   A) after sentence 1.  
   B) after sentence 2.  
   C) after sentence 3.  
   D) after sentence 4.
No Test Material On This Page
Math Test – No Calculator

20 MINUTES, 14 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

DIRECTIONS

For questions 1-10, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 14-17, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 14 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator is not permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function \( f \) is the set of all real numbers \( x \) for which \( f(x) \) is a real number.

REFERENCE

\[
\begin{align*}
A &= \pi r^2 \\
C &= 2\pi r \\
A &= \ell w \\
\ell &= \frac{1}{2} bh \\
c^2 &= a^2 + b^2 \\
\end{align*}
\]

Special Right Triangles

\[
\begin{align*}
V &= \ell wh \\
V &= \pi r^2 h \\
V &= \frac{4}{3} \pi r^3 \\
V &= \frac{1}{3} \pi r^2 h \\
V &= \frac{1}{3} \ell wh \\
\end{align*}
\]

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is \( 2\pi \).
The sum of the measures in degrees of the angles of a triangle is 180.
A babysitter earns $8 an hour for babysitting 2 children and an additional $3 tip when both children are put to bed on time. If the babysitter gets the children to bed on time, what expression could be used to determine how much the babysitter earned?

A) \(8x + 3\), where \(x\) is the number of hours
B) \(3x + 8\), where \(x\) is the number of hours
C) \(x(8 + 2) + 3\), where \(x\) is the number of children
D) \(3x + (8 + 2)\), where \(x\) is the number of children

If \((x, y)\) is a solution to the equation above and \(y \neq 0\), what is the ratio \(\frac{x}{y}\)?

A) \(-\frac{4}{3}\)
B) \(-\frac{2}{3}\)
C) \(\frac{1}{3}\)
D) \(\frac{2}{3}\)

\[
\begin{align*}
\frac{1}{2}x - \frac{1}{4}y &= 10 \\
\frac{1}{8}x - \frac{1}{8}y &= 19
\end{align*}
\]
Which ordered pair \((x, y)\) satisfies the system of equations above?

A) \((-112, -264)\)
B) \((64, 88)\)
C) \(\left(\frac{232}{3}, \frac{224}{3}\right)\)
D) \((288, 536)\)
Triangle $ABC$ above is isosceles with $AB = AC$ and $BC = 48$. The ratio of $DE$ to $DF$ is $5:7$. What is the length of $DC$?

A) 12
B) 20
C) 24
D) 28

In a certain game, a player can solve easy or hard puzzles. A player earns 30 points for solving an easy puzzle and 60 points for solving a hard puzzle. Tina solved a total of 50 puzzles playing this game, earning 1,950 points in all. How many hard puzzles did Tina solve?

A) 10
B) 15
C) 25
D) 35

To cut a lawn, Allan charges a fee of $15 for his equipment and $8.50 per hour spent cutting a lawn. Taylor charges a fee of $12 for his equipment and $9.25 per hour spent cutting a lawn. If $x$ represents the number of hours spent cutting a lawn, what are all the values of $x$ for which Taylor’s total charge is greater than Allan’s total charge?

A) $x > 4$
B) $3 \leq x \leq 4$
C) $4 \leq x \leq 5$
D) $x < 3$

\[2x^2 + 7x - 15 = 0\]

If $r$ and $s$ are two solutions of the equation above and $r > s$, which of the following is the value of $r - s$?

A) $\frac{15}{2}$
B) $\frac{13}{2}$
C) $\frac{11}{2}$
D) $\frac{3}{2}$
8

\[ n = 456 - 3T \]

The equation above is used to model the relationship between the number of cups, \( n \), of hot chocolate sold per day in a coffee shop and the average daily temperature, \( T \), in degrees Fahrenheit. According to the model, what is the meaning of the 3 in the equation?

A) For every increase of 3°F, one more cup of hot chocolate will be sold.
B) For every decrease of 3°F, one more cup of hot chocolate will be sold.
C) For every increase of 1°F, three more cups of hot chocolate will be sold.
D) For every decrease of 1°F, three more cups of hot chocolate will be sold.

9

A truck enters a stretch of road that drops 4 meters in elevation for every 100 meters along the length of the road. The road is at 1,300 meters elevation where the truck entered, and the truck is traveling at 16 meters per second along the road. What is the elevation of the road, in meters, at the point where the truck passes \( t \) seconds after entering the road?

A) \( 1,300 - 0.04t \)
B) \( 1,300 - 0.64t \)
C) \( 1,300 - 4t \)
D) \( 1,300 - 16t \)

10

If \( f(x - 1) = 2x + 3 \) for all values of \( x \), what is the value of \( f(-3) \)?

A) \(-7\)
B) \(-5\)
C) \(-3\)
D) \(-1\)
**DIRECTIONS**

For questions 14–17, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If $3\frac{1}{2}$ is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
6. **Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

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<th>2</th>
<th>Answer: $\frac{7}{12}$</th>
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<td>2</td>
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</table>

**NOTE:** You may start your answers in any column, space permitting. Columns you don’t need to use should be left blank.
14. For what value of \( h \) is \( 24 = \frac{h}{10} - 6 \)?

15. What is the value of \( a \) if \( (2a + 3) - (4a - 8) = 7 \)?

16. If \( x \) is not equal to zero, what is the value of \( \frac{4(x^3)^2}{(2x)^2} \)?

17. If \( x - 2 \) is a factor of \( x^2 - bx + b \), where \( b \) is a constant, what is the value of \( b \)?

STOP

If you finish before time is called, you may check your work on this section only.

Do not turn to any other section.
No Test Material On This Page
Math Test – Calculator

25 MINUTES, 18 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

**DIRECTIONS**

For questions 14-27, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 28-31, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 28 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

**NOTES**

1. The use of a calculator is permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function $f$ is the set of all real numbers $x$ for which $f(x)$ is a real number.

**REFERENCE**

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is $2\pi$.
The sum of the measures in degrees of the angles of a triangle is 180.
Questions 14-16 refer to the following information.

A survey of 170 randomly selected teenagers aged 14 through 17 in the United States was conducted to gather data on summer employment of teenagers. The data are shown in the table below.

<table>
<thead>
<tr>
<th>Ages</th>
<th>Have a summer job</th>
<th>Do not have a summer job</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 14–15</td>
<td>20</td>
<td>69</td>
<td>89</td>
</tr>
<tr>
<td>Ages 16–17</td>
<td>39</td>
<td>42</td>
<td>81</td>
</tr>
<tr>
<td>Total</td>
<td>59</td>
<td>111</td>
<td>170</td>
</tr>
</tbody>
</table>

14. Which of the following is closest to the percent of those surveyed who had a summer job?

A) 22%
B) 35%
C) 47%
D) 53%

15. In 2012 the total population of individuals in the United States who were between 14 and 17 years old (inclusive) was about 17 million. If the survey results are used to estimate information about summer employment of teenagers across the country, which of the following is the best estimate of the total number of individuals between 16 and 17 years old in the United States who had a summer job in 2012?

A) 8,200,000
B) 3,900,000
C) 2,000,000
D) 390,000

16. Based on the data, how many times more likely is it for a 14 year old or a 15 year old to NOT have a summer job than it is for a 16 year old or a 17 year old to NOT have a summer job? (Round the answer to the nearest hundreth.)

A) 0.52 times as likely
B) 0.65 times as likely
C) 1.50 times as likely
D) 1.64 times as likely
The graph above shows the amount of protein supplied by five different food products, A, B, C, D, and E, as a percentage of their total weights. The costs of 10 grams of products A, B, C, D, and E are $2.00, $2.20, $2.50, $4.00, and $5.00, respectively. Which of the five food products supplies the most protein per dollar?

A) A  
B) B  
C) C  
D) E

In quadrilateral $ABCD$ above, $BC$ is parallel to $AD$, and $AB = CD$. If $BC$ and $AD$ were each doubled and $BE$ was reduced by 50 percent, how would the area of $ABCD$ change?

A) The area of $ABCD$ would be decreased by 50 percent.  
B) The area of $ABCD$ would be increased by 50 percent.  
C) The area of $ABCD$ would not change.  
D) The area of $ABCD$ would be multiplied by 2.

Boyd grows only tomatoes and raspberries in his garden. Last year, he grew 140 pounds of tomatoes and 60 pounds of raspberries. This year, the production, by weight, of tomatoes declined by 20 percent, and the production, by weight, of raspberries declined by 50 percent. By what percentage did the total yield, by weight, of Boyd’s garden decline?

A) 29 percent  
B) 30 percent  
C) 35 percent  
D) 70 percent
The graph above shows the frequency distribution of a list of randomly generated integers between 0 and 10. What is the mean of the list of numbers?

A) 3.0  
B) 3.5  
C) 4.25  
D) 12.0

What is the minimum value of the function graphed on the xy-plane above, for \(-4 \leq x \leq 6\)?

A) \(-\infty\)  
B) \(-4\)  
C) \(-2\)  
D) 1
Questions 22-24 refer to the following information.

In 1929, the astronomer Edwin Hubble published the data shown. The graph plots the velocity of galaxies relative to Earth against the distances of galaxies from Earth.

Hubble’s data can be modeled by the equation \( v = 500d \), where \( v \) is the velocity, in kilometers per second, at which the galaxy is moving away from Earth and \( d \) is the distance, in megaparsecs, of the galaxy from Earth. Assume that the relationship is valid for larger distances than are shown in the graph. (A megaparsec (Mpc) is \( 3.1 \times 10^19 \) kilometers.)

22. According to Hubble’s data, how fast, in meters per second, is Galaxy Q moving away from Earth?
   A) \( 2 \times 10^6 \) m/s
   B) \( 5 \times 10^5 \) m/s
   C) \( 5 \times 10^2 \) m/s
   D) \( 2.5 \times 10^2 \) m/s

23. There are four galaxies shown in the graph at approximately 0.9 Mpc from Earth. Which of the following is closest to the range of velocities of these four galaxies, in kilometers per second?
   A) 100
   B) 200
   C) 450
   D) 700

24. Based on the model, what is the velocity, in kilometers per second, of a galaxy that is 15 Mpc from Earth?
   A) 7,500 km/s
   B) 5,000 km/s
   C) 1,100 km/s
   D) 750 km/s
25 Janice puts a fence around her rectangular garden. The garden has a length that is 9 feet less than 3 times its width. What is the perimeter of Janice’s fence if the area of her garden is 5,670 square feet?

A) 342 feet  
B) 318 feet  
C) 300 feet  
D) 270 feet

26 Given the right triangle $ABC$ above, which of the following is equal to $\frac{b}{a}$? 

A) $\sin A$  
B) $\sin B$  
C) $\tan A$  
D) $\tan B$

27 \[
\begin{align*}
y &\leq -x \\
2y &> 3x + 2
\end{align*}
\]

A system of inequalities and a graph are shown above. Which section or sections of the graph could represent all of the solutions to the system?

A) Section R  
B) Sections Q and S  
C) Sections Q and P  
D) Sections Q, R, and S
**DIRECTIONS**

For questions 28-31, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. Mixed numbers such as $3 \frac{1}{2}$ must be gridded as 3.5 or $\frac{7}{2}$. (If $\frac{31}{2}$ is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3 \frac{1}{2}$.)
6. Decimal answers: If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

**Answer: \( \frac{7}{12} \)**

**Answer: 2.5**

Acceptable ways to grid \( \frac{2}{3} \) are:

**Answer: 201 – either position is correct**

**NOTE:** You may start your answers in any column, space permitting. Columns you don’t need to use should be left blank.
The $xy$-plane above shows one of the two points of intersection of the graphs of a linear function and a quadratic function. The shown point of intersection has coordinates $(v, w)$. If the vertex of the graph of the quadratic function is at $(4, 19)$, what is the value of $v$?

In a college archaeology class, 78 students are going to a dig site to find and study artifacts. The dig site has been divided into 24 sections, and each section will be studied by a group of either 2 or 4 students. How many of the sections will be studied by a group of 2 students?
Questions 30 and 31 refer to the following information.

\[ v = v_0 - gt \quad \text{(speed-time)} \]

\[ h = v_0 t - \frac{1}{2} gt^2 \quad \text{(position-time)} \]

\[ v^2 = v_0^2 - 2gh \quad \text{(position-speed)} \]

An arrow is launched upward with an initial speed of 100 meters per second (m/s). The equations above describe the constant-acceleration motion of the arrow, where \( v_0 \) is the initial speed of the arrow, \( v \) is the speed of the arrow as it is moving up in the air, \( h \) is the height of the arrow above the ground, \( t \) is the time elapsed since the arrow was projected upward, and \( g \) is the acceleration due to gravity (9.8 m/s²).

**30**

What is the maximum height from the ground the arrow will rise to the nearest meter?

**31**

How long will it take for the arrow to reach its maximum height to the nearest tenth of a second?

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**STOP**

If you finish before time is called, you may check your work on this section only.

Do not turn to any other section.