### ACT PRACTICE TEST 4

**Answer Sheet**

#### ENGLISH

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Refer to the Scoring Worksheet on page 314 for help in determining your Raw and Scale Scores.
Begin WRITING TEST here.

If you need more space, please continue on the next page.
DIRECTIONS: In the passages that follow, some words and phrases are underlined and numbered. In the answer column, you will find alternatives for the words and phrases that are underlined. Choose the alternative that you think is best, and fill in the corresponding bubble on your answer sheet. If you think that the original version is best, choose “NO CHANGE,” which will always be either answer choice A or F. You will also find questions about a particular section of the passage, or about the entire passage. These questions will be identified either by an underlined portion or by a number in a box. Look for the answer that clearly expresses the idea, is consistent with the style and tone of the passage, and makes the correct use of standard written English. Read the passage through once before answering the questions. For some questions, you should read beyond the indicated portion before you answer.

PASSAGE I

On the Road Again

We drive across the country the way most people might go from home to work and back again to home. I guess you could call us nomads, except for the fact that our trips have become fairly regular, mostly to Las Vegas, Nevada, than back to New York, our home for the past 35 years.

My husband and I are retired high school teachers, which means that we have plenty of time to travel. Three of our five children now live west of the Mississippi River. All of our grandchildren live in New York, and we have two large dogs. Therefore, staying in Las Vegas for more than three consecutive weeks is generally enjoyable. And so, we find ourselves back on the road time and time again.

Las Vegas had become our sunshine sanctuary; we have become completely fed up with New York’s cold and gloomy winters and are determined to spend as much time

1. A. NO CHANGE
   B. to home
   C. back home again
   D. back

2. F. NO CHANGE
   G. fair and regular
   H. regularly fair
   J. regular to fair

3. A. NO CHANGE
   B. then
   C. and than
   D. and then we go

4. F. NO CHANGE
   G. to be traveling
   H. for us to travel
   J. OMIT the underlined portion

5. Which choice would best help establish that the narrator has good reasons for driving back and forth across the country?
   A. NO CHANGE
   B. simplistic
   C. not viable
   D. quite easy

6. F. NO CHANGE
   G. became
   H. has became
   J. has become
as possible in the warm sunny West. Moreover, we have extended family in Nevada, Arizona, Colorado, and California, so vacationing in Las Vegas makes a lot of sense for us.

[1] So we have two adopted dogs, both of which are shelter mutts, flying is not an option; we want the dogs with us and we want to avoid paying boarding fees.

[2] And so, here we are, for the second time this month, trekking home with our dogs in our extended-cab truck.

[3] Hunter, a lab and spaniel mix, fills his limited space on the back bench seat, and Lizzie, our elderly pooch, lying on her special blanket on the floor. [4] They are quiet; they know the drill. [5] Every few hours they get to jump out of the truck and sniff out the newest stop.

Thus far, we have past the Hoover Dam, climbed the mountains of Flagstaff, Arizona, crossed the high deserts of New Mexico and the Texas panhandle, paid our toll’s in Oklahoma, and looped around St. Louis, Missouri. After 26 hours on the road, we are a mere seven hours from home; this will be one of our fastest trips, thanks to pre-packed turkey sandwiches, fewer stops for gas, good weather, and audio books.

The landscape in Missouri is surprisingly snow-free for the month of January, but the sky is becoming predictably thick with gray clouds. I’m mentally preparing myself for
a sunless New York sky during our week at home. But that’s okay; it will just reinforce for me the purpose of getting right back on the road in seven days to head back to sunny Las Vegas.

14. The writer is considering deleting the preceding sentence. If the sentence was deleted, the essay would primarily lose:
   F. the writer’s focus of the entire essay.
   G. the gravity of the situation that is being discussed in the essay.
   H. a reinforcement of the reason the writer doesn’t mind her constant travels.
   J. detail that reiterates why the narrator does not like to live in New York.

Question 15 asks about the preceding passage as a whole.

15. Suppose the writer had chosen to write a travel article about Las Vegas, Nevada. Would this essay fulfill the writer’s goal?
   A. Yes, because the writer expounds on the beautiful weather of Las Vegas and the surrounding areas.
   B. Yes, because the writer clearly gives reasons for leaving New York to go to Las Vegas.
   C. No, because the writer likes Las Vegas only for the warm, sunny weather.
   D. No, because the essay is a personal account of a trip to Las Vegas, and does not highlight any particular features about the city.

PASSAGE II

Listening to a Different Language

Dog obedience training is an important undertaking when one acquires a new dog. This is particularly important if the dog owner is a social person or plans to interact with other dogs and the owners. One problem, however, is that obedience training was a form of one-way communication from the owner to the dog. Many owners fail to consider that the animal actually communicates back.

Carefully watching a dog’s movements and facial expressions reveals a great deal about what a dog is thinking. A dog’s forehead, for example, may wrinkle...
when the dog is confused or waiting for a signal from its owner. When the dog wants to play, it might pull the lips back slightly, showing its teeth in a “smile.” A relaxed dog might let its tongue loll out of its mouth, creating a look of contentment on its face.

Other forms of body language can also indicate which emotion a dog is experiencing. For example, if its ears are raised, it is probably absorbing the sounds around it. Shifting its ears back flat against its head demonstrates submission or fear. A high, wagging tail shows that the dog is happy and ready to play. If the wagging tail is held low and taut, however, the dog is probably on guard and may be ready to pounce. When it feels threatened or indicates submissiveness, the dog might tuck its tail between its legs, crouch down, and then roll over onto its back. Body language and even vocalizations are good indicators of a dog’s emotions.

[1] While most dogs are capable of learning a variety of human words and physical signals; training a dog becomes much easier when the owner tries to discern its unique communication signals. [2] As an owner begins tuning in

20. F. NO CHANGE
G. confusing
H. confused by some
J. confused with

21. A. NO CHANGE
B. its
C. its’
D. their

22. The author is considering deleting the previous sentence. If the sentence were deleted, the essay would primarily lose:
F. an example of how a dog communicates with its owner.
G. support for the author’s suggestions regarding the importance of obedience training.
H. an irrelevant detail.
J. an important fact about dog anatomy.

23. A. NO CHANGE
B. can do the indicating of
C. shall be indicative of
D. can show by indicating

24. Given that all of the following are true, which one, if added here, would provide the most effective support for the statements made in the preceding sentence?
F. The dog’s owner should immediately try to determine what the dog is responding to.
G. Dogs are often fearful of unusual or unfamiliar situations and people.
H. It is important to have a dog’s hearing assessed by a veterinarian and to check the ears frequently for mites or ticks.
J. Many purebred dogs have their ears trimmed or clipped in a particular manner to suit their breed.

25. Given that all of the choices are true, which one would most effectively conclude this paragraph?
A. NO CHANGE
B. Smaller dogs generally have a higher-pitched bark, while a larger dog usually vocalizes with a much louder and deeper tone.
C. A yip or whimper indicates some type of pain or discomfort, while a deep bark probably shows more dominance and assertiveness and may be a signal of danger.
D. Part of obedience training is teaching a dog when it is appropriate to bark and when it isn’t.

26. F. NO CHANGE
G. signals, training
H. signals training
J. signals and training
to his or her dog’s body language, he or she may find that
the dog responds to movements in addition to verbal
commands. [3] For example, when teaching a dog to
“come,” the owner might find it more effective to crouch
down, the owner’s back to the dog as its name is called.
[4] The dog will interpret this behavior in a more positive
light than if the owner leans forward and yells at it to
“come.” [5] To a dog, a crouching position is more
welcoming than a forward-lean, which a dog naturally
finds threatening. [6] Dog owners should always have
small treats on hand to reward their dog when it obeys a
command.

The bottom line, is that there is a great deal more
involved in communicating with a canine than just
teaching it to come, stay, heel, and fetch. To attain a
strong, two-way relationship, it is best with remembering
the importance of non-verbal communication.

PASSAGE III

Playing with Piñatas

While the history of the piñata is somewhat
murky. Most scholars believe that the piñata originated in
China and later became popular in Europe. Some
historians believe that the modern version of the piñata
was created centuries ago in China, where most of them
were made to resemble animals. These animal figures were
covered with colorful paper and filled with seeds, rather

31. A. NO CHANGE
B. murky; most
C. murky most
D. murky, most

32. F. NO CHANGE
G. in which most
H. where, the most
J. so that most
than candy or toys as is customary today. Once the seeds were spilled, they were gathered and burned as a ritualistic practice. The ashes of the seeds were in keeping until the end of the year and were thought to bring good luck to their owners.

The Italian explorer, Marco Polo, is probably responsible for bringing the Chinese piñata to Europe. The piñata quickly became associated with religious ceremonies and was also used in celebrations. Often, the piñata was made into the shape of a star, which represented the Star of Bethlehem. During this time in Italy, the piñata was often made of fragile clay that broke easily. In fact, the Italian word *pignatta* translates to “fragile pot.” The clay pots would be hung from a tree or a pole and a stick would be used to hit the pot until it broke. The broken pots dispensed of tiny treasures that would fall to the ground, where eager children and adults would quickly gather them up.

With colorful ribbons and paper, these clay pots could be unadorned or decorated. In the United States, piñatas’ are generally made either of papier-mâché or a cardboard-type material. American piñatas come in almost every shape and design imaginable.
Every holiday has their own host of possible choices and themes. In America, baseball bats are the preferred tool used to break open the piñata. In general, using a baseball bat should make it simple to break open the piñata, laden with pounds of candy and toys; however, each person attempting the feat is first blind-folded and then spun around several times, which presents a challenge. Onlookers will generally try to help the participant by offering suggestions, but the audience most enjoys watching the blindfolded person swing mightily at nothing but thin air. Everyone wins when the broken piñata spills its contents, and onlookers scramble to collect the fun surprises.

PASSAGE IV

A Gift From the Heart

Contrary to advertisements seen on television, read, in magazines, or heard on the radio, having spent a lot of money on a gift for a friend or loved one is totally unnecessary. Many people collect photos or mementos from special events, trips, or celebrations throughout their lives, throwing them in a drawer or cardboard box somewhere, intending to sort them out later. It seems, though, that “later” never comes. So, the next time you’re ready to plop down a plastic credit card for a silk scarf or pair of leather gloves for that special someone...
whom you care about, consider sorting through that junk drawer filled of trinkets and special photos.

[1] For example, you can decorate an inexpensive picture frame with colorful buttons for your seamstress mother, or you can use nuts and bolts for your workshop-crazed brother. [2] Shadow boxes are also a wonderful way to display several objects from a single special event, such as a wedding. [3] Inserting a special photo of you and that certain someone will create a gift that will be treasured forever. [4] Take the original wedding invitation, a candy favor, and a dried flower from the table centerpiece, a napkin, or anything else that you can gather from the wedding.

When you have many photos and mementos, making a photo album or scrapbook for a friend or family member. Today, the options for embellishing your book are near to be endless. Entering a scrapbooking store can make your head spin. If some happens to you on your first scrapbooking venture, consider taking an introductory

50. F. NO CHANGE  
   G. who is important to you  
   H. who means a lot to you  
   J. OMIT the underlined portion.

51. A. NO CHANGE  
   B. filled with  
   C. fall with  
   D. filling with

52. F. NO CHANGE  
   G. you can also use  
   H. use  
   J. also you can use

53. A. NO CHANGE  
   B. or  
   C. as well as  
   D. OMIT the underlined portion.

54. F. NO CHANGE  
   G. gather or take from  
   H. get together and take  
   J. gather up and take with you

55. Which of the following sequences of sentences makes this paragraph most logical?  
   A. NO CHANGE  
   B. 1, 3, 2, 4  
   C. 2, 3, 4, 1  
   D. 1, 2, 4, 3

56. F. NO CHANGE  
   G. mementos, make  
   H. mementos make,  
   J. mementos to make

57. A. NO CHANGE  
   B. are near endless  
   C. are nearly to be endless  
   D. are nearly endless

58. F. NO CHANGE  
   G. when it  
   H. this  
   J. so
class, which many stores offer. Of course, you will have a much better idea of which scrapbook supplies to buy when the class ends.

Pictures or books that can be enjoyed over and over again are one-of-a-kind, original gifts. There is nothing like receiving a gift that comes straight from the heart. Such gifts help people recall happy times and solidify the bond between the giver and the receiver.

59. Given that all of the choices are true, which one would best conclude the paragraph while providing the reader with the most specific and detailed information about why store owners offer introductory classes?
   A. NO CHANGE
   B. Most craft stores publish detailed class schedules with a plethora of sessions from which to choose.
   C. If you enroll in an instructional class at a craft store, you might receive discounts or coupons to use at local businesses.
   D. There you will learn how to use pinking shears, picture cut-outs, lettering, and stickers.

60. At this point, the writer is considering adding the following sentence:
   Many people enjoy original gifts.
   Should the writer make this addition here?
   F. Yes, because it reiterates the notion that gift-giving is a rewarding experience.
   G. Yes, because no gift is as good as a homemade gift.
   H. No, because the writer is giving a personal opinion contrary to the rest of the essay.
   J. No, because it is redundant information.

PASSAGE V

The following paragraphs may or may not be in the most logical order. You may be asked questions about the logical order of the paragraphs, as well as where to place sentences logically within any given paragraph.

Strides Toward Safety
[1]

Automotive engineers all over the world are responsible for designing and redesigning, special features for the newest car models. These engineers also know that it is necessary to consider safety issues in all new designs. Statistics consistently indicate that car accidents occur more often during the night than during the day. These statistics take into account that there are fewer drivers on the road at night.

61. A. NO CHANGE
   B. redesigning; special
   C. redesigning: special
   D. redesigning special

62. Given that all of the choices are true, which one would provide the most detailed and relevant information at this point in the essay?
   F. NO CHANGE
   G. accidents occur more frequently
   H. accidents can
   J. accidents occur about three times more often

63. A. NO CHANGE
   B. take into account
   C. taken into account for
   D. taking into account

GO ON TO THE NEXT PAGE.
64. Which of the following sentences would most effectively introduce the subject of this paragraph and act as a transition from the preceding paragraph?

F. In an effort to improve driver and pedestrian safety, auto engineers often come up with ingenious designs.

G. Headlights are probably the single most important feature of a car for night driving, so they should always be kept in proper working order.

H. Car manufacturers compete on a daily basis to find the brightest and most accomplished design engineers.

J. Some of the designs that car engineers come up with are beyond futuristic.

65. A. NO CHANGE

B. and they illuminate

C. by illuminating

D. and, in addition, they illuminate

66. F. NO CHANGE

G. are

H. they are

J. were

67. A. NO CHANGE

B. switches for many years;

C. switches for many years

D. switches, for many years

68. F. NO CHANGE

G. it

H. doing so

J. by doing it, it

69. A. NO CHANGE

B. prove

C. will prove

D. proves

70. F. NO CHANGE

G. Two other systems are being developed that will potentially make driving at night safer:

H. Two other systems are being developed which will potentially increase night safety on the road

J. There are two other systems being developed on the road for night safety that will potentially increase driving safety, these being
71. A. NO CHANGE  
   B. are displayed  
   C. displayed  
   D. are displaying  

72. For the sake of the logic and coherence of this paragraph, Sentence 5 should be placed:  
   F. after Sentence 1.  
   G. after Sentence 6.  
   H. before Sentence 4.  
   J. before Sentence 3.  

73. A. NO CHANGE  
   B. road particularly, during,  
   C. road particularly during,  
   D. road, particularly during  

74. F. NO CHANGE  
   G. safety, but, the  
   H. safety but the  
   J. safety but, the  

Question 75 asks about the preceding passage as a whole.  

75. The writer wishes to add the following sentence in order to show that car manufacturers are concerned with safety issues.  

   While many of these accidents are related to driver fatigue and drunk driving, the inherent hazards of driving in the dark are important factors to be considered in any design initiative.  

   The new sentence would best support and be placed:  
   A. at the beginning of the essay.  
   B. at the end of Paragraph 1.  
   C. at the end of Paragraph 2.  
   D. at the end of Paragraph 3.  

END OF THE ENGLISH TEST.  
STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.
MATHEMATICS TEST
60 Minutes—60 Questions

DIRECTIONS: Solve each of the problems in the time allowed, then fill in the corresponding bubble on your answer sheet. Do not spend too much time on any one problem; skip the more difficult problems and go back to them later.

You may use a calculator on this test. For this test you should assume that figures are NOT necessarily drawn to scale, that all geometric figures lie in a plane, and that the word line is used to indicate a straight line.

DO YOUR FIGURING HERE.

1. One foot is equivalent to approximately 0.3048 meters. If a building is 65-feet long, what is the length of the building in meters, to the nearest tenth?
   A. 19.8
   B. 31.1
   C. 65.3
   D. 198.1
   E. 213.3

2. To keep up with rising costs, a carpenter needs to increase his $30.00 per hour rate by 18%. What will be his new hourly rate?
   F. $30.18
   G. $31.80
   H. $35.40
   J. $38.00
   K. $48.00

3. Contributions to the school dance fund are made by each of 4 student groups according to the table below.

<table>
<thead>
<tr>
<th>Student group</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution in dollars</td>
<td>25</td>
<td>40</td>
<td>30</td>
<td>15</td>
</tr>
</tbody>
</table>

What is the average dollar amount of the contributions made by the 4 student groups?
   A. $110.00
   B. $55.00
   C. $35.00
   D. $27.50
   E. $22.50

4. Bus X travels 40 miles per hour for 2 hours; Bus Y travels 60 miles per hour for 1\(\frac{1}{2}\) hours. What is the difference, in miles, between the number of miles traveled by Bus X and the number of miles traveled by Bus Y?
   F. 10
   G. 20
   H. 50
   J. 80
   K. 90
5. Which of the following is a value of $r$ for which $(r + 2)(r - 3) = 0$?
   A. 6
   B. 0
   C. $-2$
   D. $-3$
   E. $-6$

6. In the parallelogram $PQRS$ shown below, $PS$ is 7 centimeters long. If the parallelogram’s perimeter is 40 centimeters, how many centimeters long is $PQ$?

7. In the standard $(x, y)$ coordinate plane, if the $x$-coordinate of each point on a line is 5 more than half the $y$-coordinate, what is the slope of the line?
   A. $-5$
   B. $\frac{-1}{2}$
   C. $\frac{1}{2}$
   D. 2
   E. 5

8. A rectangular garden has a length of $x$ and a width of $y$. The garden has its length reduced by 3 feet and its width extended by 2 feet. What is the area of the new garden?
   F. $x + y$
   G. $(x - 3)(y - 2)$
   H. $(x + 3)(y + 2)$
   J. $(x - 3)(y + 2)$
   K. $(x + 3)(y - 2)$

9. If $x = 3yz^2$, what is $y$ in terms of $x$ and $z$?
   A. $\frac{x}{3z^2}$
   B. $3xz^2$
   C. $\left(\frac{1}{3}\right)xz^2$
   D. $\frac{z^2y}{3x}$
   E. $\frac{\sqrt{x}}{3z}$
10. In the figure below, what is the measure of \( \angle \alpha \)?

![Diagram of a triangle with sides of length 10 and an angle marked \( \alpha \) with a 55° angle at the vertex.

F. 20°
G. 55°
H. 70°
J. 75°
K. 110°

11. Which of the following is the product of \((3x^2 - 1)(x^2 - 4)\)?

A. \(3x^4 + 13x^2 + 4\)
B. \(3x^4 + 5\)
C. \(3x^4 - 13x^2 + 4\)
D. \(3x^4 - 12x^2 + 4\)
E. \(3x^4 + 12x^2 + 4\)

12. In the standard \((x, y)\) coordinate plane, if a square has the vertices \((-2, -3)\), \((2, -3)\), and \((2, 1)\), what is the set of coordinates for the final vertex?

F. \((2, -1)\)
G. \((1, -2)\)
H. \((-1, 2)\)
J. \((-2, -1)\)
K. \((-2, 1)\)

13. Reduce \(\frac{x^{8y^{12}}}{x^{4y^9}z^2}\) to its simplest terms.

A. \(\frac{x^2y^4}{z^2}\)
B. \(\frac{x^4y^9}{z^2}\)
C. \(x^y^{9}z^2\)
D. \(x^2y^{12}z^2\)
E. \(\frac{x^2y^9}{z^2}\)

14. Which of the following is a value of \(n\) that satisfies \(\log_2 64 = 2r\)?

F. 4
G. 6
H. 8
J. 12
K. 32
15. A survey is conducted among 700 high-school students to see who their favorite college basketball teams are. If 250 students like the Hawks, 200 students like the Vikings, 50 students like the Bears, and the remaining students like the Warriors, approximately what percentage of the 700 high school students answered that the Warriors were their favorite team? (round to the nearest tenth of a percentage point)
   A. 14.3%
   B. 28.6%
   C. 42.9%
   D. 56.2%
   E. 78.6%

16. If $x^2 = 36$ and $y^2 = 81$, which of the following CANNOT be the value of $x + y$?
   F. $-15$
   G. $-3$
   H. 0
   J. 3
   K. 15

17. A system of linear equations is shown below.
   \[4y = 3x + 12\]
   \[-4y = -3x - 8\]

   Which of the following describes the graph of this system of linear equations in the standard $(x, y)$ coordinate plane?
   A. Two parallel lines with negative slope
   B. Two parallel lines with positive slope
   C. A single line with negative slope
   D. A single line with positive slope
   E. Two perpendicular lines

18. \[\frac{-6}{\left|-3\right|} = ?\]
   F. $-3$
   G. $-2$
   H. 0
   J. 2
   K. 9

19. What are the values for $a$ that satisfy the equation \[(a + y)(a + z) = 0?\]
   A. $-y$ and $-z$
   B. $-y$ and $z$
   C. $-yz$
   D. $y$ and $-z$
   E. $y$ and $z$
20. In the circle shown below, \( C \) is the center and lies on segments \( AE \) and \( BF \). Which of the following statements is NOT true?

\[
\begin{align*}
\text{F. } & \angle BAC \text{ measures } 70^\circ \\
\text{G. } & \overline{AB} \text{ is parallel to } \overline{EF} \\
\text{H. } & \overline{AB} \cong \overline{BD} \\
\text{J. } & \angle BCE \cong \angle DCF \\
\text{K. } & \overline{CF} \cong \overline{EF}
\end{align*}
\]

21. What is the slope of the line given by the equation \( 21x - 3y + 18 = 0 \)?

A. \(-7\) \\
B. \(-3\) \\
C. \(\frac{6}{7}\) \\
D. \(\frac{7}{6}\) \\
E. \(7\)

22. Which of the following is the least common denominator for the expression below?

\[
\frac{1}{a^2 \times b \times c} + \frac{1}{b^3 \times c} + \frac{1}{b \times c^2}
\]

F. \(b \times c\) \\
G. \(a \times b \times c\) \\
H. \(a^2 \times b \times c\) \\
J. \(a^2 \times b^2 \times c^2\) \\
K. \(a^2 \times b^4 \times c^5\)

23. What number can you add to the numerator and denominator of \(\frac{5}{8}\) to get \(\frac{1}{2}\)?

A. \(-5\) \\
B. \(-3\) \\
C. \(-2\) \\
D. \(0\) \\
E. \(1\)
24. If \( x + y = 13 \) and \( 2y = 16 \), what is the value of \( x \)?
   - F. 4
   - G. 5
   - H. 7
   - J. 8
   - K. 9

25. If the inequality \(|m| > |n|\) is true, then which of the following must be true?
   - A. \( m = n \)
   - B. \( m \neq n \)
   - C. \( m < n \)
   - D. \( m > n \)
   - E. \( m > 0 \)

26. Given that \( y - 5 = \frac{1}{2}x + 1 \) is the equation of a line, at what point does the line cross the \( x \) axis?
   - F. \(-15\)
   - G. \(-12\)
   - H. \(1\)
   - J. \(4\)
   - K. \(6\)

Use the following information to answer Questions 27 and 28.

The figure above shows the plan for the ground floor of a townhouse. The thickness of the walls should be ignored when answering the questions. The dimensions shown are in feet, and each region is rectangular.

27. What is the area, in square feet, of the living room?
   - A. 360
   - B. 280
   - C. 216
   - D. 168
   - E. 120

GO ON TO THE NEXT PAGE.
28. What is the perimeter, in feet, of the ground floor of the
townhouse?
F. 76
G. 80
H. 92
J. 180
K. 360

29. Three years ago, the population of a certain species of
bird was calculated at 20 birds per acre. This year, a
biologist recorded a total of 47 birds in an area equal
to 3.25 acres. By about what percentage has the bird
population in the biologist’s sample decreased over the
last 3 years, to the nearest tenth?
A. 14.7%
B. 27.7%
C. 38.3%
D. 42.6%
E. 72.3%

30. A right triangle that has sides measured in the same
unit of length is shown below. For any such triangle,
\((\tan \alpha)(\sin \beta)\) is equivalent to:

F. \(\frac{x}{z}\)
G. \(\frac{x^2}{z^2}\)
H. \(\frac{z}{y}\)
J. \(\frac{z^2}{y^2}\)
K. \(\frac{z^2}{x}\)

31. For all \(x > 0\), \(\frac{1}{x} + \frac{3}{4} = \) ?
A. \(\frac{3}{4x}\)
B. \(\frac{4}{4x}\)
C. \(\frac{4 + 3x}{4x}\)
D. \(\frac{4}{4 + x}\)
E. \(\frac{4 + 3x}{4 + x}\)
32. If \( \cos A = \frac{4}{5} \), and \( \sin A = \frac{3}{5} \); then \( \tan A = ? \)
   
   F. \( \frac{3}{4} \)
   
   G. \( \frac{3}{5} \)
   
   H. \( \frac{4}{5} \)
   
   J. \( \frac{4}{3} \)
   
   K. \( \frac{12}{5} \)

33. In the \((x, y)\) coordinate plane, what is the \(y\)-intercept of the line \(5x + 3y = 8\)?
   
   A. \( \frac{8}{3} \)
   
   B. 3
   
   C. \( \frac{5}{3} \)
   
   D. \( \frac{3}{5} \)
   
   E. \( -\frac{5}{3} \)

34. If \( a^x = a^y \) for all \( a \neq 0 \), which of the following must be true?
   
   F. \( \sqrt{xy} = 4 \)
   
   G. \( x \times y = 4 \)
   
   H. \( x + y = 4 \)
   
   J. \( x - y = 4 \)
   
   K. \( x \div y = 4 \)

35. In a certain music store, CDs were put on display and assigned prices for May. Each month after that, the price was 20% less than the price for the previous month. If the price of a CD was \( d \) dollars in May, what was the price in August?
   
   A. 0.2\( d \)
   
   B. 0.3\( d \)
   
   C. 0.512\( d \)
   
   D. 0.64\( d \)
   
   E. 0.8\( d \)

36. If \(|5 - 2x| > 5\), which of the following is a possible value of \( x \)?
   
   F. 2
   
   G. 3
   
   H. 4
   
   J. 5
   
   K. 6
37. What value of \( t \) will satisfy the equation \( 0.1(t + 3,420) = t \)?
   A. \(-3,420\)  
   B. \(-313.64\)  
   C. \(313.64\)  
   D. \(342\)  
   E. \(380\)

38. What is the slope of any line parallel to the \( y \)-axis in the \((x, y)\) coordinate plane?
   F. \(-1\)  
   G. \(0\)  
   H. \(1\)  
   J. Undefined  
   K. Cannot be determined from the given information

39. Which one of the following lines has the smallest slope?
   A. \( y = x + 6 \)  
   B. \( y = 2x + 10 \)  
   C. \( y = \frac{1}{2}x - 1 \)  
   D. \( 5y = 15x + 4 \)  
   E. \( 7y = 3x - 7 \)

40. Amy can run 3.5 miles in \( x \) minutes. At that pace, how many minutes would it take her to run 10.5 miles?
   F. \(10.5x\)  
   G. \(7x\)  
   H. \(4x\)  
   J. \(3.5x\)  
   K. \(3x\)

41. A certain rectangle is 5 times as long as it is wide. Suppose the length and width are both tripled. The perimeter of the second rectangle is how many times as large as the perimeter of the first rectangle?
   A. \(3\)  
   B. \(5\)  
   C. \(6\)  
   D. \(12\)  
   E. \(15\)

42. If \( r \) and \( s \) are constants and \( x^2 + rx + 12 \) is equivalent to \((x + 3)(x + s)\), what is the value of \( r \)?
   F. \(3\)  
   G. \(4\)  
   H. \(7\)  
   J. \(12\)  
   K. Cannot be determined from the given information
43. For what value of b would the following system of equations have an infinite number of solutions?

\[3x + 5y = 27\]
\[12x + 20y = 3b\]

A. 9  
B. 27  
C. 36  
D. 81  
E. 126

44. Which of the following calculations will yield an even integer for any integer \(a\)?

F. \(2a^2 + 3\)  
G. \(4a^3 + 1\)  
H. \(5a^2 + 2\)  
J. \(6a^4 + 6\)  
K. \(a^6 - 3\)

45. What is the solution set of \(|3a - 3| \geq 12\)?

A. \(a \geq 5\) and \(a \leq -5\)  
B. \(a \geq 5\) and \(a \leq -3\)  
C. \(a \geq -5\) and \(a \leq 5\)  
D. \(a \geq -5\) and \(a \leq 3\)  
E. \(a \leq 5\) and \(a \geq -5\)

46. What is \(\cos \frac{5\pi}{12}\) given that \(\frac{5\pi}{12} = \frac{\pi}{4} + \frac{\pi}{6}\) and that \(\cos(\alpha + \beta) = (\cos \alpha)(\cos \beta) - (\sin \alpha)(\sin \beta)\)? (Note: You may use the following table of values.)

<table>
<thead>
<tr>
<th>(\theta)</th>
<th>(\sin \theta)</th>
<th>(\cos \theta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\frac{\pi}{6})</td>
<td>(\frac{1}{2})</td>
<td>(\frac{\sqrt{3}}{2})</td>
</tr>
<tr>
<td>(\frac{\pi}{4})</td>
<td>(\frac{\sqrt{2}}{2})</td>
<td>(\frac{\sqrt{2}}{2})</td>
</tr>
<tr>
<td>(\frac{\pi}{3})</td>
<td>(\frac{\sqrt{3}}{2})</td>
<td>(\frac{1}{2})</td>
</tr>
</tbody>
</table>

F. \(\frac{1}{4}\)  
G. \(\frac{1}{2}\)  
H. \(\frac{\sqrt{6} - \sqrt{2}}{4}\)  
J. \(\frac{\sqrt{3} - \sqrt{2}}{2}\)  
K. \(\frac{\sqrt{6} + 2}{4}\)
47. If \( y \neq z \), what are the real values of \( x \) that make the following inequality true?

\[
\frac{xy - xz}{3y - 3z} < 0
\]

A. All negative real numbers
B. All positive real numbers
C. \(-\frac{1}{3}\) only
D. \(\frac{1}{3}\) only
E. 3 only

48. The perimeter of a square is 36 units. How many units long is the diagonal of the square?

F. 8
G. \(9\sqrt{2}\)
H. 16
J. 18
K. \(18\sqrt{3}\)

49. What is the equation of the circle in the standard \((x, y)\) coordinate plane that has a radius of 4 units and the same center as the circle determined by \(x^2 + y^2 - 6y + 4 = 0\)?

A. \(x^2 + y^2 = -4\)
B. \((x + 3)^2 + y^2 = 16\)
C. \((x - 3)^2 + y^2 = 16\)
D. \(x^2 + (y + 3)^2 = 16\)
E. \(x^2 + (y - 3)^2 = 16\)

50. A rectangular kitchen is 8 feet longer than it is wide. Its area is 240 square feet. How long, in feet, is it?

F. 12
G. 16
H. 20
J. 24
K. 30

51. What is the slope of a line that is parallel to the line determined by the equation \(5x - 4y = 8\)?

A. \(-4\)
B. \(-\frac{5}{4}\)
C. \(\frac{5}{4}\)
D. 2
E. 4

52. If \(3^{8x} = 81^{3x-2}\), what is the value of \(x\)?

F. \(-2\)
G. 0
H. 2
J. 3
K. 4
53. The picture shown below has a uniform frame-width of \(\frac{5}{8}\) inches. What is the approximate area, in square inches, of the viewable portion of the picture?

![Picture Diagram]

A. 426.25
B. 481.56
C. 510.40
D. 510.75
E. 540.00

54. A horse eats 12 bales of hay in 5 days. At this rate, how many bales of hay does the horse eat in \(5 + x\) days?

F. \(12 + \frac{12x}{5}\)
G. \(12 + \frac{x}{5}\)
H. \(\frac{12}{5} + \frac{12}{5x}\)
J. \(\frac{12}{5} + \frac{x}{5}\)
K. \(\frac{12}{5} + x\)

55. When graphed in the standard \((x, y)\) coordinate plane, the lines \(x = -5\) and \(y = x - 5\) intersect at what point?

A. \((-5, -10)\)
B. \((-5, -5)\)
C. \((-5, 0)\)
D. \((0, -5)\)
E. \((0, 0)\)

56. Which of the following expresses the number of miles a runner must travel in a 4-lap race where the course is a circle of radius \(m\) miles?

F. \(4m\)
G. \(4\pi m\)
H. \(4\pi m^2\)
J. \(8\pi m\)
K. \(16\pi m\)
57. For some real number $n$, the graph of the line $y = (n + 1)x + 6$ in the standard $(x, y)$ coordinate plane passes through $(4, 8)$. What is the value of $n$?

A. $-\frac{3}{2}$
B. $-\frac{1}{2}$
C. $\frac{1}{2}$
D. $\frac{3}{2}$
E. 2

58. A computer repair person charges $50.00 per hour, plus an additional mileage fee. The charge for mileage varies directly with the square root of the number of miles traveled. If one hour plus 25 miles traveled costs $140.00, what is the total amount charged for one hour plus 36 miles traveled?

F. $218.00$
G. $196.92$
H. $179.60$
J. $158.00$
K. $143.60$

59. In the right triangle below, $YZ = 10$ units, and $XZ = 4$ units. What is $\sin Z$?

A. $\frac{4}{10}$
B. $\frac{10}{2\sqrt{21}}$
C. $\frac{2\sqrt{21}}{10}$
D. $\frac{10}{4}$
E. $\frac{4}{2\sqrt{21}}$
60. A triangle, \( \triangle ABD \), is reflected across the line \( y = x \) to have the image \( \triangle A'B'D' \) in the standard \((x, y)\) coordinate plane: thus \( A \) reflects to \( A' \). The coordinates of point \( A \) are \((m, n)\). What are the coordinates of point \( A' \)?

F. \((-m, n)\)
G. \((m, -n)\)
H. \((-m, -n)\)
J. \((n, m)\)
K. Cannot be determined from the given information.

END OF THE MATHEMATICS TEST.
STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.
PASSAGE I
PROSE FICTION: Football Failures

A cold wind soothed the faces of the sweaty men huddled on the muddy field. The team stared at the goal line and focused on the game-ending, season-defining play in front of them. Dusty air filled their lungs with each deep heave they mustered.

For almost two hours the men had battled their opponents on the barren football field. Joe, the center, could see the coach describing the play to a younger player. He was one of the grunts, a lineman, big and tall and eager to push open gaps for the backs. The underclassman's labored jog back to the huddle mirrored every man’s fatigue.

The quarterback confirmed the play and articulated it to his team. Joe saw his mouth move but could not hear the words; nonetheless, he knew his blocking assignment. The hiss of the crowd muffled all sound on the field. Suddenly, Joe picked a voice out of the din, and turned his attention to his good friend Mark. "This is it guys," Mark was yelling. "We've been practicing for four months this season and for three more years before that. It's time we score and take home a win. Let's get it done!" They all clasped hands to break the huddle and returned to their individual concentration.

Time seemed to drag as the team marched back to the line of scrimmage. Joe glared at his opponents, pleased by the heavy clouds of vapor billowing from their mouths. Exhaustion was written on their faces and in their twitchy movements on the line. He turned his head toward the place in which he wanted to force a gap, then to the defensive end who stood fast with his hands on his knees, gaze fixed on the ground. Joe smiled inwardly; he knew his team had beaten the other with physical play and superior endurance. Time froze as he prepared to snap the ball.

Joe leaned over carefully and clutched the moist leather ball. His teammates cautiously took their places right and left, lining up as in countless practice drills, in perfect order. Like clockwork, too, was each man’s thorough examination of the opposing force, scanning back and forth for a gap or a weak player, feeling the opponents’ stares in return. Joe felt the quarterback crouch behind him. The passer’s booming voice still did not register with Joe, but instinct told him what he needed to know. Three staccato hikes later, he snapped the ball with speed and hurled himself towards the first defender.

Joe felt the crunch of pads and brought his forearm under the other man’s shoulder pads. Lifting with his arms and legs, he threw the lesser player onto his back.

The meager lineman lay stunned for a moment, which greatly amused Joe, assuming the two yards he had sent his man back was more than enough to free the rusher to enter the endzone. This lucid moment lasted but a split second before Joe again lunged toward an upright opponent.

Joe turned abruptly at the sound of a whistle and strained to find the scoring rusher. Something was wrong. Joe’s teammates stood stunned, staring at the pile of defensive players who had fallen on their running back. Referees began pulling men off the heap. With only a few men left on the ground, Joe could see the ball, still in the backfield, and in the arms of an opponent. He heard his coach from the sideline: “Fumble? Are you kidding me? I can’t believe you guys!”

His men had turned over possession of the ball, and time ran out on the game. “We had them beat, you know,” Mark hissed to Joe as they walked slowly off the field. “They were dead tired. We should have won the game.” Their one chance was gone and now they had to endure the other team’s celebration on the field. Joe’s team never liked losing, but having come so close to a victory that day meant their last-minute defeat would be especially disappointing.

1. Joe would most likely agree with which of the following statements about the relationship between the players on his team?

A. The players take the game very seriously and spend little time interacting with one another.

B. Most of the players are excellent friends and maintain a lively atmosphere on the field.

C. The players work very hard at a common goal and provide support for one another to achieve it.

D. The players react poorly to their coach’s hostile yelling and find strength in their shared objection.
2. Joe can most accurately be characterized as:
   F. self-assured and presumptuous.
   G. confident but dismayed.
   H. amiable but reserved.
   J. engrossed and dedicated.

3. Which of the following statements does NOT describe one of Joe’s reactions to the events of the final play of the game?
   A. He glanced around, shocked.
   B. He lunged at his opponents in a blind rage.
   C. He commiserated with Mark.
   D. He trudged off the field with his teammates.

4. The main point of the first paragraph is that:
   F. football is a game whose players can get very dirty.
   G. the players have all worked hard to arrive at a crucial point in the game.
   H. the long fall sports season can include some cold-weather days.
   J. cool grass fields are ideal surfaces for football games.

5. The main point of the last paragraph is that Joe feels:
   A. sad as usual about the loss.
   B. frustrated by his teammates’ lackluster performance during the final play.
   C. guilty that he and his teammates let down the coach.
   D. dejected by the loss of this important game.

6. According to the passage, when Joe observes the opposing defensive line, Joe feels:
   F. surprised at their resilience so late in the game.
   G. quietly pleased by their signs of weakness.
   H. apprehensive about their alignment.
   J. pensive over the strategy of the defense.

7. Which of the following statements most accurately expresses Mark’s feelings after the loss?
   A. Mark was disappointed by the loss, but saw the circumstances that led to it.
   B. Mark rejected the loss and held to the belief that they had won.
   C. Mark denied the loss at first, but was convinced by Joe that it was legitimate.
   D. Mark is angered by his team’s failure to defeat an inferior team.

8. It can logically be inferred from the passage that the reason the players join hands at the end of a huddle is because:
   F. such a ritual draws attention to the quarterback, who must announce the play.
   G. the team must have the right number of players to execute the play.
   H. it reinforces the notion of team purpose and mutual reliance essential to game play.
   J. it alerts players who cannot hear the quarterback to the end of the huddle.

9. A reasonable conclusion Joe draws about his first block is that the block:
   A. was particularly effective, leaving ample room for the rusher to score.
   B. was insufficient to make a gap for the rusher, who ended up fumbling the football.
   C. was clearly illegal, evident in the way Joe’s thrust sent the opponent onto his back.
   D. was not included in the original play.

10. According to the passage, the reason the final play of the game is crucial to the success of the entire season is that:
    F. no game had yet been so closely contested.
    G. pride is at stake during important goal line plays.
    H. the game comes late in the season after many weeks of preparation.
    J. the defending team appeared fatigued and easy to beat.
PASSAGE II
SOCIAL SCIENCE: American Influences Abroad

A tourist walks along a muddy Indonesian street looking for a souvenir that represents the local culture. He stops by a small street vendor to look at the goods for sale. What he sees shocks him: T-shirts and posters promoting American football, basketball, and baseball teams, brand-name American food and drink, and an assortment of other items of Americana.

Although this example may seem surprising, it is a reality in many countries. American culture has infiltrated many nations around the world that Americans generally consider the most exotic. In these places, the importation of American culture—be it by consumer goods, media, or otherwise—is affecting indigenous peoples and their traditions.

The presence of American culture in other countries receives mixed reactions. Some people praise American business or simply find the so-called invasion innocuous. American logos appear in quite unexpected places, embodying the ubiquitous American symbols worldwide. The presence of such American food and retail goods in a foreign market might indicate that the companies producing them are eager to support the local economy. American corporate confidence in a country’s markets can boost additional foreign investment. In many cases, the populations of developing countries and highly industrialized and modern nations have embraced Americana.

Many other people reject what has been called American “cultural imperialism.” Some sociologists, anthropologists, and cultural experts lament the steady decline of distinct national, ethnic, and cultural identities as omnipresent American influences overpower ancient traditions and beliefs.

For example, Mexico and the United States have often had a tense relationship unhelped by the language barrier. Regardless, there has been an overwhelming influx of American ideas and products into Mexico. Look to the typical Mexico tourist resort. Only about fifty years ago the sleepy towns were still untouched by commercial development. They held their local culture close. Now, however, grand international hotels tower above the traditional colonial architecture. A walk down a main thoroughfare in a tourist town could reveal a plethora of American businesses. The local cantinas and native boutiques are losing the battle against large American corporations.

Despite these issues, however, many other experts have applauded the spread of American institutions across the world. They point to jobs created, as well as the modernization of infrastructure that comes with American commerce. They explain that these things will help bring lesser-developed nations into the modern world and help to decrease poverty and other social ailments. In fact, many of the jobs offered by American companies pay handsomely compared to the local market’s average wage.

Furthermore, some experts point to Japan as a prime example of where American involvement has been beneficial. After helping to rebuild the country both politically and economically after World War II, America left a pervasive cultural footprint on the country. Although the Japanese people have embraced many American concepts and products, they have maintained a distinct culture that is rich in the traditions of the past but open to Western ideas.

American commercial and cultural expansion abroad has created both benefits and problems. In many places, there is still no clear picture of the future effects of Americana.

11. According to the first paragraph, the tourist was shocked because:
A. he could not find any souvenirs.
B. he expected to find souvenirs that reflected the local culture.
C. he did not realize that the shops would be so small.
D. he had never before been to Indonesia.

12. As it is used in line 19, the word ubiquitous most nearly means:
F. very expensive.
G. supportive.
H. far-reaching.
J. localized.

13. According to the passage, some people reject Americana because:
A. it boosts foreign investment in local economies.
B. it modernizes the infrastructure of aging communities.
C. it pays wages that local businesses cannot compete with.
D. it dilutes indigenous cultures.

14. According to the passage, the spread of American influences resulted in which of the following in certain foreign countries?
I. Increased number of jobs
II. Modernized infrastructure
III. Decline in tourism
F. I only
G. II only
H. I and II only
J. II and III only

GO ON TO THE NEXT PAGE.
15. The passage suggests that tourist resorts in Mexico:
   A. remain unaffected by American influences.
   B. are struggling to maintain their cultural identity.
   C. can only benefit from the influence of American ideas.
   D. have never been so popular with Americans.

16. The passage indicates about America’s influence on Japanese culture that it:
   F. was detrimental to the Japanese economy.
   G. led to a harmonious blend of American and Japanese ideas.
   H. had no direct effect on Japanese politics.
   J. put Japan at a distinct disadvantage in relation to other Asian countries.

17. It can reasonably be inferred from the passage that, if American cultural influences continue to infiltrate foreign markets, those markets:
   I. will experience unlimited economic growth.
   II. will not be able to maintain their unique identities.
   III. could either benefit from or be harmed by such influences.

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

18. As it is used in line 30, the word *lament* most nearly means:
   F. embrace.
   G. enjoy.
   H. deny.
   J. regret.

19. According to the passage, the Indonesian street vendor sold:
   A. American sports memorabilia.
   B. only goods manufactured in Indonesia.
   C. souvenirs unsuitable for Americans.
   D. trinkets imported from the surrounding countries.

20. It can be reasonably inferred from the last paragraph that:
   F. American expansion abroad continues to benefit some nations.
   G. American expansion abroad will likely decline in the future.
   H. American expansion abroad causes more problems than it solves.
   J. American expansion abroad will not be supported by either Japan or Mexico.
Many of us have looked at a great work of art and wondered how a person is able to paint or draw something so lifelike and emotive. We see the masterpieces of painters such as Monet or Picasso and wonder what stirred these men to put brush to canvas so delicately. Most of an artist’s greatness lies in his or her natural ability and practice of technique, but other factors affect the work an artist produces. The trained eye knows that even the smallest of details can have a powerful impact on the meaning of an artist’s work.

A formal style is among the most apparent traits of a work of art. One of the first popular styles was known as Realism. Paintings from this school focused on depicting real life unembellished with fanciful notions or feelings. Realism traces its roots to ancient Rome, where artists attempted to depict their leaders in ways that did not glamorize or gloss over unattractive physical attributes. This approach became unpopular after a while for many different reasons, but was revived during the Renaissance. For the next several centuries, Western artists attempted to portray life as realistically as possible.

In the late 19th century, a rebellion against Realism arose in response to the rigidity and staleness some saw in the style. As a result, many artists began painting in the Impressionist style, which allowed for more creativity. Monet and Manet, two prominent painters, used this style of painting, characterized by its subtle use of light and color to create a dreamlike quality in scenes of the natural world.

Impressionist painters use small brush strokes with unmixed primary colors to simulate reflected light. The result is a picture that appears hazy, leaving a general “impression” upon the viewer. The large number of young painters who took up Impressionism resulted in it being a very vigorous and contentious school of thought. Impressionistic style is still popular with both art collectors and museum-goers.

Several new styles grew out of the Impressionist movement that actually rejected all or some of the beliefs held by Impressionists. Some of these styles became schools of thought in their own right, while others simply existed as one artist’s trademark way of painting. Post-Impressionism is one example of a style that grew out of the naturalistic form of Impressionism. Post-impressionism uses form and color to reflect art in a more personal and subjective way than did its predecessor.

Another style that grew out of Impressionism was Pointillism. Georges Seurat led this movement, which emphasized the application of paint in small dots and brush strokes to create the effect of blending and luminosity.

Vincent Van Gogh, a well-known artist, adapted Impressionism to his own unique method. Although a real school of thought never followed his style of painting, he is nonetheless regarded as a brilliant painter for his use of bold, bright colors and even larger and bolder brush strokes.

Many other styles of painting evolved from the first descendants of Impressionism. Cubism, Abstract Art, Expressionism, Abstract Expressionism, Modernism, and a host of other styles have all expanded the range of acceptable artistic expression and allowed artists to explore new and creative ways in which to express themselves and their points of view. Each style has distinct ways of interpreting the world and depicting it in art. Although some have similarities, they all are unique and distinguishable from one another. For example, one tableau may reflect the world through rigid geometric figures while another may show life in smooth black curves.

One consequence of the spread of different artistic styles is the wide variety of art people enjoy today. While some favor one style over another, it is important that these styles coexist, because a variety of techniques and opinions is the ideal environment for the evolution of art.

21. As it is used in line 3, the word emotive most nearly means:
   A. inciting to action.
   B. expressing emotion.
   C. inducing impassiveness.
   D. defining artistry.

22. The author mentions all of the following as adaptations of Impressionism EXCEPT:
   F. Modernism.
   G. Cubism.
   H. Realism.
   J. Expressionism.

23. The author suggests that Realists were most interested in depicting:
   A. ancient Romans as glamorous figures.
   B. people and places as they actually appeared.
   C. unattractive physical attributes of Western artists.
   D. the dreamlike quality of the real world.

24. The main emphasis of the second paragraph (lines 11–22) regarding the Realist approach is that:
   F. despite fluctuations in its popularity, it is an enduring style.
   G. it regained popularity during the Renaissance.
   H. it was the only formal style of painting in ancient Rome.
   J. while it was popular during the Renaissance, it fell out of favor shortly thereafter.
25. Which of the following best states the main point of the passage?
   A. Painters must adapt to a changing world.
   B. Artistic styles have evolved over the years.
   C. Some styles of painting are more popular than others.
   D. Artists often change their styles based on popular demand.

26. As it is used in line 43, the phrase “artist's trademark” most nearly means:
   F. prime example.
   G. legal background.
   H. formal training.
   J. unique style.

27. The passage suggests that Impressionist painters:
   A. rejected Realism.
   B. were unpopular.
   C. embraced Realism.
   D. were rigid and stale.

28. The author claims that Impressionism:
   F. was unable to expand the range of artistic expression.
   G. was the precursor of both Realism and Pointillism.
   H. paved the way for many other creative artistic styles.
   J. evolved from other styles, such as Abstract Art and Cubism.

29. The author of the passage indicates that Post-Impressionism, as compared to Impressionism, is:
   A. more personal.
   B. less subjective.
   C. less natural.
   D. more vigorous.

30. According to the passage, artists rebelled against Realism because:
   F. it used light and color to embellish the real world.
   G. it traced its roots to ancient Rome.
   H. it glossed over the true feelings of the artists.
   J. it did not allow for freedom of artistic expression.
The ability of every organism on earth to reproduce is the hallmark of life. Reproduction can be either asexual, involving a single parent, or sexual, involving two parents. Sexual reproduction begets offspring that inherit half of their genes from each parent. This transmission of genes from one generation to the next is called heredity.

Each hereditary unit, the gene, contains specific encoded information that translates into an organism’s inherited traits. Inherited traits range from hair color, to height to susceptibility to disease. Genes are actually segments of the DNA molecule, and it is the precise replication of DNA that produces copies of genes that can be passed from parents to offspring. DNA is subdivided into chromosomes that each include hundreds or thousands of genes. The specific traits or characteristics of each offspring depend on the arrangement and combination of the chromosomes supplied by both parents.

Genes located on the same chromosome tend to be inherited together. Transmission of these so-called linked genes can affect the inheritance of two different characteristics. Thomas Hunt Morgan was the first biologist to associate specific genes with specific chromosomes. In the early 20th century, Morgan selected a species of fruit fly, Drosophila melanogaster, on which to study his genetic theory. The fruit fly is a prolific breeder, producing hundreds of offspring in a single mating. In addition, the fruit fly has only four pairs of easily distinguishable chromosomes, making it the ideal experimental organism. Soon after Morgan commenced working with Drosophila, he began to notice variations in certain traits. For example, Morgan noticed that the natural characteristics of Drosophila included gray bodies and normal wings. However, mutant examples of these characteristics sometimes appeared; these flies had black bodies, and much smaller, vestigial wings. Morgan crossed female flies that appeared normal, but carried the mutant genes, with males that exhibited the mutations. He expected the offspring to include equal numbers of gray flies with normal wings, black flies with vestigial wings, gray flies with vestigial wings, and black flies with normal wings. What he found was a disproportionate number of gray flies with normal wings and black flies with vestigial wings, which suggested to him that the genes for body color and wing size are transmitted together from parents to offspring because they are located on the same chromosome and must be somehow linked.

Additional research conducted by Morgan on D. melanogaster demonstrated that many, often spontaneous mutations occur across generations. These observations, together with the results of experiments carried out to test his theory on linked genes, led Morgan to postulate that the location of the genes on the chromosomes contributes to the likelihood of any given gene being transmitted from parent to offspring. This theory of linear arrangement, along with Morgan’s other important contributions to the field of genetics, led to his being awarded the Nobel Prize in Physiology or Medicine in 1933.

Current research exploring the significance of linked genes reveals that many factors affect the transmission of certain traits from parents to offspring. The location of genes on a particular chromosome is but one of a multitude of determinants involved in whether or not a characteristic will be inherited.

31. The main idea of the passage is that:
A. fruit flies are excellent experimental organisms.
B. chromosomes contain many different genes.
C. the position of genes on a given chromosome can affect the inheritance of certain traits.
D. linked genes are primarily responsible for all of the mutations associated with body color and wing shape.

32. The passage states that a hereditary unit is called:
F. a chromosome.
G. a gene.
H. an organism.
J. a characteristic.

33. The passage states that all of the following are examples of inherited traits EXCEPT:
A. hair color.
B. molecules.
C. height.
D. disease susceptibility.

34. As it is used in line 28, the word prolific most nearly means:
F. easily distinguishable.
G. characteristically ideal.
H. clearly superior.
J. highly productive.
35. According to the passage, asexual reproduction involves:
   A. two parents.
   B. either one or two parents.
   C. one parent.
   D. no parents.

36. With which of the following statements would the author most likely agree?
   F. There is still much to learn about the way in which genes are transmitted.
   G. It is no longer necessary to study the effects of linked genes.
   H. The *Drosophila melanogaster* is the best organism on which to experiment for all genetic research.
   J. All genes that are located on the same chromosome are somehow linked.

37. What, according to the passage, was the primary reason that Thomas Hunt Morgan chose to experiment on *Drosophila melanogaster*?
   A. It had many easily distinguishable chromosomes.
   B. It was able to produce many offspring in a short period of time.
   C. It exhibited many different mutations.
   D. It was the only organism that had linked genes.

38. The passage suggests that mutant genes:
   F. are always apparent in an organism’s physical characteristics.
   G. can sometimes be suppressed, causing the organism to appear normal.
   H. are never transmitted from parent to offspring.
   J. can clearly be seen on the chromosomes on which they are located.

39. What is the main idea of the last paragraph?
   A. Current research into the effects of linked genes is insufficient.
   B. The location of genes on a chromosome is not important to the transmission of genetic material from parent to offspring.
   C. Certain characteristics will never be inherited, due to their association with linked genes.
   D. The transmission of genetic material is affected by more than simply the location of genes on a chromosome.

40. According to the passage, if the genes for blue eyes and brown hair are located on the same chromosome:
   F. none of the offspring will have both blue eyes and brown hair.
   G. all of the offspring will have both blue eyes and brown hair.
   H. both of the traits are considered mutations.
   J. a certain number of offspring will inherit both traits.

END OF THE READING TEST.
STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.
PASSAGE I

A number of different chemical elements are essential for the survival and growth of plants. The macronutrients—those nutrients required in the greatest quantity—are nitrogen, phosphorus, and potassium. These macronutrients are only available in the soil and generally come from the decay of other plants. To enrich the soil and make more of these essential nutrients available, many people use fertilizers to supply plants with the nutrients they need to grow faster. Two botanists discuss whether inorganic or organic fertilizers are most optimal for plant growth.

Botanist 1

In addition to carbon, hydrogen, and oxygen available in the water and the air, and other micronutrients, such as sulfur, calcium, and magnesium, plants also need the macronutrients nitrogen, phosphorus, and potassium to thrive. The best way to supply the soil, and thus the plants, with the proper macronutrients is to apply organic fertilizers, as opposed to commercial inorganic fertilizers. Organic nutrients include cow, poultry, horse, and sheep manures. Green manure—a crop that is grown for a specific period of time, then plowed and incorporated into the soil—and compost can also be used. Organic fertilization mimics the natural breakdown of organic material into nutrients for which the plants can use. In other words, organic fertilizer provides a naturally slow release of nutrients as the organic material breaks down in the soil, reducing the likelihood of over-fertilization. Organic fertilizers also improve soil structure in the long term and improve the ability of sandy soils to hold water, which is immensely important in arid climates. Commercial inorganic fertilizers, on the other hand, are often applied too heavily, damaging the roots of the plants. Inorganic fertilizers can also cause chemical imbalances in the soil because they can build up a toxic concentration of salts in the soil.

Botanist 2

Plant growth and survival depends on an adequate supply of essential nutrients that cannot always be found in the soil. Inorganic commercial fertilizers have many benefits over organic fertilizers. The elements in inorganic fertilizers have been thoroughly measured and tested, insuring that each application provides the appropriate amount of nutrients to the plants, as opposed to the highly variable, and often unknown, nutrient content of organic fertilizers. Organic fertilizers are usually lower in nutrient content than inorganic fertilizers, requiring more of the organic material to be applied to achieve the same level of nutrient delivery acquired from the application of smaller amounts of inorganic material. In addition, characteristics of organic fertilizer require application well in advance of need to ensure that the materials have broken down and can be used by the plant. Inorganic fertilizers, however, once applied, offer immediate availability of nutrients to plants for use. The likelihood of nitrogen depletion is another disadvantage of organic fertilizers. Organic material can cause a temporary depletion of nitrogen in the soil and therefore in the plants that depend on it. Inorganic fertilizer use does not present this problem.

1. According to the passage, plants need the most of which of the following to grow and survive?
   A. Oxygen
   B. Fertilizer
   C. Micronutrients
   D. Macronutrients

2. Which of the following can be inferred from Botanist 2’s viewpoint about organic fertilizers?
   F. It is impossible to determine the proper amount of inorganic fertilizer to apply.
   G. The levels of essential macronutrients are closer to those that occur naturally.
   H. Organic fertilizers are useless in achieving and promoting plant growth.
   J. Organic fertilizers can reduce the amount of necessary nutrients in the soil.
3. Botanist 2 would most likely agree with which of the following statements made by Botanist 1?
   A. Inorganic fertilizers can create imbalances in the soil.
   B. Organic fertilizer slowly releases nutrients into the soil.
   C. Organic fertilizer should be used in place of inorganic fertilizers.
   D. Inorganic fertilizer is the best source of micronutrients.

4. Which of the following best describes the difference between the two botanists’ opinions?
   F. The effects of putting additional macronutrients in the soil.
   G. The amount of fertilizer that should be applied.
   H. The type of fertilizer that is most beneficial to plant growth.
   J. The type of fertilizer that behaves most like natural nutrient-rich soil.

5. According to Botanist 1, all of the following are true of organic fertilizer EXCEPT:
   A. organic fertilizer is safer for the plant in terms of over-application of fertilizer.
   B. soil quality is slowly improved over time with the use of organic fertilizer.
   C. organic fertilizers are less likely than inorganic fertilizers to burn the roots of plants.
   D. less organic fertilizer can be applied to achieve the same results as those achieved with an inorganic fertilizer.

6. With which of the following statements would both botanists likely agree?
   F. Soil quality does not need to be considered if a nitrogen-rich fertilizer is used to compensate for nutrients not found in the soil.
   G. Plants require some additional nutrients to reach optimal growth if the nutrients are not available in the soil.
   H. Plants need only the macronutrients nitrogen, potassium, and phosphorus in order to survive.
   J. The amount of water, oxygen, and other micronutrients available to plants is less important if the proper amount of fertilizer is applied.

7. Which of the following can be inferred from the passage about inorganic fertilizers?
   A. If improperly applied, they are less likely than organic fertilizers to damage crops.
   B. Regardless of their application, they are less effective than organic fertilizers.
   C. If properly applied, they take longer to act than organic fertilizers and are similarly effective.
   D. If properly applied, they are faster acting than organic fertilizers and are just as effective.
PASSAGE II

Certain species of flowers attract more bees than others with the scent of their pollen. The pollen is found on a structure within the flower called the *anther*, which is located on top of another structure called the *stamen*. Flowers typically have multiple anthers and stamens.

Bees carry the pollen from the flowers on their legs. The bees move from flower to flower while collecting pollen. Some of the pollen falls from their legs as they land on another flower. This depositing of pollen causes cross-pollination to occur (fertilization of the other flowers). Three studies were conducted to study this process.

**Study 1**

For two flower species (A and B), pollen quantity per anther in milligrams (mg), anther quantity per flower in number, and percentage of stamens covered with pollen were recorded (see Table 1).

<table>
<thead>
<tr>
<th>Flower species</th>
<th>Pollen quantity (mg) per anther</th>
<th>Anther quantity per flower</th>
<th>Stamens covered with pollen (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.9</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>B</td>
<td>7.6</td>
<td>19</td>
<td>27</td>
</tr>
</tbody>
</table>

**Study 2**

Three study sites were established to determine the pollen collection rate of one species of bee for the flowers used in Study 1. In Site 1, Species A flowers were absent. In Site 2, Species B flowers were absent. In Site 3, both Species A and B flowers were absent.

Two pollen containers were placed at each site: one containing 50 mg Species A pollen and one containing 50 mg Species B pollen. The containers were left in place for 36 hours and the amount of pollen that was taken from the containers was measured. The results are recorded in Table 2.

<table>
<thead>
<tr>
<th>Site</th>
<th>Flower species absent</th>
<th>Amount of Pollen (mg) removed from dishes containing pollen from:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Species A</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>A and B</td>
<td>2</td>
</tr>
</tbody>
</table>

**Study 3**

The researchers hand-pollinated flowers from a third species, Species C. They also observed the Species C plants being cross-pollinated by the bees in the area. All flowers were observed for 2 years. The scientists recorded the results in Table 3.

<table>
<thead>
<tr>
<th>Cross-pollination of Species C flowers</th>
<th>Results from:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hand-pollinated flowers</td>
</tr>
<tr>
<td>Flowers that reproduced</td>
<td>31</td>
</tr>
<tr>
<td>Flowers reproducing after 1 year</td>
<td>10</td>
</tr>
<tr>
<td>Flowers reproducing after 2 years</td>
<td>8</td>
</tr>
<tr>
<td>Total flowers produced after 2 years</td>
<td>50</td>
</tr>
</tbody>
</table>

8. Based on the results of Study 3, one could generalize that compared to flowers pollinated by hand, flowers pollinated by bees resulted in:
   F. an overall increase in flower production.
   G. an overall decrease in flower production.
   H. increased number of flowers still reproducing after 2 years.
   J. decreased number of flowers still reproducing after 2 years.

9. Which of the following variables was controlled in the design of Study 2?
   A. The amount of pollen placed at each site
   B. The level of pollen on each flower
   C. The total amount of pollen removed by the bees from each site
   D. The number of bees present at each site

10. According to the results of the studies, Species A and Species B are most similar in that their:
    F. percentage of stamens covered with pollen is equivalent.
    G. anther quantity per flower is equivalent.
    H. pollen quantity per anther is equivalent.
    J. rate of cross-pollination after 2 years is equivalent.
11. In Study 2, Site 3 was used to study the:
   A. pollen preference when Species A flowers only were present.
   B. pollen preference when both Species A and Species B flowers were missing.
   C. pollen preference when Species B flowers only were missing.
   D. pollen preference when both Species A and Species B flowers were present.

12. Which of the following is a weakness in the design of Study 2?
   F. Some species of flowers were not at both sites.
   G. Some species of bees were not present at both sites.
   H. The pollen could have been taken away by something other than bees.
   J. The containers did not hold enough pollen for accurate measurements.

13. The results of Study 2 suggest that which of the following factors most affects the flower preference of bees?
   A. Level of pollen count on the stamen.
   B. Location of the particular flower species within the area.
   C. Type of a particular flower species available in the area.
   D. Number of anthers on a flower.
PASSAGE III

A scientist wanted to observe the effects of altitude on the respiratory system of mammals. Four different species of mammals were placed in a chamber that underwent gradual changes in pressure (measured in atmospheres, or atm) to simulate the atmosphere at high altitudes. After 5 minutes at each atmospheric pressure tested, the average number of breaths per minute (respiratory rate) was determined for each of the 4 mammals while they remained at rest. The data from the experiment are shown in the following graph. (Note: Larger animals typically have slower respiratory rates. Higher respiratory rates indicate rapid breathing, a sign of distress in some mammals.)

14. What is the relationship between respiratory rate and atmospheric pressure for Mammal 2?
   F. Decreases in pressure decrease the respiratory rate.
   G. Decreases in pressure increase the respiratory rate.
   H. Pressure changes have no effect on the respiratory rate.
   J. Increases in pressure increase the respiratory rate.

15. At approximately which pressure, in atmospheres, did Mammals 2 and 3 have the same respiratory rate?
   A. 1.0
   B. 0.95
   C. 0.80
   D. 0.75

16. Further measurements showed that Mammal 4 used significantly more oxygen per minute than Mammal 2. This would be consistent with the data from the graph if:
   F. Mammal 4 was in a warmer environment than Mammal 2.
   G. Mammal 4 was significantly larger than Mammal 2.
   H. Mammal 2 was significantly larger than Mammal 4.
   J. Mammals 2 and 4 were the same weight.

17. A higher respiratory rate causes mammals to have a higher metabolic rate. Which of the mammals would have a higher metabolic rate at a pressure of 1.0 atm than at .80 atm?
   A. 1 only
   B. 2 only
   C. 4 only
   D. 1 and 4 only

18. Based on the data in the graph, which of the mammals might be native to higher-altitude environments (meaning that they are more comfortable at higher altitudes than at lower altitudes)?
   F. 1 only
   G. 2 only
   H. 3 only
   J. 4 only
PASSAGE IV

The photoelectric effect is the emission of electrons from matter upon the absorption of electromagnetic radiation, such as ultraviolet radiation or X-rays. Electromagnetic radiation is made up of photons, which can be considered finite packets of energy at various levels. Photons have properties attributed to both particles and waves. This phenomenon is known as the wave-particle duality.

The photoelectric effect is especially noticeable when dealing with metals. When a metallic surface is exposed to electromagnetic radiation that is above the minimum energy threshold (which is specific to the type of surface and material), photons are absorbed and electrons are emitted. No electrons are emitted for radiation with energy frequencies below that of the threshold, as the electrons are unable to gain sufficient energy to overcome the attractive forces within the metal. A scientist wishing to measure the photoelectric effect so as to further understand the nature of photons conducted the following experiments.

Experiment 1

Wishing to measure the energy required to produce the photoelectric effect on a surface of a sheet of copper, the scientist directed a beam of radiation at different frequencies (energies)—measured in Hertz (Hz)—onto the surface. After 5 minutes, the charge—measured in volts (V)—of the sheet of metal was recorded. This was done because if electrons were emitted from the surface, the metal would take on a positive charge. The results were recorded in Table 1.

<table>
<thead>
<tr>
<th>Frequency of radiation (Hertz)</th>
<th>Charge on the sheet of copper (volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10^{14}$</td>
<td>0</td>
</tr>
<tr>
<td>$10^{15}$</td>
<td>+0.001</td>
</tr>
<tr>
<td>$10^{16}$</td>
<td>+0.224</td>
</tr>
<tr>
<td>$10^{17}$</td>
<td>+0.239</td>
</tr>
</tbody>
</table>

Experiment 2

Solar cells used to generate electricity are based on the concept of the photoelectric effect; however, the goal of the cell is to capture the emitted electron and create an electric current. The scientist measured the effects of different frequencies (in Hz) of radiation on the current (in V) generated by a certain solar cell. The results were recorded in Table 2.

<table>
<thead>
<tr>
<th>Frequency of radiation (Hertz)</th>
<th>Voltage of electric current (volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10^{14}$</td>
<td>0.02</td>
</tr>
<tr>
<td>$10^{15}$</td>
<td>0.15</td>
</tr>
<tr>
<td>$10^{16}$</td>
<td>0.95</td>
</tr>
<tr>
<td>$10^{17}$</td>
<td>1.25</td>
</tr>
</tbody>
</table>

19. A scientist predicts that in years to come the earth’s atmosphere will become much less effective at shielding the surface from radiation of higher frequencies. If this prediction is correct, which of the following is most likely to happen based on results of the experiments?

A. The photoelectric effect on metals exposed to the sun will be less evident.
B. The photoelectric effect on metals exposed to the sun will be more evident.
C. Solar cells will gradually become less effective at producing electricity.
D. Fewer photons will be emitted by particular metals.

20. Suppose that the rate of the photoelectric effect is directly proportional to the surface area of the metal exposed. Using a larger sheet of copper metal in Experiment 1 would most likely have affected the results in what way?

F. The frequency of radiation would have increased.
G. The charge on the sheet would have decreased.
H. The charge on the sheet would have increased.
J. The charge on the sheet would have stayed the same.

21. Which of the following procedures would result in the most accurate values for the effect of frequency of radiation on the photoelectric effect (Experiment 1)?

A. Test a variety of metals once each and record the trends.
B. Test a single metal many times and record the trends.
C. Test a variety of metals each at different frequencies of radiation and record the trends.
D. Test different sized samples of a variety of metals many times each, systematically varying the frequency, and record the trends.
22. Suppose a scientist wanted to measure the effect of the atmosphere on the photoelectric effect. The scientist could learn most by doing which of the following?
   
   F. Setting up on the earth’s surface a sheet of metal and a detector to measure the metal’s charge.
   
   G. Setting up in orbit around the earth a sheet of metal and a detector to measure the metal’s charge.
   
   H. Placing radioactive materials close to a sheet of metal and a detector to measure the metal’s charge.
   
   J. Setting up on the earth’s surface and in space in orbit around the earth sheets of metal and detectors to measure the metal’s charge.

23. Which of the following assumptions did the scientist probably make in choosing these experiments to test the nature of photons?
   
   A. The photoelectric effect will occur regardless of the energy of the radiation present.
   
   B. Radiation will not have an effect on inanimate objects.
   
   C. Because photons are finite quantities of energy, only photons with high enough frequency will emit electrons.
   
   D. Doubling the frequency of radiation will result in doubling the emission of electrons by various metals.

24. Do the results of the experiments help to explain the nature of photons as finite packets of energy at various levels?
   
   F. Yes, because the experiments illustrate how solar panels can produce more electricity when exposed to higher frequencies of radiation.
   
   G. Yes, because the experiments illustrate how higher frequency radiation (photons with higher energy levels) causes emission of electrons, which require a minimum energy to escape the surface of the metal.
   
   H. No, because the experiments illustrate how higher frequency radiation (photons with higher energy levels) does not cause increased emission of electrons.
   
   J. No, because there is no relation between the energy level of photons and the rate of photoelectric emission of electrons.
PASSAGE V

Gregor Mendel is known for his work in genetics. He is credited with discovering how traits (characteristics) are passed from one generation to the next. After his observations of inherited traits, Mendel concluded that each organism carries two sets of information about a certain trait. If the two sets differ about the same trait, one set dominates the other. That way, information can be passed on through the generations, even if the trait is not expressed.

It has since been determined that the presence of certain traits is attributed to genes, and the different forms that genes can take, known as alleles. Dominant alleles ($D$) produce dominant characteristics; recessive alleles ($d$) produce recessive characteristics. Dominant alleles are expressed whenever present ($DD, Dd$) but recessive alleles are expressed only when the dominant allele is absent ($dd$).

A study was done in which the independence of two traits was tested. In this study, a rabbit with long black hair was mated with a rabbit with short white hair. The dominant trait for hair length is short ($H$). The dominant trait for hair color is black ($B$). If the two initial rabbits (level 1 in the figure below) are homozygous for their traits, meaning that the two alleles for each trait are the same, breeding them will result in offspring that have both a dominant and recessive allele for each trait. Such a pairing of alleles is known as heterozygous. If, as in level 2 of the figure, two heterozygous rabbits are bred, the chart (level 3) contains all the possibilities for their offspring.

25. In the figure above, each numbered level represents:
A. different generations.
B. different members of the same generation.
C. which rabbits have dominant alleles.
D. which rabbits have recessive alleles.

26. Which of the following statements best explains the observation that offspring of the two rabbits in level 1 must have short black hair?
F. If parents have a certain trait, their offspring must also possess the same trait.
G. There is a 75% chance that the offspring will have short, black hair.
H. Because offspring receive one allele per trait from each parent, the only possible outcome of the mixing is to have one dominant and one recessive allele for each trait.
J. Because offspring receive one allele per trait from each parent, the recessive alleles are not transmitted to the offspring.

27. What is the probability that offspring of the level 2 rabbits will have white hair?
A. 75%
B. 25%
C. 6.25%
D. 0%

28. If several pairs of heterozygous rabbits were mated (as in level 2), what would be the expected ratio for the traits of the offspring (express as a ratio of short black hair: long black hair: short white hair: long white hair)?
F. 16:4:4:1
G. 16:3:3:1
H. 9:4:4:1
J. 9:3:3:1

29. Which of the following statements might be a reasonable generalization made after examining this study?
A. If heterozygous rabbits with opposite traits are bred, the recessive traits will not be visible in the immediate generation, but may be visible in the second generation.
B. If heterozygous rabbits with opposite traits are bred, the recessive traits might be visible in the immediate generation, but will not be visible in the second generation.
C. If heterozygous rabbits with opposite traits are bred, the recessive traits will be visible in the immediate generation and in the second generation.
D. If heterozygous rabbits with opposite traits are bred, the recessive traits will not at all be visible in future generations because they are overcome by the dominant traits.
PASSAGE VI

A chemical bond is the physical phenomenon of chemical substances being held together by attraction of atoms to each other through both sharing and exchanging of electrons or electrostatic forces. Bond energy is a measure of bond strength in a chemical bond. For example, the carbon—hydrogen (C–H) bond energy is the energy change involved with breaking up the bond between the carbon and hydrogen atoms. Bonds with a higher energy release more energy when they form, and are considered to be more stable (less reactive).

When reacting with nonmetals, hydrogen forms covalent bonds, meaning that the bonded atoms share electrons with each other. Figure 1 shows the bond energies and distances for bonds involving hydrogen and nonmetals (H–X). The chart is arranged by period (rows of periodic table); in addition, the values for group 17 (column 17 on the periodic table) are compared.

### Bond Length

Bond length is the distance between two bonded atoms in a molecule. Bond lengths are measured in molecules by means of X-ray diffraction. A set of two atoms sharing a bond is unique going from one molecule to the next. For example, the oxygen to hydrogen bond in water is different from the oxygen to hydrogen bond in alcohol. It is, however, possible to make generalizations when the general structure is the same. Figure 2 relates bond energy to bond length for H–X bonds between hydrogen and nonmetals. The elements in each period or group are connected by a line (with the exception of the first, which contains only hydrogen).

<table>
<thead>
<tr>
<th>Bond</th>
<th>Energy (kJ/mol)</th>
<th>Length (pm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H–H</td>
<td>436</td>
<td>74</td>
</tr>
<tr>
<td>Period 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H–B</td>
<td>391</td>
<td>119</td>
</tr>
<tr>
<td>H–C</td>
<td>413</td>
<td>109</td>
</tr>
<tr>
<td>H–N</td>
<td>393</td>
<td>101</td>
</tr>
<tr>
<td>H–O</td>
<td>460</td>
<td>96</td>
</tr>
<tr>
<td>Period 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H–P</td>
<td>326</td>
<td>144</td>
</tr>
<tr>
<td>H–S</td>
<td>366</td>
<td>134</td>
</tr>
<tr>
<td>H–Cl</td>
<td>432</td>
<td>127</td>
</tr>
<tr>
<td>Period 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H–Se</td>
<td>279</td>
<td>146</td>
</tr>
<tr>
<td>H–Br</td>
<td>366</td>
<td>141</td>
</tr>
<tr>
<td>Group 17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H–F</td>
<td>568</td>
<td>92</td>
</tr>
<tr>
<td>H–Cl</td>
<td>432</td>
<td>127</td>
</tr>
<tr>
<td>H–Br</td>
<td>366</td>
<td>141</td>
</tr>
<tr>
<td>H–I</td>
<td>298</td>
<td>161</td>
</tr>
</tbody>
</table>

**Figure 1**

30. Suppose a certain experiment calls for a very stable substance with bond energy greater than 420 kJ/mol. Which of the following pairs of elements in a compound would yield a stable enough substance?
F. H and C
G. H and O
H. H and P
J. H and S

31. Generally speaking, the higher the bond energy, the more stable the bond is. The three most stable bonds shown in Figure 1 are:
A. H–F, H–Cl, H–Br
B. H–F, H–N, H–H
C. H–F, H–O, H–H
D. H–H, H–O, H–Cl

32. Which of the following substances would have the highest sum of bond energies (for example, H₂O has two H–O bonds)?
F. H₂O
G. H₂S
H. NH₃
J. H₃Cl
33. Based on observations from Figures 1 and 2, which of the following statements is the best assessment of the data?
   A. Hydrogen H–X bond energies decrease along a group and bond lengths increase along a group.
   B. Hydrogen H–X bond energies increase along a group and bond lengths increase along a group.
   C. Hydrogen H–X bond energies decrease along a group and bond lengths decrease along a group.
   D. Hydrogen H–X bond energies decrease across a period and increase along a group.

34. Which of the following is the correct order for increasing bond lengths for bonds between these pairs of elements: H–O, H–S, H–Se?
   F. H–Se > H–S > H–O
   G. H–S > H–O > H–Se
   H. H–S < H–O < H–Se
   J. H–O < H–S < H–Se
PASSAGE VII

The growth rate of trees can be determined by counting concentric growth bands present in the trunks. This is called *dendrochronology*. Because *dendrochronology* is not completely accurate on its own, it is often combined with a process called *cross dating*, whereby band-growth characteristics across many samples from a homogeneous area (area of similar environmental conditions) are matched. It is believed that variation in the bands is due to some variation in environmental conditions, such as annual rainfall, when the bands were formed. During years with less rain, fewer bands will be formed, and the bands will be narrower than the bands formed during years with heavier rainfall. Heavier rainfall typically results in faster growth.

Researchers applied this information to white oak trees at three separate sites and tabulated the following data. At least 50 trees of varying ages were sampled from each site.

<table>
<thead>
<tr>
<th>Site</th>
<th>Average number of growth bands per year</th>
<th>Average size of growth bands (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>12</td>
</tr>
</tbody>
</table>

35. Based on the observed trend in the data, which of the following statements is true?
A. Site 1 received a higher average annual rainfall than Site 2.
B. Site 2 received a higher average annual rainfall than Site 3.
C. Site 3 received a higher average annual rainfall than Site 2.
D. Site 1 received a higher average annual rainfall than Site 3.

36. On the basis of the tabulated data, one would conclude that the trees at Site 1, as compared to the trees at Site 2:
F. experienced faster growth.
G. experienced slower growth.
H. experienced the same growth rate.
J. are not homogenous.

37. Which of the following graphs best represents the data presented in the table?

A. ![Graph A]
B. ![Graph B]
C. ![Graph C]
D. ![Graph D]
38. Based on the passage, the average annual rainfall was most likely highest at which site?
   F. Site 1
   G. Site 2
   H. Site 3
   J. It cannot be determined from the information in the passage.

39. According to the passage, cross dating is applied in order to:
   A. improve the accuracy of determining the growth rate of trees.
   B. predict the amount of rainfall any given area will receive.
   C. decrease the number of trees that are required to be studied.
   D. reduce the number of bands formed during years with heavy rainfall.

40. Trees from another site, Site 4, were sampled and found to have an average of 13 growth bands per year. According to the tabulated data, the average size of these growth bands, in millimeters, is most likely:
   F. less than 2.
   G. between 2 and 4.
   H. between 4 and 12.
   J. greater than 12.

END OF THE SCIENCE REASONING TEST.
STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.
Many high schools have a police liaison officer who works full-time with the student body and the administration to combat drugs, violence, and other criminal issues within the school buildings. Supporters of the liaison program feel that the officers are beneficial as an active crime deterrent and first response to incidents within the schools. Opponents say a single officer in each building cannot effectively manage crime in the schools and that police resources are better spent in neighborhoods with more pressing needs.

In your opinion, should a police liaison officer be assigned to every public high school? In your essay, take a position on this question. You may write about one of the points of view mentioned above, or you may give another point of view on this issue. Use specific examples and reasons for your position.
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. F</td>
<td>22. F</td>
<td>42. G</td>
</tr>
<tr>
<td>3. B</td>
<td>23. A</td>
<td>43. A</td>
</tr>
<tr>
<td>5. C</td>
<td>25. A</td>
<td>45. A</td>
</tr>
<tr>
<td>7. C</td>
<td>27. D</td>
<td>47. D</td>
</tr>
<tr>
<td>12. J</td>
<td>32. F</td>
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<td>15. D</td>
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<td>55. D</td>
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<td>17. B</td>
<td>37. D</td>
<td>57. D</td>
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<td>20. F</td>
<td>40. H</td>
<td>60. J</td>
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<td>Mathematics Test</td>
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<tr>
<td>------------------</td>
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<td>---</td>
</tr>
<tr>
<td>1.   A</td>
<td>21. E</td>
<td>41. A</td>
</tr>
<tr>
<td>7.   D</td>
<td>27. D</td>
<td>47. A</td>
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<td>12. K</td>
<td>32. F</td>
<td>52. H</td>
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<td>15. B</td>
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<tr>
<td>Reading Test</td>
<td>Science Reasoning Test</td>
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<td>--------------</td>
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<tr>
<td>1. C</td>
<td>1. D</td>
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<td>2. J</td>
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<td>7. D</td>
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<td>8. H</td>
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<td>9. A</td>
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<td>10. H</td>
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<td>15. C</td>
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<td>17. C</td>
<td>17. D</td>
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<td>25. B</td>
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<td>27. A</td>
<td>27. B</td>
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<td>29. A</td>
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<td>30. J</td>
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<td>40. J</td>
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</tbody>
</table>
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SCORING GUIDE

Your final reported score is your COMPOSITE SCORE. Your COMPOSITE SCORE is the average of all of your SCALE SCORES.

Your SCALE SCORES for the four multiple-choice sections are derived from the Scoring Table on the next page. Use your RAW SCORE, or the number of questions that you answered correctly for each section, to determine your SCALE SCORE. If you got a RAW SCORE of 60 on the English test, for example, you correctly answered 60 out of 75 questions.

**Step 1**  Determine your RAW SCORE for each of the four multiple-choice sections:

- **English**
- **Mathematics**
- **Reading**
- **Science Reasoning**

The following Raw Score Table shows the total possible points for each section.

<table>
<thead>
<tr>
<th>RAW SCORE TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>KNOWLEDGE AND SKILL AREAS</td>
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<tr>
<td>ENGLISH</td>
</tr>
<tr>
<td>MATHEMATICS</td>
</tr>
<tr>
<td>READING</td>
</tr>
<tr>
<td>SCIENCE REASONING</td>
</tr>
<tr>
<td>WRITING</td>
</tr>
</tbody>
</table>
Multiple-Choice Scoring Worksheet

Step 2 Determine your SCALE SCORE for each of the four multiple-choice sections using the following Scoring Worksheet. Each SCALE SCORE should be rounded to the nearest number according to normal rules. For example, 31.2 ≈ 31 and 31.5 ≈ 32. If you answered 61 questions correctly on the English section, for example, your SCALE SCORE would be 29.

<table>
<thead>
<tr>
<th>Section</th>
<th>RAW SCORE</th>
<th>SCALE SCORE</th>
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<tbody>
<tr>
<td>English</td>
<td>( \frac{\text{RAW SCORE}}{\frac{36}{75}} ) - 2</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>( \frac{\text{RAW SCORE}}{\frac{36}{60}} ) + 1</td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>( \frac{\text{RAW SCORE}}{\frac{36}{40}} ) + 2</td>
<td></td>
</tr>
<tr>
<td>Science Reasoning</td>
<td>( \frac{\text{RAW SCORE}}{\frac{36}{40}} ) + 1.5</td>
<td></td>
</tr>
</tbody>
</table>

*The correction factor is an approximation based on the average from several recent ACT tests. It is most valid for scores in the middle 50% (approximately 16–24 scale composite score) of the scoring range. The scores are all approximate. Actual ACT scoring scales vary from one administration to the next based upon several factors.

If you take the optional Writing Test, you will need to combine your English and Writing scores to obtain your final COMPOSITE SCORE. Once you have determined a score for your essay out of 12 possible points, you will need to determine your ENGLISH/WRITING SCALE SCORE, using both your ENGLISH SCALE SCORE and your WRITING TEST SCORE. The combination of the two scores will give you an ENGLISH/WRITING SCALE SCORE, from 1 to 36, that will be used to determine your COMPOSITE SCORE mentioned earlier.

Using the English/Writing Scoring Table, find your ENGLISH SCALE SCORE on the left or right hand side of the table and your WRITING TEST SCORE on the top of the table. Follow your ENGLISH SCALE SCORE over and your WRITING TEST SCORE down until the two columns meet at a number. This number is your ENGLISH/WRITING SCALE SCORE and will be used to determine your COMPOSITE SCORE.

Step 3 Determine your ENGLISH/WRITING SCALE SCORE using the English/Writing Scoring Table on the following page:

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## ENGLISH/Writing Scoring Table

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**Step 4**  Determine your COMPOSITE SCORE by finding the sum of all your SCALE SCORERs for each of the four sections: English only (if you do not choose to take the optional Writing Test) or English/Writing (if you choose to take the optional Writing Test), Math, Reading, and Science Reasoning, and divide by 4 to find the average. Round your COMPOSITE SCORE according to normal rules. For example, 31.2 \approx 31 and 31.5 \approx 32.

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English Test Explanations

PASSAGE I

1. **The best answer is D.** The sentence is clearest and most concise when the word back is inserted in place of the underlined portion. Answer choices A, B, and C are either awkward or redundant.

2. **The best answer is F.** This sentence is best as written. The word fairly is correctly used as an adverb to further modify the adjective regular, which modifies the noun trips. Answer choice G is not correct because the word fair is being used as an adjective to describe the trips, when it should be used to modify the adjective regular. Answer choice H is incorrect because it reverses the words, thereby changing the meaning of the sentence. It is not best to use regular because the context of the sentence indicates that the trips were mostly between Las Vegas and New York, so answer choice J is incorrect.

3. **The best answer is B.** The context of the sentence indicates that first the author goes to Las Vegas, “then” the author returns home to New York. It is not appropriate to use “than” to indicate a progression in time, so answer choices A and C are incorrect. Answer choice D is wordy and is not as clear and effective as answer choice B.

4. **The best answer is F.** The sentence is best as it is written. It clearly indicates that because the author and her husband are retired, they have sufficient time to travel. Answer choices G and H are wordy and are not as clear and effective as answer choice F. Omitting the underlined portion would result in some ambiguity within the sentence: you do not know for what the author and her husband have plenty of time.

5. **The best answer is C.** According to the passage, the fact that the author’s grandparents live in New York combined with the fact that she has two dogs makes it difficult for her to stay for any longer than three weeks in Las Vegas. These responsibilities require her to be at home in New York most of the time. Therefore, it would not be viable for her to stay longer than a few weeks at a time in Las Vegas.

6. **The best answer is J.** The paragraph is written in the present tense, so it is necessary to use the present tense verb has. Answer choices F and G use the past tense, so they are incorrect. It is never correct to use the helping verb has with the simple past tense verb became, so answer choice H is incorrect.

7. **The best answer is C.** If two adjectives modify a noun in the same way, they are called coordinate adjectives. It is necessary to separate coordinate adjectives, such as warm and sunny with a comma. You could also insert the coordinate conjunction and, but you should not use any commas if you do so; therefore, answer choice B is incorrect. A semicolon should be used to separate two related main clauses, so answer choice D is incorrect.

8. **The best answer is G.** The subordinating conjunction because clearly indicates that the dogs are the reason that the author cannot fly to Las Vegas. The subordinating conjunction so is used to indicate a consequence, and if it is used here, it creates an incomplete sentence; eliminate answer choice F. Answer choice H is a preposition phrase that does not correctly express the idea that having the dogs prevents the author from flying to Las Vegas, so it is incorrect. While answer choice J expresses essentially the same idea as answer choice G, it is wordy and awkward and should be eliminated.

9. **The best answer is A.** It is necessary to use commas to set off parenthetical expressions within a sentence. Because the phrase “both of which are shelter mutts” is not essential to the meaning of the sentence, it is considered a parenthetical, or non-restrictive phrase. A nonrestrictive phrase can be omitted from the sentence without changing the meaning of the sentence.

10. **The best answer is H.** The sentence is written in the present tense, so it is necessary to use the present tense verb lies. In addition, the sentence indicates that only one dog lies on a blanket on the floor.

11. **The best answer is A.** It is best to leave Sentence 5 where it is in the paragraph. The paragraph describes the behavior of the dogs as they travel with the author, and the sequence of events is clearly indicated without changing the order of the sentences.
12. **The best answer is J.** The passage is written primarily in the present perfect tense so it is necessary to use the present perfect form of the verb have passed. The word past indicates “the time before the present,” and is not a verb that suggests movement. Therefore, eliminate answer choices F and H. Answer choice G is incorrect because it uses the present participle passing, which suggests that the action is currently taking place.

13. **The best answer is B.** The context of the sentence indicates that the author paid multiple tolls, so the plural form of the word is correct. The tolls do not possess anything, so it is not necessary to use an apostrophe; eliminate answer choices A and D. Answer choice C includes an extraneous comma, so it is incorrect. Because the phrase “in Oklahoma” is necessary to the meaning of the sentence, it should not be set off by commas.

14. **The best answer is H.** The preceding sentence reads, “I’m mentally preparing myself for a sunless New York sky during our week at home.” This sentence and the final sentence of the passage suggest that the author enjoys her visits to “sunny Las Vegas” and is glad for the chance to escape the “sunless New York sky.” The sentence reinforces the author’s decision to travel back and forth from New York to Nevada.

15. **The best answer is D.** The tone and context of the passage clearly indicate that it is a personal account of the author’s travels to and from Nevada. Therefore, it would not fulfill an assignment to write a travel article about Las Vegas, Nevada.

**PASSAGE II**

16. **The best answer is F.** The indefinite pronoun one is used to indicate any of the possible people who acquire a new puppy or dog. Because one is a collective pronoun, it is considered a singular pronoun, so the correct verb to use is “acquires.” You do not need the pronoun who in the sentence, so eliminate answer choice H. It is not correct to use the pronoun it refer to people, so eliminate answer choice J.

17. **The best answer is B.** By using the article the, the sentence does not clearly indicate to whom the pets belong. The context of the sentence shows that the pets belong to the dog owners so it is correct to use the plural pronoun their. The word “there” indicates a place, so eliminate answer choice C. The word they're is the conjunction of they and are, so eliminate answer choice D.

18. **The best answer is H.** The sentence is written in the present tense, so it is necessary to use the present tense verb is. As it is written, the sentence suggests that the problem will be become evident in the future, so eliminate answer choice F. Answer choice G is incorrect because it uses the participle becoming; answer choice J is awkward.

19. **The best answer is D.** The sentence discusses the “movements and facial expressions” of “a dog,” which means that you should use the singular possessive dog’s.

20. **The best answer is F.** The sentence is written as it is written. Answer choice G is incorrect because he participle confusing suggests that the dog’s actions are not clear to the owner, which does not fit the context of the sentence. Answer choice H is incorrect because use of the preposition by suggests that the dog finds “waiting for a signal” to be confusing, which is not supported by the context. Answer choice J is incorrect for the same reason; in addition, it is not idiomatic to say “confused with” unless you are making a comparison.

21. **The best answer is B.** Since the sentence refers to a single dog—the dog—it is correct to use the singular possessive its. As it is written, the sentence is unclear as to whom or what the lips belong. It is never correct to use the plural possessive its, because it is a singular pronoun. Therefore, answer choice C is incorrect. Answer choice D is incorrect because the sentence refers to a single dog.

22. **The best answer is F.** The paragraph describes several ways that a dog will communicate non-verbally with its owner. The description of a relaxed dog letting “its tongue loll out of its mouth” is another example of this type of communication.

23. **The best answer is A.** This question tests your ability to convey the intended idea clearly and effectively. The simplest way to show that other forms of body language exist is to say “can also indicate.” The other answer choices are wordy and awkward and are not appropriate for standard written English.

24. **The best answer is G.** The preceding sentence describes how a dog owner might recognize when his or her dog is being aggressive or fearful. Answer choice G offers a reason for this behavior.

25. **The best answer is A.** The main focus of the paragraph is additional forms of body language that a dog might exhibit when attempting to communicate. Therefore, the best concluding sentence will refer to and generalize the main idea. Only answer
choice A does this. The other answer choices are too specific and offer additional forms of communication.

26. The best answer is G. You should use a comma to separate elements that introduce and modify a sentence. The phrase “While most dogs are capable of learning” is an introductory clause that should be followed by a comma. Answer choice F is incorrect because a semicolon should be used to separate two independent clauses. Answer choices H and J are incorrect because it is necessary to use a comma to separate an introductory clause from the rest of the sentence. In addition, answer choice J creates an incomplete sentence.

27. The best answer is D. The main focus of the paragraph is on learning to understand a dog’s body language and using that knowledge to more effectively train the dog. The sentence that mentions offering a dog treats is least relevant—it does not add any information that is necessary to the flow or structure of the paragraph. While Sentence 6 is not entirely unrelated to the topic, of the answer choices, it is the least relevant to the paragraph.

28. The best answer is G. According to the conventions of standard written English, you should never separate a subject from its verb with any sort of punctuation. Therefore, it is incorrect to place a comma, a semicolon, or a colon between The bottom line—the subject—and is—the verb.

29. The best answer is A. The ACT rewards active voice. Therefore, it is better to use the verb communicating as opposed to the noun communication in this sentence; eliminate answer choices B and D. It is idiomatic to say involved in, whereas involved to is not correct in standard written English.

30. The best answer is J. The ACT rewards active voice. Therefore, it is best to say to remember; the other answer choices are not as good because they are written in the passive voice.

PASSAGE III

31. The best answer is D. You should use a comma to separate elements that introduce and modify a sentence. The phrase “While the history of the piñata is somewhat murky” is an introductory clause that should be followed by a comma. Answer choice A is incorrect because it creates an incomplete sentence. Answer choice B is incorrect because a semicolon should separate two independent clauses. Answer choice C is incorrect because you must use a comma to separate an introductory clause from the rest of the sentence.

32. The best answer is F. The word where correctly indicates that most of the piñatas were made in China. Because China is a place, it is better to say where than in, so answer choice G is incorrect. Answer choice H is incorrect because it includes an extraneous comma. The coordinate conjunction so indicates that China is the reason that most piñatas were made to resemble animals, which does not make sense.

33. The best answer is A. The underlined portion clearly and effectively indicates that the current custom of filling piñatas with candy or toys differs from the original custom of filling the piñatas with seeds. Answer choice B is incorrect because it includes the ambiguous pronoun they. Answer choice C is redundant—it is not necessary to use both standard and customary in the sentence because the words are synonyms. If you omit the underlined portion, you lose the comparison between the original custom and the current custom.

34. The best answer is G. The sentence is written in the past tense so you must use the past tense verb were kept. Answer choice H is incorrect because, while it uses the past tense verb kept, it creates an incomplete sentence.

35. The best answer is B. No commas are necessary to set off a person’s name from a clause when the title of occupation precedes the name: for example, President Abraham Lincoln.

36. The best answer is H. The paragraph focuses specifically on the piñata and its use in European celebrations. The sentence that the author is considering adding does not offer anything relevant to the main idea of the paragraph.

37. The best answer is D. The phrase “that broke easily,” while not grammatically incorrect, is redundant. Something that is fragile, by definition, breaks easily. Therefore, answer choices B and C are also redundant, and it would be best to omit the underlined portion.

38. The best answer is F. The sentence is describing an event as it might have taken place in the past. Therefore, it is appropriate to use the auxiliary verb would be with the past tense verb hung. It is not necessary to use any punctuation in the underlined portion.
39. The best answer is B. The past tense verb dispensed effectively indicates that the tiny treasures came from the pot after it was broken. The phrase dispensed with refers to getting rid of or doing away with something, which does not fit the context.

40. The best answer is H. Only answer choice H uses the active voice to clearly indicate that either the pots could be unadorned, or they could be decorated with ribbons and paper. The other answer choices are in the passive voice and are awkward.

41. The best answer is C. The sentence is discussing more than one piñata, so the plural form piñatas is correct. The “s” apostrophe means plural possession, and the apostrophe “’s” means singular possession; possession is not indicated by the context of the sentence, so answer choices A and B are incorrect.

42. The best answer is G. The singular subject every needs the singular pronoun its. The word it’s is the conjunction of it is.

43. The best answer is A. The phrase “In America” is an introductory clause that must be followed by a comma.

44. The best answer is J. The context of the sentence indicates that the piñatas are filled with candy and toys; in fact, the sentence says pounds, which can be interpreted as a large quantity. Because barren means empty, it would not be an appropriate alternative.

45. The best answer is A. As it is written, the underlined portion clearly and effectively shows what the audience most enjoys doing: “watching the blindfolded person swing mightily at nothing but thin air.” It is in the active voice and is free from ambiguity. The other answer choices are either in the passive voice or do not make sense.

PASSAGE IV

46. The best answer is J. If a list contains three or more items, it is necessary to separate those items with commas. It is not appropriate to include a comma between the verb read and the prepositional phrase in magazines, so answer choice F is incorrect. Answer choice G does not include any of the necessary separating commas, so it is incorrect. A semicolon should be used to separate items in a list that follows a colon, so the use of a semicolon in answer choice H is incorrect.

47. The best answer is D. This sentence requires the use of the participle spending in order to accurately show that the spending takes place after the watching, reading, and hearing of the advertisements. The helping verb having suggests that the spending occurs first, which does not make sense. Answer choice D is the most simple and clear selection.

48. The best answer is F. The underlined portion is best as it is written. It is not appropriate to use a comma to separate a subject from its verb, so answer choice G is incorrect. Both answer choices H and J create an incomplete sentence that lacks a main verb.

49. The best answer is A. The underlined portion correctly uses the contraction of you are, whereas answer choice B incorrectly uses the possessive pronoun your. The other answer choices are awkward and contain extraneous commas.

50. The best answer is J. The underlined portion is redundant, because the sentence already indicates that the person is special. Therefore, the best thing to do is to omit the underlined portion. Because all of the answer choices are grammatically correct and express the same idea, you should be able to quickly recognize the redundancy.

51. The best answer is B. This question tests your ability to recognize idiom. In standard written English it is appropriate to use the phrase filled with.

52. The best answer is H. Because the sentence uses the pronoun you earlier in the sentence, it is not necessary to restate the pronoun later in the sentence. It is clear that you are performing both actions—decorating a picture frame and using nuts and bolts.

53. The best answer is D. The coordinate conjunction and is not necessary at this point in the sentence. The sentence presents a list of items that could be used in a shadow box, and a dried flower is an item that falls in the middle of the list. Therefore, no additional language is necessary.

54. The best answer is F. In order to avoid redundancy and wordiness, it is best to simply say gather from. This clearly and effectively expresses the idea.

55. The best answer is D. Sentence 1 is an appropriate introductory sentence because it includes the transitional phrase For example, and then goes on to give examples of how to create a handmade gift from someone’s trinkets or other personal items. Sentence 2 directly follows with yet another example. Sentence 4 would best follow sentence 2,
because it provides details on how to make a shadow box. Finally, sentence 3 is best as the last sentence because it effectively concludes the topic discussed in the paragraph.

56. The best answer is G. The sentence as it is written is an incomplete sentence that lacks a main verb. Answer choice G is correct because it is necessary to use a comma to separate an introductory clause from the rest of the sentence. Answer choice H has the comma after the verb, which is incorrect.

57. The best answer is D. It is best to use the adverb nearly to modify the adjective endless. Answer choice D is best because it does not include the extraneous verb to be.

58. The best answer is H. To identify more effectively exactly what is happening, it is better to use the specific pronoun this. The pronoun it is rather ambiguous, and the coordinate conjunction so is not appropriate.

59. The best answer is A. The student benefits by learning about scrapbooking and the store benefits by receiving customer patronage. The other answer choices offer support for why a patron would take a class, but not for why a store owner would offer such a class.

60. The best answer is J. The notion that original, hand-made pictures or books will be enjoyed is stated previously in the paragraph. Therefore, it is not necessary or relevant to mention it again. The other answer choices are not supported by the essay.

PASSAGE V

61. The best answer is D. No punctuation is necessary in this sentence. A good rule of thumb is to use a comma wherever you would naturally pause in a sentence. Because there are no natural pauses in this sentence, you don’t need a comma. Answer choice B is incorrect because a semicolon should be used to separate two independent clauses. Answer choice C is incorrect because a colon should generally be used to introduce a list.

62. The best answer is J. Answer choice J is best because it indicates not only that accidents occur more frequently, but how many times more frequently they occur. This is more detailed and relevant than the information contained in the other answer choices.

63. The best answer is B. The plural subject These statistics requires the plural verb take. The other answer choices use the wrong verb form or tense.

64. The best answer is F. The sentence in answer choice F introduces the idea of ingenious designs which are then discussed in the paragraph. Answer choice G does not provide an effective transition, and answer choice H is irrelevant to the topic of the paragraph. Answer choice J is incorrect because the focus of the passage is safety.

65. The best answer is C. In order to maintain parallelism within the sentence, it is necessary to use illuminating to match the verb allowing.

66. The best answer is G. The plural noun headlights requires the plural verb are.

67. The best answer is B. You should use a semicolon to separate two independent but related clauses. A comma is insufficient and creates a comma splice, so answer choice A is incorrect. Answer choices C is incorrect because it does not include any punctuation. Answer choice D is incorrect because it is not correctly punctuated.

68. The best answer is H. By using the verb phrase doing so, answer choice H clearly and effectively indicates that using the high-beams would provide more light. Answer choice F is incorrect because the pronoun they is ambiguous—it is unclear whether the antecedent is high-beams or drivers. Answer choice G is incorrect for a similar reason—the pronoun it is ambiguous. Answer choice J is awkward and contains an ambiguous pronoun.

69. The best answer is D. It is best to say switching proves because switching is singular. The other answer choices include incorrect verb tense and aspect.

70. The best answer is G. It is appropriate to use a colon to introduce a list of items. Answer choice F is incorrect because it creates an incomplete sentence. Answer choice H is incorrect because it includes a comma splice. Answer choice J is incorrect because it is awkward and wordy.

71. The best answer is B. To clearly indicate that the images are displayed on a screen after the images are detected, it is best to use the phrase are then displayed. The images themselves do not display; rather, they are displayed, so answer choices A and C are incorrect.

72. The best answer is G. Sentence 5 should be the last sentence of the paragraph because it effectively
concludes the topic of the paragraph, and most logically follows sentence 6.

73. **The best answer is D.** The phrase “particularly during dangerous nighttime driving” is a non-restrictive clause, which should be set off with commas. Only answer choice D correctly places a comma between road and particularly.

74. **The best answer is F.** Use a comma with a coordinating conjunction to separate main clauses within a sentence. A coordinating conjunction connects words, phrases, or clauses that are of equal importance in the sentence.

75. **The best answer is B.** Paragraph 1 states that more accidents occur at night than in the daytime. The new sentence uses the possessive determiner these, which takes the mention of night accidents as its antecedent from earlier in the paragraph.
Mathematics Test Explanations

1. **The correct answer is A.** You are given that one foot is approximately 0.3048 meters. Therefore, a building that is 65 feet long will be $65(0.3048)$, or 19.8 meters long.

2. **The correct answer is H.** To calculate the new hourly rate, multiply the current rate by 18%, or 0.18, its decimal equivalent, and add the result to the current rate:

   $$30(0.18) + 30 = 30 + 5.40, \text{ or } \$35.40$$

3. **The correct answer is D.** To find the average, divide the sum of the contributions by the number of contributions, as follows:

   $$\frac{(25 + 40 + 30 + 15)}{4} = \frac{110}{4} = 27.50$$

4. **The correct answer is F.** To find the difference in the distance traveled, first find the distance traveled by each bus. Distance equals rate multiplied by time. Since Bus X travels 40 miles per hour for 2 hours, it traveled $40(2) = 80$ miles. Likewise, since Bus Y travels 60 miles per hour for $1\frac{1}{2}$ hours, it traveled $60(1.5) = 90$ miles. Therefore, the difference is 90 – 80, or 10 miles.

5. **The correct answer is C.** The expression $(r + 2)(r - 3)$ will equal zero when either $r + 2$ or $r - 3$ equals zero. Thus $r = -2$ or $r = 3$.

6. **The correct answer is H.** The perimeter is the distance around the parallelogram. In parallelograms, opposing sides have equal lengths. If $PS$ is 7 cm long, so is $QR$. Also, $PQ$ and $SR$ will have the same length. Set the length of $PQ$ and $SR$ to $l$, and solve.

   $$7 + 7 + l + l = 40$$
   $$14 + 2l = 40$$
   $$14 + 2l = 40$$
   $$l = \frac{26}{2}, \text{ or } 13.$$  

7. **The correct answer is D.** If the $x$-coordinate of each point on a line is 5 more than half the $y$-coordinate, then $x = \frac{y}{2} + 5$. To find the slope of the line, solve for $y$ and put the equation in slope-intercept form ($y = mx + b$, where $m$ is the slope). To do so, first subtract 5 from both sides, then multiply the entire equation by 2 to get $y = 2x - 10$. The slope is 2.

8. **The correct answer is J.** You are given that a rectangular garden has a length of $x$ and a width of $y$, and has its length reduced by 3 feet and its width extended by 2 feet. Therefore, the length becomes $x - 3$ and its width becomes $y + 2$. The area of the new garden is then $(x - 3)(y + 2)$.

9. **The correct answer is A.** To get $y$ in terms of $x$ and $z$, solve $x = 3yz^2$ for $y$, as shown below:

   $$x = 3yz^2$$
   $$\frac{x}{3z^2} = y, \text{ or } y = \frac{x}{3z^2}$$

10. **The correct answer is H.** The triangle pictured is isosceles, meaning that the two angles opposite the sides that have equal length have equal measure. Since the sum of the interior angles of a triangle is $180^\circ$, the measure of $\angle \alpha$ is $180^\circ - 2(55^\circ)$, or $180^\circ - 110^\circ$, which is $70^\circ$.

11. **The correct answer is C.** To solve this problem, distribute using the FOIL method, as follows:

   $$(3x^2 - 1)(x^2 - 4)$$

   First: $3x^4$
   Outside: $-12x^2$
   Inside: $-x^2$
   Last: 4

   Combine like terms and simplify to get $3x^4 - 13x^2 + 4$.

12. **The correct answer is K.** To solve this problem it might be helpful to draw a picture like the one below.
18. The correct answer is G. The absolute value of any number is non-negative. Since $|−3| = 3$, the value of $\frac{−6}{|−3|} = \frac{−6}{3}$, or $−2$.

19. The correct answer is A. In order for the expression $(a + y)(a + z)$ to equal zero, either $a + y = 0$ or $a + z = 0$. Thus either $a = −y$ or $a = −z$.

20. The correct answer is K. The statement that $CF$ is congruent to $EF$ is not true because $\triangle CEF$ is an isosceles triangle in which $CE$ and $CF$ are equal. Since the triangle is isosceles, $\angle CFE$ is congruent to $\angle CEF$, and they have measure $70^\circ$. In a triangle, the length of a side is proportional to the measure of the angle opposite it. Since the measure of the angle opposite $EF$ is only $40^\circ$ while the measure of the angle opposite $CF$ is $70^\circ$, $EF$ must be shorter than $CF$.

21. The correct answer is E. To find the slope, convert the equation $21x − 3y + 18 = 0$ to slope-intercept form ($y = mx + b$, where $m$ is the slope and $b$ is the $y$-intercept). To do so, first subtract 18 and 21x from both sides to get $−3y = 21x − 18$. Then divide both sides by $−3$ to get $y = 7x = 6$. Therefore the slope is 7.

22. The correct answer is J. The least common denominator (LCD) is actually the least common multiple of the three denominators. To find the LCD, first find the greatest common factor of the denominators. In this case, each denominator contains either $a$, $b$, or both $b$ and $c$, so those are the factors that they have in common. The values that remain in the three denominators represent what they don’t have in common, and are the least common multiples of each denominator. To find the least common multiple, otherwise known as the least common denominator (LCD), simply multiply the least common multiples of each denominator together, to get $a^2 \times b^2 \times c^2$.

23. The correct answer is C. To solve this problem, go through and try each answer choice to see which one has the desired result. The correct answer is $−2$ because adding negative 2 is the same as subtracting 2: $\frac{(5 − 2)}{(8 − 2)} = \frac{3}{6} = \frac{1}{2}$.

24. The correct answer is G. To solve this problem, first solve the equation $2y = 16$ for $y$ to get $y = 8$. Then substitute $y = 8$ into the equation $x + y = 13$ to get $x + 8 = 13$, making $x = 5$.

25. The correct answer is B. One possible method of solving this problem is to systematically eliminate wrong answer choices. It is given that $|m| > |n|$.
Assuming that statement is true, then \( m \) cannot equal \( n \) because if \( m = n \), then \(|m| = |n|\); eliminate answer choice A. Pick numbers for the variables to more clearly see the relationships, as follows:

**Answer choice B:** When \( m = 3 \) and \( n = 2 \), \( |m| > |n| \) is true. Likewise, when \( m = -3 \) and \( n = -2 \), \( |m| > |n| \) is true. Therefore, answer choice B is correct.

**Answer choice C:** When \( m = 2 \) and \( n = 3 \), \( |m| > |n| \) is not true, so answer choice C is incorrect.

**Answer choice D:** When \( m = 3 \) and \( n = -4 \), \( |m| > |n| \) is not true, so answer choice D is incorrect.

**Answer choice E:** Because you are not given any information about \( n \), you cannot determine a relationship, so answer choice E is incorrect.

26. **The correct answer is G.** A graph crosses the \( x \)-axis at the point when \( y = 0 \). Given that \( y - 5 = \frac{1}{2x} + 1 \), let \( y = 0 \) such that \(-5 = \frac{1}{2x} + 1 \). Subtracting 1 from both sides yields \(-6 = \frac{1}{2x} \). Multiplying by 2 yields \(-12 = x \).

27. **The correct answer is D.** To calculate the area of the living room, first calculate its dimensions. The length of the living room is 18’ less the width of the hallway, which is 4’, making it 18 - 4 = 14’. The width of the living room is 20’ less the width of the kitchen, which is 8’, making it 20 - 8 = 12’. Thus the area of the living room is 14’ \times 12’ = 168 square feet.

28. **The correct answer is F.** The perimeter is equal to the distance around an object. To calculate the perimeter of the ground floor of the townhouse, add the sides. The perimeter of the ground floor of the townhouse is \( 2(20’) + 2(18’) \), or 40’ + 36’, which is 76’.

29. **The correct answer is B.** This question asks you to calculate the percentage by which the population has decreased. First, determine the number of birds that you would expect to find in your sample area if the population density had not changed. Multiply the population density 3 years ago (20 birds) by the size of the sample area (3.25 acres):

\[
20 \times 3.25 = 65
\]

You would expect to find 65 birds in your sample area if there had been no change in population density.

Next, subtract the actual number of birds recorded in the sample area (47) from the expected number of birds (65):

\[
65 - 47 = 18
\]

There are 18 fewer birds in the sample area than what you would expect to find. Since you are asked to calculate the percentage decrease, set up a proportion:

\[
\frac{18}{65} = \frac{x}{100}
\]

Cross-multiply and solve for \( x \):

\[
65x = 1,800
\]

\[
x = \frac{1,800}{65}
\]

\[
x = 27.69
\]

Since the problem asks for an answer to the nearest tenth, round to 27.7. According to the study, the population density of the particular bird that you are studying has decreased by approximately 27.7%.

Answer choice C could be obtained if you found the difference between the number of birds expected (65) and the number of birds recorded (47), then divided by the number of birds recorded (47) to get a percent. Answer choice D is the percentage that the number of birds per acre 3 years ago (20) is of the number of birds recorded in 3.5 acres this year (47).

30. **The correct answer is H.** To find the product \((\tan \alpha)(\sin \beta)\), break up \(\tan \alpha\) and \(\sin \beta\) to their ratios. The ratio \(\tan \alpha\) is the side opposite \(\alpha\) divided by the side adjacent to \(\alpha\): \(\frac{z}{x}\). The ratio \(\sin \beta\) is the side opposite \(\beta\) divided by the hypotenuse: \(\frac{x}{y}\). The product \((\tan \alpha)(\sin \beta)\) is, therefore, \((\frac{z}{x})(\frac{x}{y}) = \frac{z}{y}\).

31. **The correct answer is C.** In order to add \(\frac{1}{x} + \frac{3}{4}\), the fractions must have a common denominator. To achieve a common denominator, multiply \(\frac{1}{x}\) by \(\frac{4}{4}\) and \(\frac{3}{4}\) by \(\frac{x}{x}\) to get \(\frac{4}{4x} + \frac{3x}{4x}\), which equals \(\frac{4 + 3x}{4x}\).
32. The correct answer is F. To solve this problem, it may be helpful to draw a picture in which one angle of a right triangle is labeled A, as shown below:

Because $\cos A = \frac{4}{5}$, let the side adjacent to angle A be 4 and the hypotenuse be 5. Likewise, since $\sin A = \frac{3}{5}$, let the side opposite angle A be 3 and the hypotenuse be 5. It follows then that $\tan A = \text{side opposite divided by side adjacent, or} \frac{3}{4}$.

33. The correct answer is A. To solve this problem, convert $5x + 3y = 8$ to the slope-intercept form, $y = mx + b$, where $m$ is the slope and $b$ is the $y$-intercept. To do so, first subtract $5x$ from both sides to get $3y = -5x + 8$. Dividing the entire equation by 3 yields $y = -\frac{5x}{3} + \frac{8}{3}$. Thus $\frac{8}{3}$ is the $y$-intercept.

34. The correct answer is J. To divide $\frac{a^x}{a^y}$, subtract the exponents. Thus $\frac{a^x}{a^y} = a^{x-y}$. If $\frac{a^x}{a^y} = a^4$, then $a^{x-y} = a^4$, making $x - y = 4$.

35. The correct answer is C. Between May and August, there were 3 price decreases (in June, July, and August). If the price was decreased by 20%, then the resulting price was 80% of the previous month’s price. Thus, in June the price was 0.8$d$; in July the price was 0.8(0.8$d$); in August the price was 0.8(0.8(0.8$d$)), which is equivalent to (0.8)$3$d, or 0.512$d$.

36. The correct answer is K. Given that $|5 - 2x| > 5$, then either $5 - 2x > 5$ or $5 - 2x < -5$. In the case that $5 - 2x > 5$, $-2x > 0$ making $x < 0$ (when you divide by a negative number remember to switch the direction of the inequality). In the case that $5 - 2x < -5$, then $-2x < -10$ making $x > 5$. Thus the range for $x$ is $x < 0$ or $x > 5$. Of the answer choices, only 6 fits into the range for $x$.

37. The correct answer is E. To solve this problem, first distribute then combine like terms. Distribute 0.1 as follows:

$$0.1(t + 3,420) = t$$
$$0.1t + 342 = t$$
$$342 = 0.9t$$
$$t = \frac{342}{0.9} = 380$$

38. The correct answer is J. Any line parallel to the $y$-axis is a vertical line. Vertical lines have slopes that are undefined. Remember that the definition of slope is rise/run; vertical lines have no run and thus dividing rise by run is dividing by 0, making the quotient undefined.

39. The correct answer is E. To find which equation has the smallest slope, first convert any equations to slope intercept form ($y = mx + b$, where $m$ is the slope and $b$ is the $y$-intercept) if they are not already in that form. In choice E, dividing both sides of $7y = 3x - 7$ by 7 yields $y = \frac{3x}{7} - 1$, which has a slope of $\frac{3}{7}$. When compared to the other slopes, $\frac{3}{7}$ is the smallest (the next closest is $\frac{1}{2}$, which is only slightly larger than $\frac{3}{7}$).

40. The correct answer is K. Let the number of minutes it would take Amy to run 10.3 miles be $y$. If she ran at the same pace for 10.5 mile as she did for 3.5 miles, then the rates in miles per minute would be equal, making $\frac{3.5}{x} = \frac{10.5}{y}$. Since the question asks for the number of minutes it would take Amy to run 10.5 miles, solve $\frac{3.5}{x} = \frac{10.5}{y}$ for $y$. To do so, first invert both sides of the equation to get $\frac{x}{3.5} = \frac{10.5}{y}$. Then multiply both sides by 10.5 to get $y = \frac{10.5x}{3.5}$, or $3x$.

41. The correct answer is A. Regardless of the dimensions of a rectangle, tripling the length and width will always have the effect of tripling the perimeter because perimeter is directly proportional to length and width ($P = 2l + 2w$).

42. The correct answer is H. To solve this problem, multiply the expression $(x + 3)$ by $(x + s)$ to get $x^2 + 3x + sx + 3s$. You are given that $x^2 + rx + 12$ is equivalent to $x^2 + 3x + sx + 3s$.

Therefore, $3s$ is equal to 12, making $s$ equal to 4. It is also apparent that $3x + sx$ is equivalent to $rx$.  

PRACTICE TEST 4 ANSWERS AND EXPLANATIONS
Set the quantities equal and solve for $r$, as follows:

$$rx = 3x + sx$$
$$rx = x(3 + s)$$
$$r = 3 + s$$

Because $s = 4$, $r$ must equal 7.

43. The correct answer is C. Systems of equations have an infinite number of solutions when the equations are equivalent (i.e. they graph the same line). In order for the two equations to be equivalent, the constants and coefficients must be proportional. If the entire equation $3x + 5y = 27$ is multiplied by 4, the result is $4(3x + 5y) = 4(27)$, or $12x + 20y = 108$. Thus, in order for the two equations to be equivalent, $3b = 108$, or $b = 36$.

44. The correct answer is J. Any integer when multiplied by an even integer results in an even integer. Also, the addition of any two even integers yields another even integer. Thus, regardless of the value of $a$ or the power of $a$, multiplying by an even integer and adding an even integer will yield an even integer. This only occurs in the calculation $6a^2 + 6$.

45. The correct answer is B. To solve this problem, remember that $|3a - 3| \geq 12$ is equivalent to $3a - 3 \geq 12$ or $3a - 3 \leq -12$. Adding 3 to both sides and dividing by 3 yields $a \geq 5$ or $a \leq -3$.

46. The correct answer is H. To find $\cos \frac{5\pi}{12}$ using $\cos(\alpha + \beta) = (\cos \alpha)(\cos \beta) - (\sin \alpha)(\sin \beta)$ given that $\frac{5\pi}{12} = \frac{\pi}{4} + \frac{\pi}{6}$, you can first substitute $\frac{\pi}{4}$ for $\alpha$ and $\frac{\pi}{6}$ for $\beta$ and get $\cos \left(\frac{\pi}{4} + \frac{\pi}{6}\right) = \left(\cos \frac{\pi}{4}\right)\left(\cos \frac{\pi}{6}\right) - \left(\sin \frac{\pi}{4}\right)\left(\sin \frac{\pi}{6}\right)$. Using the table of values to substitute into that equation, you get $\cos \frac{5\pi}{12} = \left(\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{3}}{2}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)$, or $\left(\frac{\sqrt{6} - \sqrt{2}}{4}\right)$.

47. The correct answer is A. To solve this problem, factor out the $x$ in the numerator of the fraction and the 3 in the denominator to get $\frac{(xy - xz)}{(3y - 3z)}$. Since the quantity $y - z$ is on the top and bottom, it cancels out, leaving $\frac{x}{3}$. Since $(xy - xz) < 0$, it follows that $\frac{x}{3} < 0$. Multiplying both sides of the inequality by 3 yields $x < 0$. Thus $x$ can be any number less than 0 (all negative numbers).

48. The correct answer is G. If the perimeter of a square is 36 units, then each side is 9 (since perimeter in a square is $4s$ where $s$ is the length of a side). To find the length of the diagonal, you can use the Pythagorean Theorem because the diagonal is the hypotenuse of a right triangle with legs of length 9. Thus $d^2 = 9^2 + 9^2$, or $81 + 81$, which equals $2(81)$, and $d = \sqrt{2(81)}$, or $\sqrt{2\cdot81}$, which is $9\sqrt{2}$.

49. The correct answer is E. A circle with center $(h, k)$ and radius $r$ has equation $(x-h)^2 + (y-k)^2 = r^2$. In order to determine the equation of the circle in the standard $(x, y)$ coordinate plane that has a radius of 4 units and the same center as the circle determined by $x^2 + y^2 - 6y + 4 = 0$, first determine the center of the circle defined by $x^2 + y^2 - 6y + 4 = 0$ by converting the equation to the standard form for a circle (complete the square):

$$x^2 + y^2 - 6y + 4 = 0$$
$$x^2 + y^2 - 6y + 9 + 4 - 9 = 0$$
(no net change in value)
$$x^2 + (y^2 - 6y + 9) + 4 - 9 = 0$$
(regrouping)
$$x^2 + (y - 3)^2 - 5 = 0$$
(factoring)
$$x^2 + (y - 3)^2 = 5$$

Thus the center of the circle is $(0,3)$. A circle that has a radius of 4 units and the same center has the equation $x^2 + (y - 3)^2 = 16$.

50. The correct answer is H. A rectangular kitchen that is 8 feet longer than it is wide with width $w$ would have length $l = w + 8$, or $w = l - 8$. Since the area $A = 240 = lw$, substitute $w = l - 8$ into $240 = lw$ to get $240 = l(l - 8) = l^2 - 8l$, or $l^2 - 8l - 240 = 0$. To find $l$, factor $l^2 - 8l - 240 = 0$ into $(l + 12)(l - 20) = 0$. Thus $l = -12$ (which doesn’t make sense because a kitchen cannot have a negative length), or $l = 20$.

51. The correct answer is C. Parallel lines have equal slopes. To find the slope of a line that is parallel to the line determined by the equation $5x - 4y = 8$, put the equation in slope-intercept form ($y = mx + b$). To do so, first subtract $5x$ from both sides to get $-4y = -5x + 8$. Then divide by $-4$ to get $y = \frac{5x}{4} - 2$. Thus the slope is $\frac{5}{4}$. 
52. The correct answer is H. To solve this problem, recall that $81 = 3^4$. Then $81^{3x-2} = (3^4)^{3x-2} = 3^{4(3x-2)}$. Further, if $3^8x = 81^{3x-2}$, then $3^8x = 3^{4(3x-2)}$ and $8x = 4(3x - 2), 12x - 8$. Subtracting $8x$ from both sides and adding 8 to both sides yields $4x = 8$, or $x = 2$.

53. The correct answer is B. Since the width of the frame is $\frac{8}{5}$ or 0.625 inches, the length of the view-able portion is $30 - 2\left(0.625\right) = 28.75$ inches and the width is $18 - 2\left(0.625\right) = 16.75$ inches. Thus, the area is $28.75 \times 16.75 = 481.56$ square inches.

54. The correct answer is F. If a horse eats 12 bales of hay in 5 days, the average rate is $\frac{12}{5}$ bales per day. At this rate, the number of bales of hay that the horse eats in $5 + x$ days is the 12 bales for the 5 days plus $\frac{12}{5}$ bales per day after that, or $\left(\frac{12}{5}\right) x$.

Thus the total is $12 + \left(\frac{12}{5}\right) x$, or $12 + \frac{12x}{5}$.

55. The correct answer is A. To solve this problem, substitute the equation $x = -5$ into $y = x - 5$ to find the y-coordinate at which the lines $x = -5$ and $y = x - 5$ intersect (the x-coordinate is -5 because it is given that $x = -5$). Thus $y = (-5) - 5 = -10$.

The point of intersection is $(-5, -10)$.

56. The correct answer is J. The number of miles a runner must travel in a 4-lap race where the course is a circle of radius $m$ miles will be equal to 4 times the circumference of the circle. Since circumference is $2\pi r$, where $r$ is the radius, the circumference is $2\pi m$. Since it is a 4-lap race, the total number of miles traveled is $4(2\pi m)$, or $8\pi m$.

57. The correct answer is B. Given that the graph of the line $y = (n + 1)x + 6$ in the standard $(x,y)$ coordinate plane passes through (4,8), plug in the values of the point (4,8) into the equation and solve for $n$. Substituting (4,8) into $y = (n + 1)x + 6$ yields $8 = (n + 1)(4) + 6 = 4n + 10$. To solve $8 = 4n + 10$, subtract 10 from both sides and divide by 4 to get $n = -1$.

58. The correct answer is J. You are given that a computer repair person charges $50.00 per hour, plus an additional mileage fee which varies directly with the square root of the number of miles traveled. Therefore, the total fee can be expressed as $50h + k\sqrt{m}$, where $h$ is the number of hours worked, $m$ is the number of miles traveled, and $k$ is some constant. Since one hour plus 25 miles traveled costs $140, $140 = $50 + k\sqrt{25} = 50 + 5k$. Since $140 = 50 + 5k$, $k = 18$. The total amount charged for one hour plus 36 miles traveled is $50 + 18\sqrt{36} = 50 + 18(6) = 50 + 108 = $158.00.

59. The correct answer is C. Since sin $Z$ is the ratio of the side opposite the angle to the hypotenuse, the side opposite $Z$, which is $XY$, must be determined. To do so, apply the Pythagorean Theorem, as follows:

$10^2 = XY^2 + 4^2$

$XY^2 = 100 - 16 = 84$

$XY = \sqrt{84} = \sqrt{(21)(4)} = 2\sqrt{21},$ or $2\sqrt{21}$.

Since sin $Z$ is the ratio of the side opposite the angle to the hypotenuse, sin $Z = \frac{2\sqrt{21}}{10}$.

60. The correct answer is J. The image of a point $(x, y)$ reflected across the line $y = x$ will have coordinates $(y, x)$. If the coordinates of point $A$ are $(m, n)$, then the coordinates of point $A'$ are $(n, m)$. 

PRACTICE TEST 4 ANSWERS AND EXPLANATIONS
Reading Test Explanations

PASSAGE I

1. The best answer is C. The passage provides several interpersonal and physical examples of teammates working together for their goal of winning the game. Mark’s quotation is an example of encouragement. The narrator describes the role of linemen in pushing back the defense for the running back. The other answer choices are not supported by the passage.

2. The best answer is J. The passage gives details about the almost meditative quality of Joe’s preparation for the snap of the football. According to the passage, “instinct told him what he needed to know.” Engrossed is the quality of being deeply involved in something. The narrator uses rich descriptions of the rituals of the football play to emphasize the players’ dedication to the game.

3. The best answer is B. The passage discusses Joe’s surprise at the final outcome of the game. He first saw what had happened, before it truly sank in that the game had been lost. This correlates with answer choice A. The passage then goes on to state that “We had them beat, you know,” Mark hissed to Joe as they walked slowly off the field.” This illustrates both commiseration with Mark, and that he may have been “trudging” off the field in walking slowly with his teammates. The only answer choice not supported by details in the passage is answer choice B. Nowhere in the passage does it state that Joe attacked his opponents following the game.

4. The best answer is G. The first paragraph provides details on the setting that reinforce the intensity of the game so far. “A cold wind soothed the faces” indicates the faces are hurt or uncomfortable. The third sentence describes breathing dirty air. The word “muster” implies considerable effort on the part of the lungs. The phrases “game-ending” and “season-defining” indicate the team is at a crucial moment in the game.

5. The best answer is D. The last sentence of the passage describes how the loss is particularly devastating because of how close Joe’s team came to winning on the final play. The other choices are not supported by the passage.

6. The best answer is G. Details in paragraphs 4 and 5 describe Joe’s careful analysis of the defense made prior to the start of the play. The sentence “Joe glared at his opponents, pleased …” is the best example to support answer choice G. The next sentence provides further evidence.

7. The best answer is D. Mark’s quotation from the last paragraph shows that the other team was more fatigued at the end of the game than was his team. The sentence “‘We should have won the game’…” shows that Mark believed the team was prepared to win but failed.

8. The best answer is H. The last sentence of paragraph 3 describes the hand clasping, which immediately follows Mark’s statement of encouragement to his teammates. These two events come at the end of the huddle before the play. The purpose of the huddle is to establish the play and, hence, the upcoming roles of the individual players. The hand-clasping ritual seems to tie the team back together momentarily before they must break apart to perform their individual tasks during the play.

9. The best answer is A. The passage describes Joe being pleased by the block and “assuming” it had sent his man back “more than enough to free the rusher to enter the endzone.” This best supports answer choice A.

10. The best answer is H. Mark’s quotation in paragraph 3 is an example of the magnitude of the game (and so, the final play) in the context of a season that includes “practicing for four months.” Mark even alludes to the success of the final play reflecting the quality of the team developed over four years.

PASSAGE II

11. The best answer is B. The first paragraph states that the tourist was “looking for a souvenir that represents the local culture.” However, when he stopped to browse at a small street vendor, he was shocked to see a plethora of American items. This best supports answer choice B. The other answer choices are not supported by the context of the passage.

12. The best answer is H. As written in the passage, “American logos appear in quite unexpected places, embodying the ubiquitous American symbols worldwide.” Because American symbols appear in unexpected places worldwide, it makes the most sense that these symbols would be described as “far-reaching.” Answer choice F is incorrect; the price of these symbols is not mentioned anywhere in the passage. Answer choice G does not make sense in the context of the passage. Answer choice J does not make sense because if American symbols were localized, they would be found solely in America.
The best answer is D. It is stated in the passage that those people who reject Americana do so because they “lament the steady decline of distinct national, ethnic, and cultural identities as omnipresent American influences overpower ancient traditions and beliefs.”

The best answer is H. The passage explicitly states that jobs have been created due to the spread of American influence, and that with American commerce comes the modernization of infrastructure. The passage does not state that declines in tourism result from the spread of American influences, but rather that American businesses are quickly spreading to tourist areas abroad.

The best answer is B. When the passage states that “The local cantinas and native boutiques are losing the battle against large American corporations,” it is clear that these places are straining to even stay in business and retain their cultural uniqueness versus the American businesses that are invading the resort towns. The other answer choices are not supported by details in the passage.

The best answer is G. The passage states that Japan is a “prime example of where American involvement has been beneficial,” and that “America left a pervasive cultural footprint on the country” while maintaining “a distinct culture that is rich in the traditions of the past.” This clearly indicates that American influence was beneficial to Japan and that a well-balanced mix of American and Japanese culture ensued. This best supports answer choice G. The other answer choices are beyond the scope of the passage.

The best answer is C. The passage illustrates both a country that has been helped by American influence (Japan) and a country whose native businesses are suffering due to American influence (Mexico). It is unclear what will happen if American cultural influences continue to penetrate foreign markets. Answer choice B may appear to be correct; however, the example of America’s influence on Japan negates this option.

The best answer is J. Paragraph 3 discusses those people who are rejecting “American ‘cultural imperialism,’” and states that these people “lament the steady decline of distinct national, ethnic, and cultural identities as omnipresent American influences overpower ancient traditions and beliefs.” Because these people are rejecting this spread of American influence, it does not make sense that they would embrace or enjoy the loss of other cultures. It also does not make sense that they would deny the steady decline of distinct national cultures, as it is something that is obviously occurring. To “regret” is to express grief over or be unhappy with. The passage illustrates that the people who are rejecting American cultural imperialism are unhappy with its consequences.

The best answer is A. As stated in the passage, “What he sees shocks him: T-shirts and posters promoting American football, basketball, and baseball teams.” This clearly illustrates the fact that the street vendor was selling American sports memorabilia. The other answer choices are not supported by details in the passage.

The best answer is F. The last paragraph of the passage states that “Many benefits and problems are created by American commercial and cultural expansion abroad.” While there are some drawbacks to American expansion, there are still gains. This best supports answer choice F. Answer choice H may appear to be correct; however, the last paragraph does not clarify whether problems from American expansion in the future will be greater than benefits.

PASSAGE III

The best answer is B. The passage asks “how a person is able to paint or draw something so lifelike and emotive,” and marvels at “what stirred these men to put the brush to the canvas so delicately.” “Emotive” means “causing strong feelings,” which is also a synonym for “stirring.” This is the most logical choice based on the context of the passage.

The best answer is H. Realism is noted in the passage as one of the first formal styles of art, preceding Impressionism. The passage later states that among the styles of painting evolving from Impressionism were “Cubism, Abstract Art, Expressionism, Abstract Expressionism, Modernism, and a host of other styles ….” Realism is the only style of art not mentioned in this list.

The best answer is B. As stated in the passage, Realist painters “focused on depicting real life unembellished with fanciful notions or feelings.” This correlates with answer choice B. Answer choice C may appear to be correct because the passage makes note of unattractive physical attributes. However, the passage simply states that artists simply did not “gloss over” unattractive physical attributes of their subjects; artists portrayed their subjects as they actually looked. Unattractive features were not the focus of Realist artists.
24. The best answer is G. The passage clearly states that though Realism fell out of favor for a while, it was “revived during the Renaissance,” and remained popular for several centuries thereafter. This best supports answer choice G. The other answer choices are not supported by details found in the second paragraph.

25. The best answer is B. The passage begins with one of the first popular formal styles of art. The passage then goes on to describe different styles of art that have evolved over time. This best supports answer choice B. Answer choice A is incorrect because the passage does not discuss the changing world and how painters related to it. Answer choice C is incorrect because the passage only mentions the popularity of Realism falling and rising again; the passage does not discuss the popularity of other styles of painting. Answer choice D is incorrect because the passage does not discuss artists adapting to popular demand.

26. The best answer is J. The passage states that while some styles of art that grew out of Impressionism became their own schools of thought, others were simply an “artist’s trademark way of painting.” In this context, speaking of styles of art, it makes the most sense that an “artist’s trademark” would be his or her own “unique style.” Although answer choice F, “prime example,” may appear to be correct, the author is discussing different styles of art, not just one specific piece of art. Answer choices G and H do not make sense in the context of the passage.

27. The best answer is A. As stated in the passage, the Impressionist movement was a “rebellion against Realism,” which came as a result of “the rigidity and staleness some saw in the style.” The rigidity and staleness are referring to the Realist style of painting, not the Impressionist style of painting. Therefore, answer choice A is correct.

28. The best answer is H. The author lists many styles that evolved from Impressionism; these details correlate best with answer choice H. Answer choice F is incorrect because Impressionism greatly expanded the range of artistic expression through the many styles of art that developed as a result of the movement. Answer choice G is incorrect because Realism was a precursor to Impressionism, not vice versa. Likewise, answer choice J is incorrect because Abstract Art and Cubism were predecessors of Impressionism, not vice versa.

29. The best answer is A. The passage states that “Postimpressionism uses form and color to reflect art in a more personal and subjective way than did its predecessor.” This correlates best with answer choice A. The other answer choices are not mentioned in the passage as describing Post-Impressionism in comparison to Impressionism.

30. The best answer is J. As stated in the passage, “a rebellion against Realism arose in response to the rigidity and staleness some saw in the style.” The author goes on to say that many artists began to paint in the Impressionist style because it “allowed for more creativity.” These facts best support answer choice J. Although Realism could trace its roots to ancient Rome—answer choice G—this was not the reason that artists rebelled against Realism.

PASSAGE IV

31. The best answer is C. The primary focus of the passage is on gene linkage; what it is and how it works. The other answer choices are too specific and do not adequately express the overall main idea of the passage.

32. The best answer is G. The passage states that “Each hereditary unit, the gene, contains specific...” This clearly shows us that in this passage, a hereditary unit is referred to as a gene.

33. The best answer is B. The passage lists hair color, height, and susceptibility to disease all as inherited traits. Therefore, answer choice B is correct. The passage tells us that genes are found on segments of the DNA molecule, not that molecules are examples of inherited traits.

34. The best answer is J. The passage describes the fruit fly as a “prolific breeder, producing hundreds of offspring in a single mating.” The word “prolific” means “productive and fertile,” which best correlates with answer choice J. This makes the most sense in the context of the passage; if fruit flies produce so many offspring in a single mating they are clearly highly productive breeders. The other answer choices do not fit the context of the sentence as well.

35. The best answer is C. According to the first paragraph, asexual reproduction involves a single parent.

36. The best answer is F. The last paragraph of the passage indicates that current research is exploring the fact that “many factors affect the transmission of certain traits from parents to offspring.” The passage goes on to state the location of genes is “but one of a multitude of determinants involved in whether or not a characteristic will be inherited.”
These facts suggest that research is ongoing, and that there are still many questions regarding the transmission of genes from one generation to the next. This best correlates with answer choice F.

37. **The best answer is B.** After stating the Morgan chose to experiment on *Drosophila melanogaster*, the passage cites a reason for this choice: “The fruit fly is a prolific breeder, producing hundreds of offspring in a single mating.” This best corresponds with answer choice B. Although answer choice A may appear to be correct because fruit flies have easily distinguishable chromosomes, fruit flies have only four pairs of chromosomes, not “many.”

38. **The best answer is G.** As stated in paragraph 4, Morgan bred “female flies that appeared normal, but carried the mutant genes.” This tells us that the female flies held the mutant genes, yet did not appear to be mutated. This statement is best supported by answer choice G. The other answer choices are not supported by the context of the passage.

39. **The best answer is D.** The last paragraph discusses the “many factors” that affect the transmission of traits, as well as the “multitude of determinants” that determine whether a characteristic will be inherited. These statements indicate that there are many components that affect genetic transmission, which is most consistent with answer choice D. The other answer choices are not supported by the information found in the last paragraph.

40. **The best answer is J.** To answer this question, a parallel must be drawn between the logic used in the passage and the question at hand. As written in the passage “the genes for body color and wing size are transmitted together from parents to offspring because they are located on the same chromosome and must be somehow linked.” Therefore, if the genes for blue eyes and brown hair are found on the same chromosome, these two traits would be inherited together. Because the passage also states that combinations from both parents were present, it can be concluded that a certain number of offspring would inherit both blue eyes and brown hair, but a certain number of offspring would receive the eye and hair color of the other parent. This best correlates with answer choice J.
Science Reasoning Test Explanations

PASSAGE I

1. The best answer is D. Passage 1 defines macronutrients as “those nutrients required in the greatest quantity.” This definition implies that plants need macronutrients more than any other element to grow and survive.

2. The best answer is J. Botanist 2 says, “Organic material can cause a temporary depletion of nitrogen in the soil,” which suggests that when organic fertilizers are used over time, the nitrogen in the soil will be depleted. This information best supports answer choice J, because nitrogen is mentioned as a necessary nutrient.

3. The best answer is B. Botanist 2 states, “characteristics of organic fertilizer require application well in advance of need to ensure that the materials have broken down and can be used by the plant.” The botanist is implying that the materials in organic fertilizer require a long time to be broken down and supply nutrients to the plants. This suggests the correct answer is answer choice B.

4. The best answer is H. The introductory material states, “Two botanists discuss whether inorganic or organic fertilizers are most optimal for plant growth”; this best supports answer choice H. The other answer choices are not supported by the passage.

5. The best answer is D. The best way to answer this question is by the process of elimination. Botanist 1 says, “organic fertilizer provides a naturally slow release of nutrients as the organic material breaks down in the soil, reducing the likelihood of over-fertilization.” Answer choice A is true, and, therefore, incorrect. This botanist also says, “Organic fertilizers also improve soil structure in the long term,” and this proves answer choice B to be incorrect. The statement “Commercial inorganic fertilizers, on the other hand, are often applied to heavily, damaging the roots of the plants,” suggests that, although inorganic fertilizers damage the roots of plants, organic fertilizers do not. Answer choice C can be eliminated. Botanist 1 does not directly discuss the amount of organic fertilizer to use, so answer choice D is best.

6. The best answer is G. Both botanists are discussing the use of organic and inorganic fertilizers as a means to “enrich the soil and make more of these essential nutrients available.” This implies that plants require essential nutrients for optimal growth, some of which can be supplied by fertilizer. Answer choice F is incorrect because plants require nutrients other than nitrogen to survive. Answer choice H is not supported by information in the passage. Answer choice J is incorrect because water is not provided by fertilization.

7. The best answer is D. Both botanists discuss the fact that organic fertilizers, because of their breakdown process, have a slow release of nutrients. This implies that inorganic fertilizers can supply nutrients to the plants at a faster rate. In addition, Botanist 2 states “Inorganic fertilizers . . . offer immediate availability of nutrients . . .,” which best supports answer choice D.

PASSAGE II

8. The best answer is H. Table 3 shows that compared to flowers pollinated by hand, flowers pollinated by bees had a greater number of flowers reproducing after 2 years (15). The other answer choices are not supported by the data.

9. The best answer is A. According to Study 2, “Two pollen containers were placed in each site: one containing 50 mg Species A pollen and one containing 50 mg Species B pollen.” This means that the amount of pollen placed at each site remained consistent in the study. Answer choices B and C are not supported by the data. Answer choice D can be eliminated because this information was not discussed in the study.

10. The best answer is F. The information needed to answer this question is located in Table 1. The best way to answer the question is to read the answer choices and then verify if they are true according to the tables. According to Table 1, the percentage of stamen number covered with pollen is 27% for both flower species A and B, which best supports answer choice F.

11. The best answer is B. According to Study 2, flower species A and B were absent at site 3. This implies that site 3 was used to determine the pollen preference when both species A and B flowers were missing, answer choice B.

12. The best answer is H. According to Study 2, “The containers were left in place for 36 hours and the amount of pollen that was taken from the containers was recorded.” This does not take into consideration other insects that could have removed pollen from the containers. This information best supports answer choice H. While it is true that some species of flowers were not at both sites, this was a necessary variable in the experiment, and is not considered a weakness in the experimental design.
13. The best answer is C. Table 2 shows the results of Study 2. By reading the table, you can see that the amount of pollen removed from the pollen dishes was greater for the flower species that was absent at each site. This implies that an important factor affecting the flower preference of bees is which flower species is available in an area. Answer choices A and D can be eliminated because the information was not discussed in Study 2.

PASSAGE III

14. The best answer is G. According to Figure 1, for Mammal 2, as the atmospheric pressure decreases (going to the right along the x-axis), the respiratory rate increases, which best supports answer choice G.

15. The best answer is C. Mammals 2 and 3 had the same respiratory rate when the two lines representing each mammal crossed on Figure 1. This overlap occurred when the atmospheric pressure was at approximately 0.80 atm, answer choice C.

16. The best answer is G. The note in Passage III says, “Larger animals typically have slower respiratory rates.” Since larger animals need more oxygen, the note implies that larger animals take in more oxygen with each breath compared to smaller animals. This would allow them to take a fewer number of breaths per minute, but still get the oxygen they need to survive. In Figure 1, Mammal 4’s respiratory rate is consistently lower than Mammal 2’s respiratory rate. The only way Mammal 4 could take in significantly more oxygen per minute than Mammal 2 and still have a lower respiratory rate is if Mammal 4 was significantly larger than Mammal 2.

17. The best answer is D. If a higher respiratory rate causes mammals to have a higher metabolic rate, mammals that had a higher respiratory rate at a pressure of 1.0 atm and 0.80 atm would have a higher metabolic rate at these two pressures. According to Figure 1, Mammal 1 has a higher respiratory rate at 1.0 atm than at 0.80 atm, so eliminate answer choices B and C. Because Mammal 4’s respiratory rate is slightly higher at 1.0 atm, answer choice D must be correct.

18. The best answer is J. Mammal 4 is the only mammal, according to Figure 1, that has a low respiratory rate at higher atmospheric pressures. According to the passage, a high respiratory rate (rapid breathing) can be a sign of distress in some animals. This suggests that Mammal 4 is more comfortable (has a low respiratory rate) at higher altitudes, answer choice J.

PASSAGE IV

19. The best answer is B. The question states, “the earth’s atmosphere will become less effective at shielding the surface from radiation of higher frequencies.” If the atmosphere is less effective at shielding higher frequency radiation, surfaces on earth will be exposed to more radiation at higher frequencies. This will cause surfaces to emit more electrons, thus, making the photoelectric effect on metals more evident, which best supports answer choice B.

20. The best answer is H. If the rate of the photoelectric effect is directly proportional to the surface area of the metal exposed, by exposing more metal (using a larger sheet of metal) the photoelectric effect will increase. An increase in the photoelectric effect means the charge on the sheet will increase, answer choice H. Answer choice F can be eliminated because the frequency of radiation is irrelevant to this question. The remaining answer choices are not supported by the data.

21. The best answer is D. Answer choice D is correct because it tests different metals and their sizes with different frequencies of radiation many times. The other answer choices only account for one variable, and, therefore, are not thorough enough. Answer choice A can be eliminated because experiments should always be repeated more than once to obtain accurate results.

22. The best answer is J. If a scientist wanted to measure the effect of the atmosphere on the photoelectric effect, he or she would have to test the photoelectric effect in more than one atmosphere. The only answer choice that tests the photoelectric effect in more than one atmosphere—the earth’s surface and outer space—is answer choice J. Answer choice H can be eliminated because the test does not rely on the atmosphere for results.

23. The best answer is C. Passage IV states: “No electrons are emitted for radiation with energy frequencies below that of the threshold, as the electrons are unable to gain sufficient energy to overcome attractive forces within the metal.” Therefore, the scientist must have assumed that only photons with high enough frequency will emit electrons.
24. **The best answer is G.** According to the results of Experiments 1 and 2, as the frequency of radiation increased, so did the electron emission (which required a high photon energy). This supports the definition of photons as finite packets of energy at various levels because higher frequency radiation caused the emission of electrons.

**PASSAGE V**

25. **The best answer is A.** Each level in the figure represents a generation of rabbits. Level 1 is the first mating, or first generation. Level 2—the second generation—represents the offspring of level 1. Level 3 represents the offspring of level 2.

26. **The best answer is H.** Passage V implies that each offspring will receive one allele from each parent and, “Dominant alleles are expressed whenever present but recessive alleles are expressed only when the dominant allele is absent.” Out of the two parents in level 1, one parent is homozygous for at least one trait, meaning the offspring will only show dominant traits. This information best supports answer choice H.

27. **The best answer is B.** Figure 1 shows the different possible outcomes for the alleles of the offspring of the level 2 rabbits. The offspring will have white hair if they receive the recessive allele, $b$, from both parents. Out of the possible outcomes (16), this occurs 4 times. The correct answer is 25%, answer choice B.

28. **The best answer is J.** By looking at Figure 1, you can determine the ratio for the traits of the offspring of the level 2 parents. Out of the 16 possibilities, short black hair occurs 9 times, long black hair occurs 3 times, short white hair occurs 3 times, and long white hair occurs 1 time. This suggests the ratio would be $9:3:3:1$, answer choice J.

29. **The best answer is C.** If heterozygous rabbits are bred (level 2), it is possible for the recessive traits to be visible in the immediate generation, because it is possible for an offspring to receive two recessive alleles. This is also true for future generations, making answer choice C the best answer.

**PASSAGE VI**

30. **The best answer is G.** According to Figure 1, the only pair of elements in the answer choices with a bond energy greater than 420 kJ/mol is H and O (460 kJ/mol), answer choice G.

31. **The best answer is C.** To answer this question, you must look at Figure 1 to determine which 3 pairs of elements have the highest bond strength. Element pairs H—F (568 kJ/mol), H—O (460 kJ/mol), and H—H (436 kJ/mol) have the highest bond strengths in the table, and are therefore, the most stable bonds, which best supports answer choice C.

32. **The best answer is J.** To answer this question you must determine the sum of the bond energies for each answer choice, as shown below:

F. H$_2$O has two H–O bonds: $(460 \times 2) = 920$ kJ/mol

G. H$_2$S has two H–S bonds: $(366 \times 2) = 732$ kJ/mol

H. NH$_3$ has three H–N bonds: $(393 \times 3) = 1,179$ kJ/mol

J. H$_3$Cl has three H–Cl bonds: $(432 \times 3) = 1,296$ kJ/mol

The substance with the highest sum of bond energies is H$_3$Cl, answer choice J.

33. **The best answer is A.** To answer this question correctly, you must pay attention to the headings in Figure 1. According to Group 17 in Figure 1, the group bond energy decreases as bond length increase. This information best supports answer choice A.

34. **The best answer is J.** To answer this question, you must look at the bond lengths between the given pairs of elements in Figure 1. The bond lengths for H–O, H–S and H–Se are 96 pm, 134 pm, and 146 pm, respectively. Therefore, the order of their bond lengths in increasing order is H–O < H–S < H–Se, or answer choice J.

**PASSAGE VII**

35. **The best answer is C.** Passage VII says, “During years with less rain, fewer bands will be formed, and the bands will be more narrow than the bands formed during years with heavier rainfall.” This suggests that trees in areas with more rainfall will have more bands per year and a larger size of growth bands than trees in areas with less rainfall. Site 3’s trees had an average of 20 growth bands per year that were 12 mm, which is more than Site 2’s trees (15 bands per year at 4 mm).

36. **The best answer is G.** According to the results of the experiment, trees at Site 1 had smaller and fewer growth bands than trees at Site 2. This implies that the Site 1 trees did not grow as fast as Site 2 trees.

37. **The best answer is B.** According to the results of the experiment, as the average size of the growth bands increases (going down the table), the average
number of growth bands per year also increases. This causes the slope of a number versus size graph to be positive, which is indicated in answer choice B. Answer choice C can be eliminated because this graph shows that all sites had the same size of growth bands, which is not supported by the data. Likewise, the other answer choices are incorrect.

38. The best answer is H. The passage implies that trees that receive a heavier rainfall will form larger and more bands. According to the results of the experiment, Site 3 had the largest average number of growth bands per year (20) and the largest average size of growth bands (12 mm). This information supports answer choice H.

39. The best answer is A. Passage VII says that dendrochronology helps to determine the growth rate of trees but, “Because dendrochronology is not completely accurate on its own, it is often combine with a process called cross dating.” This implies that cross dating is applied in order to improve the accuracy of determining the growth rate of trees.

40. The best answer is G. The question states that trees from Site 4 were found to have an average of 13 growth bands per year, in between Site 1’s trees (11 bands) and Site 2’s trees (15 bands). This suggests that the trees from Site 4 will have an average size of growth bands that falls between the trees of Site 1 and 2. The average size of growth bands for trees from Site 1 is 2 mm and the average size of growth bands for trees from Site 2 is 4 mm. Therefore, the trees from Site 4 can be estimated to have an average size of growth bands between 2 and 4 mm.
Writing Test Explanation

Because grading the essay is subjective, we’ve chosen not to include any “graded” essays here. Your best bet is to have someone you trust, such as your personal tutor, read your essays and give you an honest critique. If you plan on grading your own essays, review the grading criteria and be as honest as possible regarding the structure, development, organization, technique, and appropriateness of your writing. Focus on your weak areas and continue to practice in order to improve your writing skills.