1 ■ ■ ■ ■ ■ ■ ■ ■ 1

ENGLISH TEST

45 Minutes—75 Questions

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 <u>back again to home</u>. I guess
                                        1
you could call us nomads, except for the fact that our trips

have become <u>fairly regular</u>, mostly to Las Vegas, Nevada,
                  2

<u>than</u> back to New York, our home for the past 35 years.
 3

My husband and I are retired high school teachers,

which means that we have plenty of time <u>to travel</u>. Three
                                              4
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 <u>enjoyable</u>. And
                                             5
so, we find ourselves back on the road time and time again.

Las Vegas <u>had become</u> our sunshine sanctuary; we have
            6
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

GO ON TO THE NEXT PAGE.

1 ■ ■ ■ ■ ■ ■ ■ **1**

as possible in the warm sunny West. Moreover, we have

         7

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

       8   9

shelter mutts, flying is not an option; we want the dogs

      9

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

                                       10

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. ⑪

   Thus far, we have past the Hoover Dam, climbed the

             12

mountains of Flagstaff, Arizona, crossed the high deserts

of New Mexico and the Texas panhandle, paid our toll's in

                                             13

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

7. A. NO CHANGE
   B. warm, and, sunny
   C. warm, sunny
   D. warm; sunny

8. F. NO CHANGE
   G. Because
   H. In spite of the fact that
   J. Due to the fact of the matter

9. A. NO CHANGE
   B. dogs both of which are shelter mutts,
   C. dogs both, of which, are shelter mutts
   D. dogs both of which are shelter mutts

10. F. NO CHANGE
   G. lay
   H. lies
   J. was lying

11. For the sake of logic and coherence, Sentence 5 should
   be placed:
   A. where it is now.
   B. before Sentence 1.
   C. after Sentence 3.
   D. after Sentence 2.

12. F. NO CHANGE
   G. are passing
   H. will be past
   J. have passed

13. A. NO CHANGE
   B. our tolls
   C. our tolls,
   D. our tolls'

GO ON TO THE NEXT PAGE.

1 ■ ■ ■ ■ ■ ■ ■ 1

a sunless New York sky during our week at home. [14] 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
<u>16</u>
important if the dog owner is a social person or plans to

interact with other dogs and <u>the</u> owners. One problem,
<u>17</u>

however, is that obedience training <u>was</u> a form of one-way
<u>18</u>
communication from the owner to the dog. Many owners fail to consider that the animal actually communicates back.

Carefully watching a <u>dog</u> movements and facial
<u>19</u>
expressions reveals a great deal about what a dog is thinking. A dog's forehead, for example, may wrinkle

16. F. NO CHANGE
G. one's acquiring
H. one who acquires
J. it acquires

17. A. NO CHANGE
B. their
C. there
D. they're

18. F. NO CHANGE
G. can sometimes becoming
H. is
J. sometimes is becoming

19. A. NO CHANGE
B. dogs
C. dogs'
D. dog's

GO ON TO THE NEXT PAGE.

1 ■ ■ ■ ■ ■ ■ ■ ■ **1**

when the dog is <u>confused</u> or waiting for a signal from its
                      20

owner. When the dog wants to play, it might pull <u>the</u> lips
                                                    21
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. 22

    Other forms of body language <u>can also indicate</u> which
                                            23
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. 24 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. <u>Body language and even vocalizations are good</u>
                                        25
<u>indicators of a dog's emotions.</u>
                25
    [1] While most dogs are capable of learning a variety of

human words and physical <u>signals; training</u> a dog becomes
                                    26
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

GO ON TO THE NEXT PAGE.

1 ■ ■ ■ ■ ■ ■ ■ ■ 1

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. ☐27

27. Which of the following sentences in this paragraph is LEAST relevant to the main focus of the essay and therefore should be deleted?
A. Sentence 3
B. Sentence 4
C. Sentence 5
D. Sentence 6

The bottom line, is that there is a great deal more
 ‾‾‾‾‾‾‾
   28

28. **F.** NO CHANGE
G. line is
H. line; is
J. line: is

involved in communicating with a canine than just
      ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
            29
teaching it to come, stay, heel, and fetch. To attain a

29. **A.** NO CHANGE
B. by communication with
C. to communicating with
D. with communication in

strong, two-way relationship, it is best with remembering
                                    ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
                                             30
the importance of non-verbal communication.

30. **F.** NO CHANGE
G. best remembering
H. remembering
J. best to remember

PASSAGE III

Playing with Piñatas

While the history of the piñata is somewhat

murky. Most scholars believe that the piñata originated in
‾‾‾‾‾‾‾‾‾‾
   31
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
                                              ‾‾‾‾‾‾‾‾‾‾
                                                  32
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

GO ON TO THE NEXT PAGE.

1 ■ ■ ■ ■ ■ ■ ■ ■ **1**

than candy or toys as is customary today. Once the seeds
                     _____
                          33
were spilled, they were gathered and burned as a ritualistic

practice. The ashes of the seeds were in keeping until the
                                _____
                                      34
end of the year and were thought to bring good luck to

their owners.

    The Italian, explorer, Marco Polo, is probably
    _____
               35
responsible for bringing the Chinese piñata to Europe. The

piñata quickly became associated with religious

ceremonies and was also used in celebrations. 36 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*
_____
      37

translates to "fragile pot." The clay pots would be hung
                                _____
                                          38
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
                                   _____
                                         39
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
_____
                                              40
unadorned or decorated.
_____
          40

    In the United States, piñatas' are generally made either
                           _____
                               41
of papier-mache or a cardboard-type material. American

piñatas come in almost every shape and design imaginable.

33. **A.** NO CHANGE
    B. like they do today
    C. which is the standard customary way today
    D. OMIT the underlined portion.

34. **F.** NO CHANGE
    G. were kept
    H. by being kept
    J. are keeping

35. **A.** NO CHANGE
    B. The Italian explorer Marco Polo
    C. The Italian explorer, Marco Polo
    D. The Italian explorer, Marco Polo,

36. At this point, the author is considering adding the
    following sentence:

    Europeans celebrate many historic events.

    Would this be a logical and relevant addition to
    the essay?
    F. Yes, because Europeans use piñatas during their
        celebrations.
    G. Yes, because historic events are important.
    H. No, because the essay focuses on piñatas, not on
        historic events.
    J. No, because the essay does not say that Europeans
        use piñatas.

37. **A.** NO CHANGE
    B. breaking easily
    C. that was easy to break
    D. OMIT the underlined portion.

38. **F.** NO CHANGE
    G. clay pots, would be hung
    H. clay pots would have been hanging
    J. clay pots, hanging

39. **A.** NO CHANGE
    B. dispensed
    C. dispensing
    D. dispense

40. **F.** NO CHANGE
    G. With colorful ribbons and paper, these clay pots
        could be unadorned or decorated.
    H. These clay pots could be unadorned or decorated
        with colorful ribbons and paper.
    J. With colorful ribbons these clay pots could be
        unadorned or decorated with paper.

41. **A.** NO CHANGE
    B. piñata's
    C. piñatas
    D. piñata

GO ON TO THE NEXT PAGE.

1 ■ ■ ■ ■ ■ ■ ■ ■ 1

Every holiday has <u>their</u> own host of possible choices and
₄₂

themes. <u>In America, baseball bats</u> are the preferred tool
₄₃
used to break open the piñata. In general, using a baseball

bat should make it simple to break open the piñata, <u>laden</u>
₄₄
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, <u>but the audience most enjoys</u>
₄₅
<u>watching the blindfolded person</u> swing mightily at nothing
₄₅
but thin air. Everyone wins when the broken piñata spills

its contents, and onlookers scramble to collect the fun

surprises.

42.　**F.** NO CHANGE
　　G. its
　　H. they're
　　J. it's

43.　**A.** NO CHANGE
　　B. In America baseball bats
　　C. In America baseball, bats,
　　D. In America, baseball, bats

44. Which of the following alternatives would NOT be appropriate?
　　F. filled
　　G. packed
　　H. loaded
　　J. barren

45.　**A.** NO CHANGE
　　B. but the audience watching the blindfolded person most enjoys
　　C. watching the blindfolded person, but the audience most enjoys
　　D. most enjoyed by the audience is watching the blindfolded person

---

PASSAGE IV

A Gift From the Heart

　Contrary to advertisements seen on <u>television, read,</u>
₄₆

<u>in magazines,</u> or heard on the radio, <u>having spent a lot</u>
₄₆　　　　　　　　　　　　　　　　　　　　₄₇
<u>of money</u> on a gift for a friend or loved one is totally
₄₇

unnecessary. <u>Many people collect</u> photos or mementos
₄₈
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

<u>you're ready</u> to plop down a plastic credit card for a silk
₄₉
scarf or pair of leather gloves for that special someone

46.　**F.** NO CHANGE
　　G. television read in magazines
　　H. television; read in magazines
　　J. television, read in magazines,

47.　**A.** NO CHANGE
　　B. having to spend a lot of money
　　C. to have to spend a lot of money
　　D. spending a lot of money

48.　**F.** NO CHANGE
　　G. Many people, collect
　　H. Many people collecting
　　J. Many people, who collect

49.　**A.** NO CHANGE
　　B. your ready
　　C. you, will be ready
　　D. you, being ready,

GO ON TO THE NEXT PAGE.

1 ■ ■ ■ ■ ■ ■ ■ ■ **1**

whom you care about, consider sorting through that junk

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

drawer filled of trinkets and special photos.

51. **A.** NO CHANGE
     B. filled with
     C. full with
     D. filling with

   [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

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

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

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

a dried flower from the table centerpiece, a napkin,

or anything else that you can gather from

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

the wedding. [55]

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

   When you have many photos and mementos, making a

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

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

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

make your head spin. If some happens to you on your first

58. **F.** NO CHANGE
     G. when it
     H. this
      J. so

scrapbooking venture, consider taking an introductory

GO ON TO THE NEXT PAGE.

1 ■ ■ ■ ■ ■ ■ ■ ■ 1

class, which many stores offer. Of course, you will
have a much better idea of which scrapbook supplies
to buy when the class ends.
₅₉

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. [60]

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
₆₁
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
₆₂
more often during the night than during the day. These
₆₂

statistics takes into account that there are fewer drivers on
₆₃
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.

1 ■ ■ ■ ■ ■ ■ ■ ■ 1

[2]

64 One such design employs headlights that swivel back and forth, allowing the driver to see the road ahead more

clearly by illumination of the sides of the road better than
      _____
          65

traditional headlamps. Automatic high-beam headlights is
                                                      ___
                                                      66
another innovative design that could improve the driver's

reaction time. All cars have been equipped with high-beam

headlight switches for many years, most drivers do not use
         _____
                 67

their high-beams even when they would provide a great
                            ____
                            68
deal more light on the road. Switching back and forth from

high-beam to low-beam lights

proving to be a nuisance to many drivers, especially when
_____
   69
another car is coming straight towards them. Therefore,

some car manufacturers now provide a system whereby a

device detects when the high-beams should be on and

when they should be off, and the change is made

automatically.

[3]

[1] Two other systems that are being developed to
    _____
                            70
potentially increase safety on the road at night, the NIR
_____
                70
(or Near-Infrared) system and the FIR (or Far-Infrared)

system. [2] In the NIR system, an infrared light is emitted

from the front of the vehicle when nearby objects such as

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

GO ON TO THE NEXT PAGE.

1 ■ ■ ■ ■ ■ ■ ■ ■ **1**

animals or people are detected. [3] Images <u>will display</u> on
71
a screen in front of the driver who can then respond

appropriately. [4] The FIR system measures the heat

radiation of nearby objects and flashes the images on the

driver's screen. 72 [5] Even as car makers work diligently

to improve safety on the <u>road particularly during</u> dangerous
73
nighttime driving, no device can replace the vigilance and

skill of the driver. [6] More advanced technologies might

improve <u>safety, but the</u> person in the driver's seat plays the
74
most critical role in reducing night-driving incidents.

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.

2 △ △ △ △ △ △ △ △ 2

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.

Student group	A	B	C	D
Contribution in dollars	25	40	30	15

   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

GO ON TO THE NEXT PAGE.

2 △ △ △ △ △ △ △ △ **2**

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*?
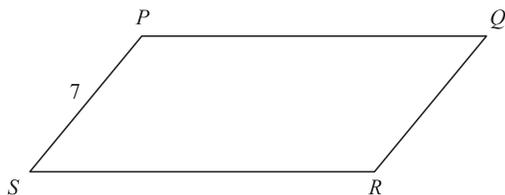
F. 49
G. 21
H. 13
J. 10
K. 5.7

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. $-\dfrac{1}{2}$
C. $\dfrac{1}{2}$
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. $\dfrac{x}{3z^2}$
B. $3xz^2$
C. $\left(\dfrac{1}{3}\right)xz^2$
D. $\dfrac{z^2y}{3x}$
E. $\dfrac{\sqrt{x}}{3z}$

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2 △ △ △ △ △ △ △ △ **2**

10. In the figure below, what is the measure of $\angle\alpha$?
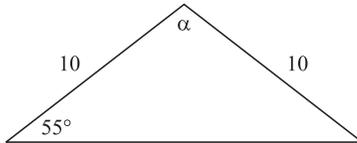
F. 20°
G. 55°
H. 70°
J. 75°
K. 110°

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 $\dfrac{x^8 y^{12}}{x^4 y^3 z^2}$ to its simplest terms.
A. $\dfrac{x^2 y^4}{z^2}$

B. $\dfrac{x^4 y^9}{z^2}$

C. $x^4 y^9 z^2$

D. $x^2 y^{12} z^2$

E. $\dfrac{x^2 y^9}{z^2}$

14. Which of the following is a value of n that satisfies $\log_n 64 = 2$?
F. 4
G. 6
H. 8
J. 12
K. 32

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

2 △ △ △ △ △ △ △ △ **2**

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. $\dfrac{-6}{|-3|} = ?$
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

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

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20. In the circle shown below, C is the center and lies on segments $\overline{AE}$ and $\overline{BF}$. Which of the following statements is NOT true?
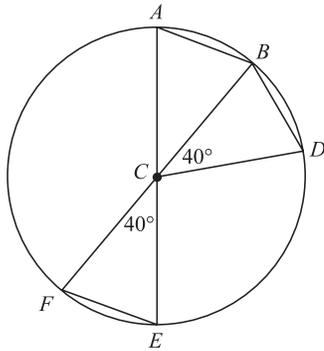
  F. $\angle BAC$ measures $70°$
  G. $\overline{AB}$ is parallel to $\overline{EF}$
  H. $\overline{AB} \cong \overline{BD}$
  J. $\angle BCE \cong \angle DCF$
  K. $\overline{CF} \cong \overline{EF}$

21. What is the slope of the line given by the equation $21x - 3y + 18 = 0$?
  A. -7
  B. -3
  C. $\dfrac{6}{7}$
  D. $\dfrac{7}{6}$
  E. 7

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

$$\frac{1}{a^2 \times b \times c} + \frac{1}{b^2 \times c} + \frac{1}{b \times c^2}$$

  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 $\dfrac{5}{8}$ to get $\dfrac{1}{2}$?
  A. -5
  B. -3
  C. -2
  D. 0
  E. 1

GO ON TO THE NEXT PAGE.

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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 $y - 5 = \dfrac{1}{2}x + 1$ 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.
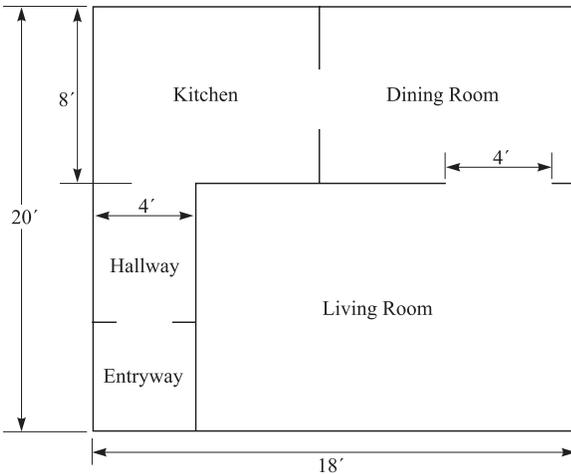
The figure above shows the plan for the ground floor of a townhouse. The thickness of the walls should be ignored when answering the questions. The dimensions shown are in feet, and each region is rectangular.

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

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

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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:
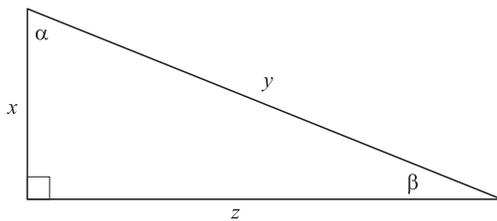
   F. $\dfrac{x}{z}$

   G. $\dfrac{x^2}{z^2}$

   H. $\dfrac{z}{y}$

   J. $\dfrac{z}{y^2}$

   K. $\dfrac{z^2}{x}$

31. For all $x > 0$, $\dfrac{1}{x} + \dfrac{3}{4} = ?$

   A. $\dfrac{3}{4x}$

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

   C. $\dfrac{4 + 3x}{4x}$

   D. $\dfrac{4}{4 + x}$

   E. $\dfrac{4 + 3x}{4 + x}$

2 △ △ △ △ △ △ △ △ **2**

32. If $\cos A = \dfrac{4}{5}$, and $\sin A = \dfrac{3}{5}$, then $\tan A = ?$

  F. $\dfrac{3}{4}$

  G. $\dfrac{3}{5}$

  H. $\dfrac{4}{5}$

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

  K. $\dfrac{12}{5}$

33. In the (x, y) coordinate plane, what is the y-intercept of the line $5x + 3y = 8$?

  A. $\dfrac{8}{3}$

  B. 3

  C. $\dfrac{5}{3}$

  D. $\dfrac{3}{5}$

  E. $-\dfrac{5}{3}$

34. If $\dfrac{a^x}{a^y} = a^4$ 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. $0.2d$
  B. $0.3d$
  C. $0.512d$
  D. $0.64d$
  E. $0.8d$

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

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

2 △ △ △ △ △ △ △ △ **2**

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. $y = \dfrac{1}{2}x - 1$
   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

DO YOUR FIGURING HERE.

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

θ	$\sin \theta$	$\cos \theta$
$\dfrac{\pi}{6}$	$\dfrac{1}{2}$	$\dfrac{\sqrt{3}}{2}$
$\dfrac{\pi}{4}$	$\dfrac{\sqrt{2}}{2}$	$\dfrac{\sqrt{2}}{2}$
$\dfrac{\pi}{3}$	$\dfrac{\sqrt{3}}{2}$	$\dfrac{1}{2}$

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

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

  H. $\dfrac{\sqrt{6} - \sqrt{2}}{4}$

  J. $\dfrac{\sqrt{3} - \sqrt{2}}{2}$

  K. $\dfrac{\sqrt{6} + 2}{4}$

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

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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. $-\dfrac{1}{3}$ only
   D. $\dfrac{1}{3}$ only
   E. 3 only

DO YOUR FIGURING HERE.

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. $-\dfrac{5}{4}$
   C. $\dfrac{5}{4}$
   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

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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?

18 inches

30 inches
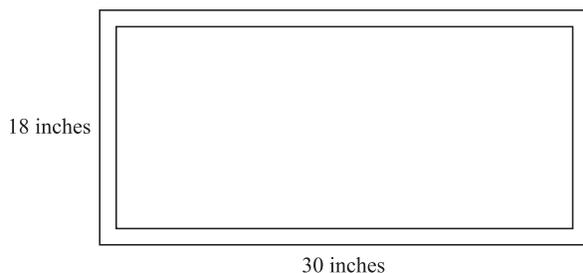
- **A.** 426.25
- **B.** 481.56
- **C.** 510.40
- **D.** 510.75
- **E.** 540.00

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.** $12 + \dfrac{12x}{5}$
- **G.** $12 + \dfrac{x}{5}$
- **H.** $\dfrac{12}{5} + \dfrac{12}{5x}$
- **J.** $\dfrac{12}{5} + \dfrac{x}{5}$
- **K.** $\dfrac{12}{5} + x$

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.** $16\pi m$

DO YOUR FIGURING HERE.

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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. $-\dfrac{3}{2}$

B. $-\dfrac{1}{2}$

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

D. $\dfrac{3}{2}$

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*?
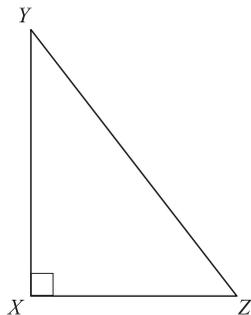
A. $\dfrac{4}{10}$

B. $\dfrac{10}{2\sqrt{21}}$

C. $\dfrac{2\sqrt{21}}{10}$

D. $\dfrac{10}{4}$

E. $\dfrac{4}{2\sqrt{21}}$

DO YOUR FIGURING HERE.

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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.

DO YOUR FIGURING HERE.

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

3 ██ 3

READING TEST

35 Minutes—40 Questions

DIRECTIONS: This test includes four passages, each followed by ten questions. Read the passages and choose the best answer to each question. After you have selected your answer, fill in the corresponding bubble on your answer sheet. You should refer to the passages as often as necessary when answering the questions.

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
5 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
10 and eager to push open gaps for the backs. The under-classman's labored jog back to the huddle mirrored every man's fatigue.

The quarterback confirmed the play and articu-lated it to his team. Joe saw his mouth move but could
15 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
20 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
25 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
30 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.
35 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
40 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

45 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.
50 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
55 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
60 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
65 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
70 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 main-tain 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.

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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.

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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
5 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 infil-
10 trated many nations around the world that Americans generally consider the most exoitc. In these places, the importation of American culture—be it by consumer goods, media, or otherwise—is affecting indigenous peoples and their traditions.
15 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
20 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
25 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,
30 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
35 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
40 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
45 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
50 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
55 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
60 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
65 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

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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.

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PASSAGE III
HUMANITIES: *Artistic Styles Explored*

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
5 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
10 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
15 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
20 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
25 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
30 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
35 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
40 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
45 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
50 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
55 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.

60 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
65 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
70 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.
75 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.

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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 rebeled 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.

3 ████████████████████████████ **3**

PASSAGE IV

NATURAL SCIENCE: *Heredity and Gene-linkage: A Possible Relationship*

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
5 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
10 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.
15 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.
20   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
25 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
30 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
35 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
40 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
45 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
50 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
55 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

60 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 trans-
65 mission 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 passsage 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.

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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.

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SCIENCE REASONING TEST

35 Minutes—40 Questions

DIRECTIONS: This test includes seven passages, each followed by several questions. Read the passage and choose the best answer to each question. After you have selected your answer, fill in the corresponding bubble on your answer sheet. You should refer to the passages as often as necessary when answering the questions. You may NOT use a calculator on this test.

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.

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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.

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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 1			
Flower species	Pollen quantity (mg) per anther	Anther quantity per flower	Stamens covered with pollen (%)
A	4.9	12	27
B	7.6	19	27

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 2			
Site	Flower species absent	Amount of Pollen (mg) removed from dishes containing pollen from:	
		Species A	Species B
1	A	26	13
2	B	12	35
3	A and B	2	4

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 3		
Cross-pollination of Species C flowers	Results from:	
	Hand-pollinated flowers	Bee-pollinated flowers
Flowers that reproduced	31	12
Flowers reproducing after 1 year	10	34
Flowers reproducing after 2 years	8	15
Total flowers produced after 2 years	50	43

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.

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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.

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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.)
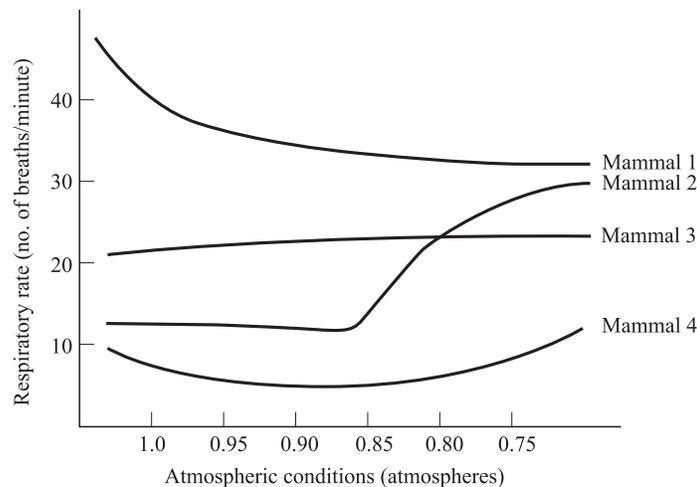
Figure 1

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

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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 1	
Frequency of radiation (Hertz)	Charge on the sheet of copper (volts)
10^{14}	0
10^{15}	+0.001
10^{16}	+0.224
10^{17}	+0.239

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 2	
Frequency of radiation (Hertz)	Voltage of electric current (volts)
10^{14}	0.02
10^{15}	0.15
10^{16}	0.95
10^{17}	1.25

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.

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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.

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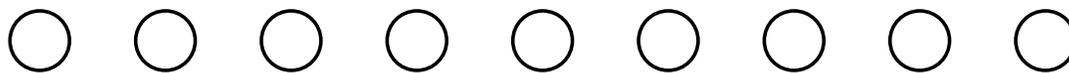
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PASSAGE V

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 charactersitics. 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.

Dominant Traits	Recessive Traits
– Black color (BB)	– White color (bb)
– Short hair (HH)	– Long hair (hh)

Level 1: Long hair (hh) × Short hair (HH)
          Black (BB)   White (bb)
                    ⇩
Level 2: Short hair (Hh)   Short hair (Hh)
          Black (Bb)   Black (Bb)

Level 3:   Hh Bb × Hh Bb

	HB	Hb	hB	hb
HB	HHBB	HHBb	HhBB	HhBb
Hb	HHBb	HHbb	HhBb	Hhbb
hB	HhBB	HhBb	hhBB	hhBb
hb	HhBb	Hhbb	hhBb	hhbb

Length	Color
= short	black
= short	white
= long	black
= long	white

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.

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

Figure 1

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).
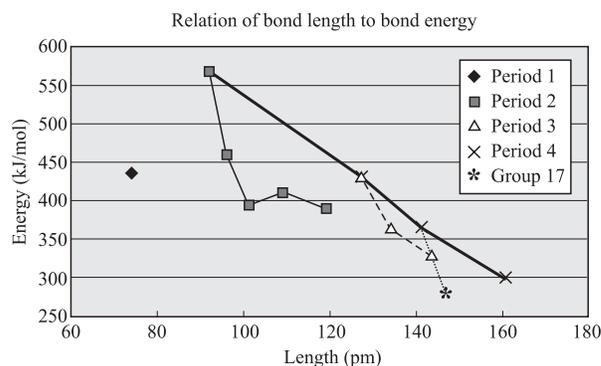

Figure 2

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, H_2O has two H–O bonds)?
  F. H_2O
  G. H_2S
  H. NH_3
  J. H_3Cl

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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

**4** ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ **4**

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 1		
Site	Average number of growth bands per year	Average size of growth bands (mm)
1	11	2
2	15	4
3	20	12

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.

B.

C.

D.

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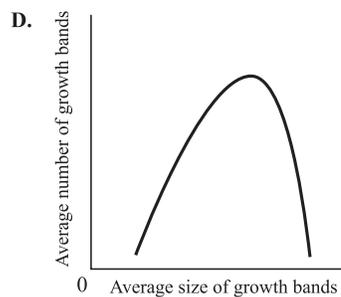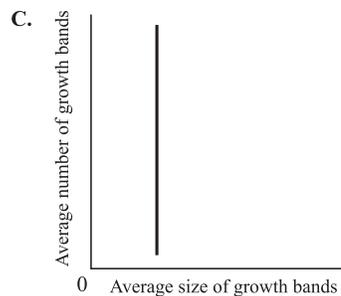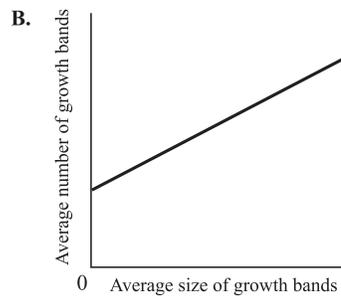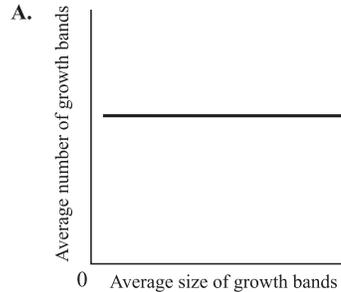
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38. Based on the passage, the average annual rainfall was most likely highest at which site?
   F. Site 1
   G. Site 2
   H. Site 3
   J. It cannot be determined from the information in the passage.

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.

WRITING TEST PROMPT

DIRECTIONS: This test is designed to assess your writing skills. You have 30 minutes to plan and write an essay based on the stimulus provided. Be sure to take a position on the issue and support your position using logical reasoning and relevant examples. Organize your ideas in a focused and logical way, and use the English language to clearly and effectively express your position.

When you have finished writing, refer to the Scoring Rubrics discussed in the Introduction (page 4) to estimate your score.

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.

ANSWER KEY

English Test

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

Mathematics Test

1. A	21. E	41. A
2. H	22. J	42. H
3. D	23. C	43. C
4. F	24. G	44. J
5. C	25. B	45. B
6. H	26. G	46. H
7. D	27. D	47. A
8. J	28. F	48. G
9. A	29. B	49. E
10. H	30. H	50. H
11. C	31. C	51. C
12. K	32. F	52. H
13. B	33. A	53. B
14. H	34. J	54. F
15. B	35. C	55. A
16. H	36. K	56. J
17. B	37. E	57. B
18. G	38. J	58. J
19. A	39. E	59. C
20. K	40. K	60. J

Reading Test		Science Reasoning Test	
1. C	21. B	1. D	21. D
2. J	22. H	2. J	22. J
3. B	23. B	3. B	23. C
4. G	24. G	4. H	24. G
5. D	25. B	5. D	25. A
6. G	26. J	6. G	26. H
7. D	27. A	7. D	27. B
8. H	28. H	8. H	28. J
9. A	29. A	9. A	29. C
10. H	30. J	10. F	30. G
11. B	31. C	11. B	31. C
12. H	32. G	12. H	32. J
13. D	33. B	13. C	33. A
14. H	34. J	14. G	34. J
15. B	35. C	15. C	35. C
16. G	36. F	16. G	36. G
17. C	37. B	17. D	37. B
18. J	38. G	18. J	38. H
19. A	39. D	19. B	39. A
20. F	40. J	20. H	40. G