



ACT Practice Test 1

Assessment Content

Section 1: English (75 Questions, 45 Minutes)

Section 2: Mathematics (60 Questions, 60 Minutes)

Section 3: Reading (40 Questions, 55 Minutes)

Section 4: Scientific Reasoning (40 Questions, 35 Minutes)

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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

Hair-raising Problems

Why is it that we are so completely obsessive¹ with the hair on our heads? Millions of dollars are spent each year on cutting hair, lengthening hair, bleaching hair, straightening hair, curling hair, highlighting hair, and even growing hair; whatever you can do to hair, someone is willing to pay the money² to do it. Natural redheads long for to be³ brunettes and dishwater blondes dream of shiny golden tresses. Both men and women cringe at the sight of each gray hair, so⁴ teenagers enjoy weekly experiments with magenta dyes, spikes, and tangerine streaks.

All of these thoughts cross my mind as I examine the result of⁵ my most recent hair adventure. As a mature

1. A. NO CHANGE
B. obsessed
C. obsessing
D. obsessed
2. F. NO CHANGE
G. pay
H. paying money
J. have paid
3. A. NO CHANGE
B. to have
C. to be
D. becoming for
4. F. NO CHANGE
G. however
H. yet
J. and
5. A. NO CHANGE
B. result for
C. result with
D. result by

GO ON TO THE NEXT PAGE.

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woman watching the gray hairs mixing in rapidly with my

6

natural brunette tones, I decided over a year ago, to

7

seen many of my peers go this route, I figured that

highlighting was for to be the answer to my reluctance to

8

[1] The monthly highlighting went well: excepting for

9

“She’ll get it right the next time.” [3] For the most part,

10

bravely approached Donna, my stylist, two months ago

and proclaimed that I was done with wimpy highlighting

and ready to go blonde. [4] The result was not quite what

I expected, but I resolved to live with it! [11] [5] Donna was

surprised at my suggestion, but quickly began sharing my

unbridled enthusiasm as she gathers the appropriate

12

Three months later, I find myself seesawing between

tears and laughter as I attempt to cover up a patch of

13

has long been fanatical about the appearance of her hair,

this absence of hair has proven to be quite a challenge to

my ego and self-confidence. I’ve always enjoyed styling

my hair, and suddenly, I have nothing to style.

6. F. NO CHANGE
G. rapidly mixing
H. mixed rapidly in
J. rapidly mix in to

7. A. NO CHANGE
B. ago to
C. ago: to
D. ago to,

8. F. NO CHANGE
G. was being
H. could of been
J. was

9. A. NO CHANGE
B. well, except
C. well except
D. well. Except

10. F. NO CHANGE
G. Also
H. Instead
J. In light of this

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 2.
D. before Sentence 4.

12. F. NO CHANGE
G. she was gathering
H. she had been gathering
J. she gathered

13. A. NO CHANGE
B. along with
C. or
D. as well as

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Each time I begin to experience a new pang of disgust and despair over this new hair anomaly, I once again ask myself why we are so obsessed with the hair on our heads. The answer always comes to me in a flash, in a simple two-word phrase: pure vanity. Soon after this realization, I cease my crying. [14]

14. The writer is considering deleting the preceding sentence. If the sentence was deleted, the essay would primarily lose:
- F. a summary of the essay.
 - G. the narrator's ability to put her situation into perspective.
 - H. a stylistic link to the essay's introduction.
 - J. an understanding of the author's purpose in writing the essay.

Question 15 asks about the preceding passage as a whole.

15. Suppose the writer had chosen to write a how-to article for people wanting to change their hair color. Would this essay fulfill the writer's goal?
- A. Yes, because the author's approach to changing her own hair color would ease the anxiety of others wishing to do the same.
 - B. Yes, because this essay emphasizes the universality of people changing their hairstyles and hair color.
 - C. No, because this article only deals with the narrator's own experimentation with her hair and does not provide steps for others to do the same.
 - D. No, because the essay discourages people from changing their hair color.

PASSAGE II

A Modern Blacksmith

You will probably never find his name in a history book, but to this day, Walker Lee continues to contribute to

America heritage. Walker Lee is an old-fashioned, modern-

16

day blacksmith who still practices the fine art of

manipulating metal over a hot fire. In his words,

"Blacksmithing is no dying art!"

16. F. NO CHANGE
G. American heritage.
H. Americas heritage.
J. American's heritage.

17. A. NO CHANGE
B. who still continues to practice
C. who continues to still practice
D. who practices still

GO ON TO THE NEXT PAGE.

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Walker Lee had begin his career in hand-forged
ironwork at the age of 30. The idea of creating an object

out of iron, a most intractable material, appealed to him.
He started on this new venture by collecting and reading
every book he could find that described the process of
blacksmithing: its history, its practical and decorative uses,
and the equipment needed to establish and outfit his own
smithy. During the course of his research, Lee discovered a
tool necessary for the success of any blacksmith: the anvil,
a heavy block of iron or steel upon which the blacksmith
hammered and shaped the malleable metal.

Lee bought his first anvil from 84-year-old Hurley
Alford Templeton of Philadelphia, lugging it home to
Michigan in the back of a 4-H county bus. This anvil
weighed 100 pounds, about the minimum size Walker Lee
needed to get started in his craft.

Lee's first anvil cost him \$100, and four months later,
he paid \$75 for an additional implement—a vice—from
Cornell University in New York. This important tool also
made its way back to Michigan in the back of Lee's 4-H bus.

Lee had spent the summer carting 4-H groups out
from Michigan to the east coast for

18. F. NO CHANGE
G. had begun
H. begun
J. began

19. Which of the following alternatives to the underlined portion would NOT be acceptable?
A. one of the most intractable metals, iron,
B. a most intractable material, that being iron
C. iron (a most intractable material)
D. a most intractable material, iron,

20. Which choice most emphasizes the difficulty in moving the large anvil?
F. NO CHANGE
G. taking
H. driving
J. transporting

21. At this point, the writer wants to express how Lee first began the craft of blacksmithing. Which choice would most effectively accomplish this task?
A. NO CHANGE
B. continue
C. keep going
D. move on

22. F. NO CHANGE
G. it's
H. its'
J. the

23. A. NO CHANGE
B. Carting 4-H groups out from Michigan to the east coast for various county fairs and expositions, Lee had spent the summer.
C. Lee had spent the summer, for various county fairs and expositions, carting 4-H groups out from Michigan to the east coast.
D. OMIT the underlined portion.

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various county fairs and expositions.

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Once Lee obtained his first portable forge, he was ready to build his blacksmith shop, commonly referred to as a “smithy.” In the interest of economy, he constructed this shop out of inexpensive oak planks and tarpaper. It

was a crude little shack but stood for only nine years. Lee, who by then was completely hooked on blacksmithing, replaced his first shop with a finer one made of more expensive wood; this shop also had glass windows, a definite improvement over Lee’s original “smithy.”

[1] The very first object Lee forged was a long, pointed Hudson Bay dagger.
 [2] Many people refer to this type of knife as a “dag.”
 [3] As he recalls that event he says, “From the minute I first saw the thing take shape, I was hooked . . . still am. There’s an element of magic in it to me. You heat it up and pound it with a hammer and it goes where you want it to go.” [4] Years later at a family event Lee, discovered that his Italian ancestors were accomplished coppersmiths.
 [5] During the gathering, Lee’s great uncle Johnny was proclaiming that Lee’s propensity for blacksmithing was “in the blood” as he happily presented Lee with a new 125-pound anvil. [29]

24. Given that all of the choices are true, which one would most effectively introduce the subject of this paragraph?

- F. NO CHANGE
- G. Obtaining a portable forge for the shop proved to be Lee’s biggest challenge.
- H. Blacksmith shops can be difficult to construct, but the most challenging task is moving the necessary equipment into it.
- J. A blacksmith’s forge requires some type of blower in order to keep the fire hot enough to bend the steel.

25. A. NO CHANGE

- B. that stood for
- C. which standing for
- D. and stands for

26. F. NO CHANGE

- G. long pointed,
- H. long, and pointed
- J. long-pointed

27. A. NO CHANGE

- B. later at a family, event Lee
- C. later, at a family event, Lee,
- D. later, at a family event, Lee

28. F. NO CHANGE

- G. proclaimed
- H. had been proclaiming
- J. having proclaimed

29. Which of the following sentences in this paragraph is LEAST relevant to the main focus of the essay and, therefore, could be deleted?

- A. Sentence 2
- B. Sentence 3
- C. Sentence 4
- D. Sentence 5

GO ON TO THE NEXT PAGE.

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As an outside observer watches Walker Lee ³⁰ bending and shaping a hot metal rod into some recognizable form, it is difficult to discern the origin of the magic Lee spoke of; is it in the glowing, orange steel or in Walker himself?

30. F. NO CHANGE
G. was watching
H. had been watching
J. watched

PASSAGE III

Scorpion Scare

As my sister begins by telling me about the ³¹ scorpion in her bed that stung her as she slumbered, I could feel my eyes popping out of my head ³² and my jaw dropping to the floor. She seemed so calm telling me this story, and all I could think about was ³³ how that she's lucky to be alive. Diana's terrifying story ³⁴ continued, detailing how her husband threw back the bed covers, began beating the dreaded thing with a broom, and then quickly flushed it down the toilet. Only later did they ³⁵ learn that the corpse should have been kept for identification purposes. Some Arizonan scorpions are deadlier than others, and it is important to know which ³⁶ species is responsible for a given attack.

My sister characteristically chose not to seek medical treatment as her upper arm first swelled, then ached with pain, and finally became numb and useless. ³⁷ As her condition worsened, she searched the Internet for general information, discovering time and again that species identification is important in administering proper care to the sting victim.

31. A. NO CHANGE
B. begun
C. had begun
D. began
32. F. NO CHANGE
G. slumbered I could
H. slumbered I could,
J. slumbered, I could,
33. A. NO CHANGE
B. could have thought
C. think
D. had thought
34. F. NO CHANGE
G. because she is
H. how she is
J. she is
35. A. NO CHANGE
B. flush
C. flushing
D. flushes
36. F. NO CHANGE
G. are more deadlier than others
H. being more deadly than others
J. more deadly than others
37. Assuming that all of the choices are true, which one best links the preceding sentence with the rest of the paragraph?
A. You could say that Diana is afraid of hospitals, doctors, and nurses.
B. Most scorpion bites should be examined by a medical professional.
C. My sister's physician had treated many scorpion bites.
D. Symptoms of a scorpion sting can vary from one person to another.

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Scorpions will sting anyone they accidentally encounter as they crawl inadvertently into human habitats. Most problems occur at construction sites where the

scorpions natural homes have been upset and uprooted by

bulldozers and dump trucks. Of the ninety scorpion species native to the United States, 30 percent live in

Arizona. Unfortunately, one of those species is the

Bark Scorpion, just about the only species whose venom is considered truly dangerous and often fatal to humans.

My sister and her husband just moved into a new home a year ago, and dozens of homes are still being built all around them. This, indeed, is a perfect explanation for the presence of a scorpion in their bedclothes. Scorpions hide during the day and search for food and water at night. Arizonans will tell you that it's a good idea to refrain from going barefoot in the dark, both outside and inside.

Checking your shoes and clothes before putting them on wouldn't hurt, either, particularly if you know you're in an area where scorpions have been found. Wherever there is one scorpion, there are probably dozens more that can be easily detected with a black light at night when they're on the move.

[1] If a scorpion happens to sting you, please don't follow my sister's example. [2] All medical facilities in Arizona have antivenin on hand. [3] Seek medical

38. F. NO CHANGE
G. inadvertently crawl
H. are crawling inadvertently
J. crawl

39. A. NO CHANGE
B. scorpion's naturally
C. scorpion natural
D. scorpions' natural

40. F. NO CHANGE
G. In Arizona, about 30 percent of the ninety scorpion species native to the United States live.
H. Arizona has about 30 percent of the ninety scorpion species, living in the United States.
J. Of the ninety species of scorpions, 30 percent native to the United States live in Arizona.

41. A. NO CHANGE
B. Bark Scorpion which is just about the only species
C. only one that is the Bark Scorpion species,
D. Bark Scorpion, yet just about the only species

42. If the author were to delete the phrase "both outside and inside," the essay would primarily lose a detail that:
F. adds essential information to the discussion of Arizona.
G. is not particularly necessary to the impact of the essay.
H. supports the reference to the scorpions' behavior.
J. adds an element of humor to the essay's theme.

43. A. NO CHANGE
B. happened to sting
C. happen to sting
D. stung

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treatment immediately, especially if you've flushed the critter down the toilet and have no way of knowing the exact nature of the perpetrator! [4] This way, you will certainly save yourself from some amount of pain and discomfort, and you might even save your life. [44]

44. For the sake of coherence, Sentence 2 should be placed:
- F. Where it is now.
 - G. Before sentence 1.
 - H. After sentence 3.
 - J. Omit it; it is not relevant to the paragraph.

Question 45 asks about the preceding passage as a whole.

45. Suppose the writer had intended to write a medical column that would offer professional advice on the treatment of scorpion stings. Would this essay successfully fulfill this goal?
- A. Yes, because this essay describes the steps that need to be taken if a person is stung by a scorpion.
 - B. Yes, because it is clear in the essay that the writer possesses professional knowledge on the topic of scorpion stings.
 - C. No, because the writer is describing only one personal incident about a scorpion sting and is offering personal, not professional, advice.
 - D. No, because there are too many species of scorpions to allow a short essay to provide professional advice on the treatment of scorpion stings.

PASSAGE IV

Unfulfilled Promises

If you have ever entered a contest of any sort—you are well aware of the legal requirements, exclusions, and

disclaimers that always accompany the contest's entry form. Many laws today regulate a contest sponsor's responsibilities to the entrants, and courts are filled with lawsuits asserting with non-compliance on both sides. However, this was not always the case.

In 1896, a contest motivated a Norwegian immigrant, Helga Estby, to travel nearly 3,500 miles on foot from the state of Washington to New York City. Unfortunately, as is still sometimes true, Helga won the competition

46. F. NO CHANGE
G. sort; you
H. sort you
J. sort, you
47. A. NO CHANGE
B. always are accompanying
C. accompany always
D. are accompanying
48. F. NO CHANGE
G. lawsuits asserting non-compliance
H. lawsuits of non-compliance asserting
J. non-compliance lawsuits asserting
49. A. NO CHANGE
B. on foot, 3,500 miles
C. 3,500 miles on feet
D. 3,500 miles per foot

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only to find that the promise \$10,000 award was mysteriously absent.

50

[1] Helga had been living on her farm with her husband and nine children in Spokane, Washington, when she read of a \$10,000 prize being offered to a woman who was willing to walk across the country. [2] Because the Estby farm was facing foreclosure, Helga decided that walking across the country in a bicycle skirt for that kind of money was a small price to pay for a greater rewarding. [3] At the

52

time, this style of skirt was considered to be inappropriate because it revealed the female ankle. [4] The only requirement, from all accounts, was that she wear a modern, newfangled bicycle skirt as she traveled. [53]

So, in May of 1896, Helga and her 18-year-old daughter, Clara, had set off on their long journey.

54

Helga carried a revolver and a spray gun containing red pepper for protection. Presumably, Helga and Clara found food and shelter along the way, and they arrived in New York City in December, seven months after their departure. The contest sponsors, however, were to be found nowhere.

56

This story of bravery and persistence had therefore been kept a secret for nearly a century, primarily because Helga's seven-month absence from the farm wreaked havoc on her family. Two of her children died of diphtheria while she was gone. Even worse, her husband had sequestered the surviving children in an

50. F. NO CHANGE
G. promise for the
H. promised
J. promising

51. A. NO CHANGE
B. been living
C. has been living
D. had lived

52. F. NO CHANGE
G. greatly rewarding
H. great reward
J. greatest reward

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

54. F. NO CHANGE
G. have set off
H. set off
J. went to set off

55. A. NO CHANGE
B. For protection, Helga carried a revolver as well as a red pepper-containing spray gun.
C. Helga, for protection, she carried a revolver and a spray gun containing red pepper.
D. Carried by Helga for protection were a revolver and a spray gun containing red pepper.

56. F. NO CHANGE
G. were nowhere when found
H. to be found nowhere
J. were nowhere to be found

57. A. NO CHANGE
B. had been kept a secret
C. had been actually kept a secret
D. had in fact been kept a secret

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unheated shed, thinking that this was the only way to keep them from being infected with the disease. Since the contest sponsor failed to award Helga the money, the Estbys ended up losing the farm; her expedition had been a disaster.

At the time, Helga's trip was considered an embarrassment by the Norwegian-American community and was kept utterly quiet. After Helga's death, her own children burned the hundreds of pages Helga had written through the years, leaving only a small scrapbook of newspaper clippings and very few details of Helga's life or her ill-fated trip. Looking back 100 years, one can only marvel at the boldness and bravery that must have energized Helga Estby to make that journey on foot across the country in an effort to save her family farm. ⁵⁸ ⁵⁹ ⁶⁰

58. F. NO CHANGE
 G. years leaving only
 H. years; leaving only
 J. years leaving only,

59. Given that all of the choices are true, which one would best conclude the sentence while providing the reader with the most specific explanation for Helga's motivation to walk across the country?
 A. NO CHANGE
 B. to win \$10,000.
 C. in an effort to save her children from diphtheria.
 D. to help her daughter Clara gain experience.

Question 60 asks about the preceding passage as a whole.

60. At this point, the writer is considering adding the following sentence:
- In 1984, Helga's great-great-grandson wrote a story about his ancestor for a history assignment.
- Should the writer make this addition here?
- F. Yes, because it links the ending of the essay to its introduction.
 G. Yes, because this information is highly relevant to the rest of the essay.
 H. No, because this story might not focus on Helga's farm.
 J. No, because this information introduces a new subtopic of the essay.

GO ON TO THE NEXT PAGE.

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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.

Jet Lag

[1]

Traveling across time zones particularly via airplane, can be very disconcerting to the human body, both physically and mentally. When you “gain” or “lose” time going from Point A to Point B, a condition (*desynchronosis*) likely affects you in some form. Jet lag is medically considered a sleeping disorder, although it is normally a temporary

condition and not as serious as other sleeping dysfunctions.

[2]

[64] The term “circadian” originates from the Latin *circa*, meaning “about,” and *diem* or “day.” Circadian rhythms refer to a variety of daily bodily functions such as temperature changes, sleep patterns, and digestive functions. Normally, the body operates on a 24-hour time period that coincides with the earth’s 24-hour cycle of night and day. The human body generally falls into a routine of sleeping and waking; that is, regular changes in body temperature, breathing, and digestion

take place. In addition, most

who’s inner clocks cause more sleepiness from 3:00 p.m. to 5:00 p.m. and again from 3:00 a.m. to 5:00 a.m. Body temperature usually rises as the day goes on, quickly drops around midnight, and then begins

61. A. NO CHANGE
B. zones; particularly
C. zones, particularly,
D. zones, particularly
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. a condition called *desynchronosis*, commonly known as jet lag,
H. a condition known as *desynchronosis*
J. a condition of jet lag
63. A. NO CHANGE
B. not serious
C. serious as not
D. as serious 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. Many scientific words have Latin origins.
G. Sleeping disorders can produce a great deal of stress and anxiety.
H. Most travelers are unaware of the exact moment that they leave one time zone and enter another.
J. Traveling across time zones over a short period of time disturbs the body’s circadian rhythms.
65. A. NO CHANGE
B. waking regular
C. waking, during which regular
D. waking. Regular
66. F. NO CHANGE
G. Likewise
H. Instead
J. For example
67. A. NO CHANGE
B. of our inner clocks
C. whose inner clocks
D. of us inner clock’s

GO ON TO THE NEXT PAGE.

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the cycle of rising again just before 6:00 a.m. Since these⁶⁸ changes occur on a twenty-four-hour cycle, so abrupt time zone changes can understandably upset the body's

highly well-tuned in⁶⁹ system of regulation.

[3]

Some symptoms of jet lag include excessive daytime sleepiness or some level of insomnia at night, changes in appetite and/or digestion, moodiness, and difficulty concentrating. Often, after traveling on a plane for⁷⁰ long periods,⁷⁰ people will also experience headaches, dry sinuses, earaches, and bloating. However, these symptoms

are more likely being attributable⁷¹ to the conditions of the

airplane cabin, which has a very dry pressurized,⁷² atmosphere, and are not symptomatic of jet lag.

[4]

[1] There are steps that can be taken to alleviate the effects of jet lag, primarily as preventive measures.

[2] First, it might be helpful to slightly alter your sleeping schedule for several days before your trip. [3] If you are⁷³ going east, for example,⁷³ go to bed one hour earlier and rise the next day an hour earlier so that you will be somewhat more acclimated to the new time zone. [4] Regulating your exposure to light can also be helpful, since light and darkness serve as triggers to the brain. [5] Before traveling west, expose yourself to evening light and avoid early morning light for several days as a way of simulating the new time zone you're headed toward. [6] Some say it takes about one day for every hour of time zone change to completely adjust to the new time zone. [7] Unfortunately

68. F. NO CHANGE
G. However, these
H. Because these
J. These

69. A. NO CHANGE
B. well-tuned
C. highly tuned well
D. high

70. F. NO CHANGE
G. Often, after doing a lot of traveling on a plane for long periods
H. After traveling for long periods on a plane sometimes
J. Traveling for long periods on a plane

71. A. NO CHANGE
B. are more likely to be attributable
C. are attributable, more likely,
D. are more likely attributable

72. F. NO CHANGE
G. dry, pressurized
H. dry, pressurized,
J. dry pressurized

73. Which of the following alternatives to the underlined portion would NOT be acceptable?
A. trip. When traveling east, for example,
B. trip; if you are going east for example,
C. trip. For example, if you are going east,
D. trip, if you are going east for example,

GO ON TO THE NEXT PAGE.

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for many, that formula often coincides precisely with the return trip. [8] Avoiding caffeine and alcohol may also aid your body in adjusting to its new environment. [74]

74. For the sake of the logic and coherence of this paragraph, Sentence 8 should be placed:
- F. where it is now.
 - G. after Sentence 4.
 - H. before Sentence 6.
 - J. before Sentence 7.

Question 75 asks about the preceding passage as a whole.

75. The writer wishes to add the following sentence in order to show that jet lag can sometimes be a more serious problem:
- There are those, however, who routinely fly across continents either for pleasure or business, and jet lag can become a more serious issue for these people.
- The new sentence would best support and be placed at the end of Paragraph:
- A. 1
 - B. 2
 - C. 3
 - D. 4

END OF THE ENGLISH TEST.

STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.

**MATHEMATICS TEST***60 Minutes—60 Questions*

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

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

1. Shannon walked $1\frac{2}{3}$ miles on Wednesday and $2\frac{3}{5}$ miles on Thursday. What was the total distance, in miles, Shannon walked during those 2 days?

A. $3\frac{5}{8}$

B. $3\frac{2}{5}$

C. $4\frac{4}{15}$

D. $4\frac{1}{3}$

E. $5\frac{1}{3}$

2. $4x^3 \times 3xy^2 \times 2xy^2$ is equivalent to:

F. $9x^3y^4$

G. $9x^5y^4$

H. $24x^3y^4$

J. $24x^5y^4$

K. $24x^5y^6$

3. Mr. Wilk is a high school math teacher whose salary is \$33,660 for this school year, which has 180 days. In Mr. Wilk's school district, substitute teachers are paid \$85 per day. If Mr. Wilk takes a day off without pay and a substitute teacher is paid to teach his classes, how much less does the school district pay in salary by paying a substitute teacher instead of Mr. Wilk for that day?

A. \$57

B. \$85

C. \$102

D. \$114

E. \$187

4. A student has earned the following scores on four 100-point tests this marking period: 63, 72, 88, and 91. What score must the student earn on the fifth and final 100-point test of the marking period to earn an average test grade of 80 for the five tests?

F. 79

G. 86

H. 89

J. 94

K. The student cannot earn an average of 80.

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.



5. The oxygen saturation of a lake is found by dividing the amount of dissolved oxygen the lake water currently has per liter by the dissolved oxygen capacity per liter of the water, and then converting that number into a percent. If the lake currently has 6.4 milligrams of dissolved oxygen per liter of water and the dissolved oxygen capacity is 9.5 milligrams per liter, what is the oxygen saturation level of the lake, to the nearest percent?

A. 64%
B. 67%
C. 70%
D. 89%
E. 95%

6. A rectangular lot that measures 125 feet by 185 feet is completely fenced. What is the length, in feet, of the fence?

F. 310
G. 435
H. 620
J. 740
K. 1,240

7. The expression $a[(b - c) + d]$ is equivalent to:

A. $ab + ac + ad$
B. $ab - ac + d$
C. $ab - ac + ad$
D. $ab - c + d$
E. $a - c + d$

8. If $6x - 3 = -5x + 7$, then $x = ?$

F. $\frac{4}{11}$
G. $\frac{10}{11}$
H. $\frac{11}{10}$
J. $\frac{1}{2}$
K. 10

9. What two numbers should be placed in the blanks below so that the difference between the consecutive numbers is the same?

13, __, __, 34

A. 19, 28
B. 20, 27
C. 21, 26
D. 23, 24
E. 24, 29

10. If x is a real number such that $x^3 = 729$, then $x^2 + \sqrt{x} = ?$

F. 9
G. 27
H. 30
J. 84
K. 90

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

2



2

11. The formula for the volume, V , of a sphere with radius r is $V = \left(\frac{4}{3}\right)\pi r^3$. If the radius of a baseball is $1\frac{1}{3}$ inches, what is the volume to the nearest cubic inch?

A. 6
 B. 8
 C. 10
 D. 14
 E. 15

12. If a gumball is randomly chosen from a bag that contains exactly 6 yellow gumballs, 5 green gumballs, and 4 red gumballs, what is the probability that the gumball chosen is NOT green?

F. $\frac{2}{3}$
 G. $\frac{1}{3}$
 H. $\frac{2}{5}$
 J. $\frac{3}{5}$
 K. $\frac{4}{15}$

13. The number of students participating in fall sports at a certain high school can be shown with the following matrix:

| Tennis | Soccer | Cross-Country | Football |
|--------|--------|---------------|----------|
| 25 | 30 | 50 | 80 |

The athletic director estimates the ratio of the number of sports awards that will be earned to the number of students participating with the following matrix:

| | |
|---------------|-----|
| Tennis | 0.2 |
| Soccer | 0.5 |
| Cross-Country | 0.3 |
| Football | 0.4 |

Given these matrices, what is the athletic director's estimate for the number of sports awards that will be earned for these fall sports?

A. 55
 B. 60
 C. 65
 D. 67
 E. 74

DO YOUR FIGURING HERE.

2 \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle **2**

Use the following information to answer questions 14–15.

DO YOUR FIGURING HERE.

The following chart shows the current enrollment in all social studies classes—Geography, US History, World Cultures, and Government—at Iron Mountain High School.

| Course title | Section | Period | Enrollment |
|----------------|---------|--------|------------|
| Geography | A | 1 | 23 |
| | B | 2 | 24 |
| US History | A | 2 | 25 |
| | B | 3 | 29 |
| | C | 4 | 24 |
| World Cultures | A | 3 | 27 |
| Government | A | 4 | 26 |
| | B | 6 | 27 |

14. What is the average number of students enrolled per section in US History?
- F.** 25
G. 26
H. 27
J. 29
K. 34
15. The school wants to have all of the students enrolled in social studies classes read the same book at the same time so that the author of the book can speak to the students at an assembly. The school originally purchased two classroom sets of 30 books each, but now one set is missing 3 books and the other is missing 5. For which of the following class periods, if any, are there NOT enough books available for each student to have one book?
- A.** Period 2 only
B. Period 3 only
C. Period 4 only
D. Period 3 and 4 only
E. There are enough books for each class period
-

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2

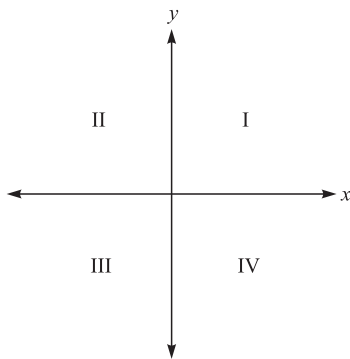


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16. What expression must the center cell of the table below contain so that the sums of each row and each column are equivalent?

| | | |
|-------|-------|-------|
| $-4x$ | $9x$ | $2x$ |
| $7x$ | | $-3x$ |
| $4x$ | $-5x$ | $8x$ |

- F. $5x$
 G. $3x$
 H. 0
 J. $-x$
 K. $-4x$
17. Point A is to be graphed in a quadrant, not on an axis, of the standard (x, y) coordinate plane below. If the x -coordinate and the y -coordinate of point A are to have the same signs, then point A *must* be located in:



- A. Quadrant I only
 B. Quadrant II only
 C. Quadrant III only
 D. Quadrant I or II only
 E. Quadrant I or III only
18. Reggie knows how to make 5 different entrees, 4 different side dishes, and 6 different desserts. How many distinct complete meals, each consisting of an entrée, a side dish, and a dessert, can Reggie make?
 F. 16
 G. 26
 H. 72
 J. 120
 K. 144
19. At a bottling plant, 10,000 liters of carbonated water are needed to produce 3,000 bottles of soda. How many liters of carbonated water are needed to produce 750 bottles of soda?
 A. 225
 B. 1,500
 C. 2,500
 D. 4,000
 E. 5,000

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

2



2

20. If a rectangle measures 20 meters by 48 meters, what is the length, in meters, of the diagonal of the rectangle?
- F. 52
G. 68
H. 72
J. 112
K. 2,704

DO YOUR FIGURING HERE.

21. For all positive integers a , b , and c , which of the following expressions is equivalent to $\frac{a}{c}$?

A. $\frac{a \times b}{c \times b}$

B. $\frac{a \times a}{c \times c}$

C. $\frac{a \times c}{c \times a}$

D. $\frac{a - b}{c - b}$

E. $\frac{a + b}{c + b}$

22. What is the slope-intercept form of $6x - 2y - 4 = 0$?

F. $y = 6x - 2$

G. $y = 3x + 2$

H. $y = 3x - 2$

J. $y = -3x + 2$

K. $y = -6x - 4$

23. Which of the following is a solution to the equation $x^2 + 25x = 0$?

A. 50

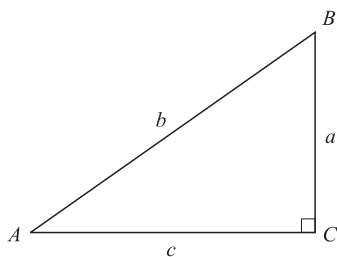
B. 25

C. 5

D. -5

E. -25

24. For the right triangle $\triangle ABC$ shown below, what is $\tan B$?



F. $\frac{a}{b}$

G. $\frac{a}{c}$

H. $\frac{b}{a}$

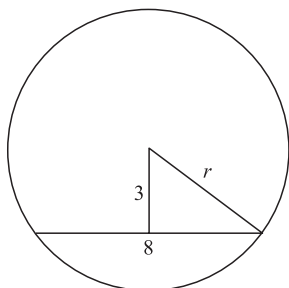
J. $\frac{c}{a}$

K. $\frac{c}{b}$

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2**2**

25. A chord 8 inches long is 3 inches from the center of a circle, as shown below. What is the radius of the circle, to the nearest tenth of an inch?



- A. 4.0
B. 4.3
C. 5.0
D. 6.9
E. 8.5
26. The length L , in meters, of a spring is given by the equation $L = \left(\frac{2}{3}\right)F + 0.05$, where F is the applied force in newtons. Approximately what force, in newtons, must be applied for the spring's length to be 0.23 meters?
F. 0.12
G. 0.18
H. 0.20
J. 0.24
K. 0.27
27. After a snowstorm, city workers removed an estimated 12,000 cubic meters of snow from the downtown area. If this snow were spread in an even layer over an empty lot with dimensions 62 meters by 85 meters, about how many meters deep would the layer of snow be?
A. Less than 1
B. Between 1 and 2
C. Between 2 and 3
D. Between 3 and 4
E. More than 4

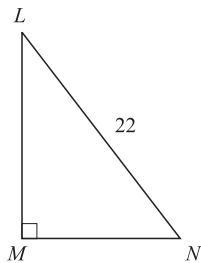
DO YOUR FIGURING HERE.

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28. The hypotenuse of the right triangle LMN shown below is 22 feet long. The cosine of angle L is $\frac{3}{4}$. How many feet long is the segment LM ?

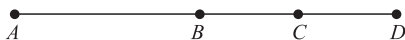


DO YOUR FIGURING HERE.

- F. 18.4
 - G. 16.5
 - H. 11.0
 - J. 6.7
 - K. 4.7
29. The table below shows the number of pounds of apples grown last year in 4 cities. (Each whole apple on the graph represents 1,000 pounds of apples.) According to the graph, what fraction of the apples grown in all 4 cities were grown in Appleton?

| City | Apples grown |
|--------------|--------------|
| Golden Hills | |
| Red Falls | |
| Appleton | |
| Shady Acres | |

- A. $\frac{5}{24}$
 - B. $\frac{1}{4}$
 - C. $\frac{1}{6}$
 - D. $\frac{5}{19}$
 - E. $\frac{3}{16}$
30. Points B and C lie on segment AD as shown below. The length of segment AD is 25 units; the segment AC is 19 units long; and the segment BD is 14 units long. How many units long, if it can be determined, is the segment BC ?



- F. 5
- G. 6
- H. 8
- J. 11
- K. Cannot be determined from the given information.

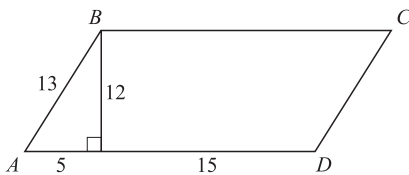
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31. What is the x -coordinate of the point in the standard (x, y) coordinate plane at which the two lines $y = -2x + 7$ and $y = 3x - 3$ intersect?
- A. 10
B. 5
C. 3
D. 2
E. 1
32. For all pairs of real numbers S and T where $S = 4T - 7$, $T = ?$
- F. $\frac{S}{4} - 7$
G. $\frac{S}{4} + 7$
H. $4S + 7$
J. $\frac{S - 7}{4}$
K. $\frac{S + 7}{4}$
33. Parallelogram $ABCD$, with dimensions in inches, is shown in the diagram below. What is the area of the parallelogram, in square inches?



- A. 60
B. 72
C. 180
D. 240
E. 260
34. If $b = a + 3$, then $(a - b)^4 = ?$
- F. 81
G. 27
H. -3
J. -27
K. -81

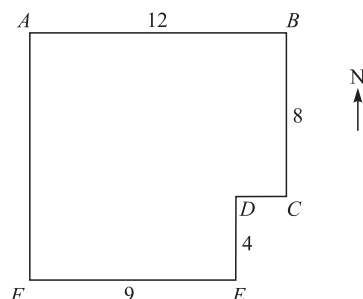
DO YOUR FIGURING HERE.

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35. A park has the shape and dimensions, in miles, given below. The park office is located halfway between point A and point D . Which of the following is the location of the park office from point A ? (Note: The park's borders run east–west or north–south.)



DO YOUR FIGURING HERE.

- A. 3 miles east and $4\frac{1}{2}$ miles north
- B. $4\frac{1}{2}$ miles east and 4 miles south
- C. 4 miles east and $4\frac{1}{2}$ miles south
- D. 6 miles east and 4 miles south
- E. 6 miles east and $4\frac{1}{3}$ miles south
36. The larger of two numbers exceeds three times the smaller number by 4. The sum of twice the larger number and 4 times the smaller number is 58. If x is the smaller number, which equation below determines the correct value of x ?
- F. $3(2x + 4) + 4x = 58$
- G. $3(2x - 4) + 3x = 58$
- H. $2(3x + 4) + 2x = 58$
- J. $2(3x + 4) + 4x = 58$
- K. $2(2x - 4) + 4x = 58$
37. Members of the fire department lean a 26-foot ladder against a building. The side of the building is perpendicular to the level ground so that the base of the ladder is 10 feet away from the base of the building. To the nearest foot, how far up the building does the ladder reach?
- A. 12
- B. 15
- C. 20
- D. 22
- E. 24

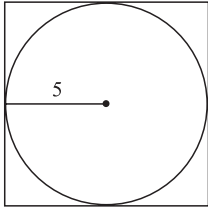
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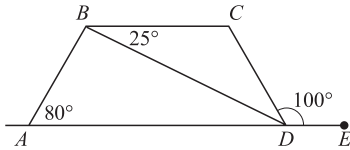


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38. A square is circumscribed about a circle of a 5-foot radius, as shown below. What is the area of the square, in square feet?



- F. 144
 G. 100
 H. 25π
 J. 50
 K. 25
39. The ratio of the side lengths for a triangle is exactly 7:11:13. In a second triangle similar to the first, the shortest side is 9 inches long. To the nearest tenth of an inch, what is the length of the longest side of the second triangle?
- A. 14.1
 B. 15
 C. 16.7
 D. 17.3
 E. Cannot be determined from the given information.
40. In the figure below, $ABCD$ is a trapezoid. E lies on line AD , and angle measures are as marked. What is the measure of angle CDB ?



- F. 25°
 G. 30°
 H. 55°
 J. 80°
 K. 100°

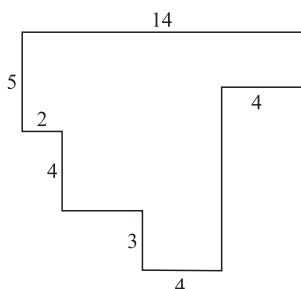
DO YOUR FIGURING HERE.

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41. In the figure shown below, each pair of intersecting line segments meets at a right angle, and all the lengths are given in inches. What is the perimeter, in inches, of the figure?



DO YOUR FIGURING HERE.

- A. 30
 B. 36
 C. 42
 D. 52
 E. 62
42. Of the 517 graduating seniors at Brighton High School, approximately $\frac{4}{5}$ will be attending college, and approximately $\frac{1}{2}$ of those going to college will be attending a state college. Which of the following is the closest estimate of the number of graduating seniors who will be attending a state college?
- F. 170
 G. 200
 H. 260
 J. 300
 K. 320
43. Let $x \square y = (x - 2y)^2$ for all integers x and y . Which of the following is the value of $5 \square (-3)$?
- A. 121
 B. 64
 C. 41
 D. 1
 E. -31
44. If 125% of a number is 425, what is 65% of the number?
- F. 221
 G. 276
 H. 284
 J. 308
 K. 340
45. What is the distance in the standard (x, y) coordinate plane between the points $(2, 3)$ and $(5, 5)$?
- A. 3
 B. 5
 C. $\sqrt{11}$
 D. $\sqrt{13}$
 E. $\sqrt{25}$

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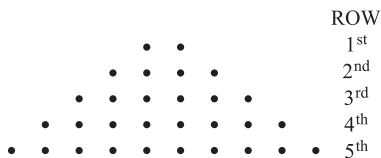
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46. The ratio of the radii of two circles is 9:16. What is the ratio of their circumferences?
- F. 3:4
G. 9:16
H. 18:32
J. $3:4\pi$
K. $9\pi:16$

DO YOUR FIGURING HERE.

47. A circle in the standard (x, y) coordinate plane is tangent to the x -axis at 4 and tangent to the y -axis at 4. Which of the following is an equation of the circle?
- A. $x^2 + y^2 = 4$
B. $x^2 + y^2 = 16$
C. $(x - 4)^2 + (y - 4)^2 = 4$
D. $(x - 4)^2 + (y - 4)^2 = 16$
E. $(x + 4)^2 + (y + 4)^2 = 16$
48. Using the complex number i , where $i^2 = -1$,
 $\frac{2}{(1 - i)} \times \frac{(1 + i)}{(1 + i)} = ?$
- F. $1 + i$
G. $i - 1$
H. $1 - i$
J. $2(1 + i)$
K. $2(1 - i)$

49. Which of the following describes the total number of dots in the first n rows of the triangular arrangement below?

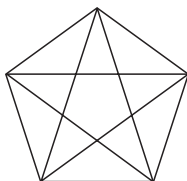


- A. 30
B. $2n$
C. n^2
D. $n(n + 1)$
E. $2n + 2(n - 1)$
50. After polling a class of 24 students by a show of hands, you find that 9 students play soccer and 21 students play basketball. Given that information, what is the number of students in the class who must play both soccer and basketball?
- F. 0
G. 1
H. 3
J. 6
K. 9

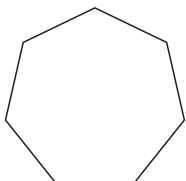
2         **2**

51. Which of the following is the set of all real numbers x such that $x + 2 > x + 5$?
- A. The set containing only zero
 - B. The set containing all nonnegative real numbers
 - C. The set containing all negative real numbers
 - D. The set containing all real numbers
 - E. The empty set

52. Pentagons have 5 diagonals, as illustrated below. How many diagonals does the heptagon (7 sides) below have?



Pentagon



Heptagon

- F. 7
 - G. 12
 - H. 14
 - J. 21
 - K. 28
53. John wants to draw a circle graph showing his friends' favorite ice cream flavors. When he polled his friends asking each their favorite flavor of ice cream, 35% of his friends said chocolate, 20% of his friends said vanilla, 15% of his friends said strawberry, 25% of his friends said mint chocolate chip, and 5% of his friends said flavors other than those previously listed. What will be the degree measure of the vanilla sector of the circle graph?
- A. 126°
 - B. 108°
 - C. 90°
 - D. 72°
 - E. 36°

DO YOUR FIGURING HERE.

2



2

54. If $\sin \theta = \frac{4}{5}$ and $\frac{\pi}{2} < \theta < \pi$, then $\tan \theta = ?$

F. $-\frac{5}{4}$

G. $-\frac{4}{3}$

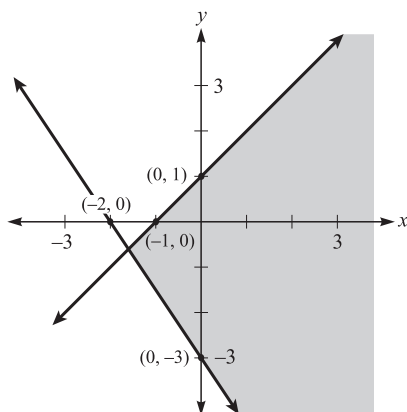
H. $-\frac{3}{5}$

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

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

DO YOUR FIGURING HERE.

55. Which of the following systems of inequalities is represented by the shaded region of the graph below?



A. $y \leq x + 1$ or $y \geq x - 3$

B. $y \leq x + 1$ and $y \geq x - 3$

C. $y \leq x + 1$ or $y \geq \left(-\frac{3}{2}\right)x - 3$

D. $y \leq x + 1$ and $y \leq \left(-\frac{3}{2}\right)x - 3$

E. $y \leq x + 1$ and $y \geq \left(-\frac{3}{2}\right)x - 3$

56. If $f(x) = 2x^2 + 3$, then $f(x + h) = ?$

F. $2x^2 + h^2$

G. $2x^2 + h + 3$

H. $2x^2 + 2h^2 + 3$

J. $x^2 + 2xh + h^2 + 3$

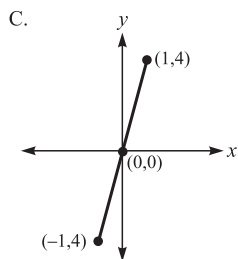
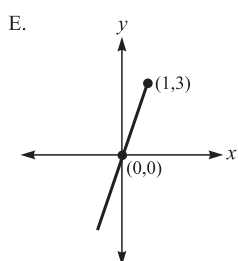
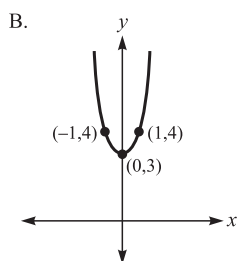
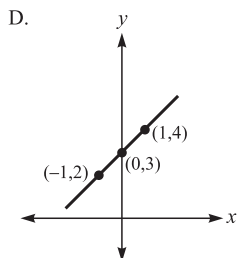
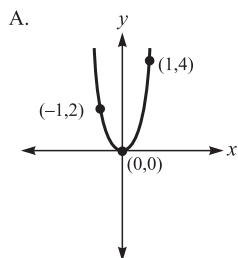
K. $2x^2 + 4xh + 2h^2 + 3$

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57. Which of the following is the graph, in the standard (x, y) coordinate plane, of $y = \frac{x^2 + 3x}{x}$?

DO YOUR FIGURING HERE.



58. A triangle, $\triangle ABD$, is reflected across the y -axis 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.

2**2**

59. If $x = 3r - 4$ and $y = 3r + 2$, which of the following expresses y in terms of x ?
- A. $y = x + 2$
 B. $y = x + 6$
 C. $y = 9r + 14$
 D. $y = 6r - 2$
 E. $y = 3x + 14$

DO YOUR FIGURING HERE.

60. What is $\cos \frac{\pi}{12}$ given that $\frac{\pi}{12} = \frac{\pi}{3} - \frac{\pi}{4}$ and that $\cos(\alpha - \beta) = (\cos \alpha)(\cos \beta) + (\sin \alpha)(\sin \beta)$?

| θ | $\sin \theta$ | $\cos \theta$ |
|-----------------|----------------------|----------------------|
| $\frac{\pi}{6}$ | $\frac{1}{2}$ | $\frac{\sqrt{3}}{2}$ |
| $\frac{\pi}{4}$ | $\frac{\sqrt{2}}{2}$ | $\frac{\sqrt{2}}{2}$ |
| $\frac{\pi}{3}$ | $\frac{\sqrt{3}}{2}$ | $\frac{1}{2}$ |

- F. $\frac{1}{4}$
 G. $\frac{1}{2}$
 H. $\frac{\sqrt{6} + \sqrt{2}}{4}$
 J. $\frac{\sqrt{3} + \sqrt{2}}{2}$
 K. $\frac{\sqrt{6} + 2}{4}$

**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: *This passage is adapted from Joseph Conrad's The Heart of Darkness © 1899.*

The *Nellie*, a cruising ship, swung to her anchor without a flutter of the sails, and was at rest. The tide had come in, the wind was nearly calm, and being bound down the river, the only thing for the ship was to come to and wait for the turn of the tide.

The Director of Companies was our captain and our host. We four affectionately watched his back as he stood in the bow looking toward the sea. On the whole river there was nothing that looked half so nautical. He resembled a pilot, which to a seaman is trustworthiness personified. It was difficult to realize his work was not out there in the luminous estuary, but behind him, within the brooding gloom.

Between us there was, as I have already said somewhere, the bond of the sea. Besides holding our hearts together through long periods of separation, it had the effect of making us tolerant of each other's stories—and even convictions. The Lawyer—the best of old fellows—had, because of his many years and many virtues, the only cushion on deck, and was lying on the only rug. The Accountant had brought out already a box of dominoes, and was toying architecturally with the pieces. Marlow sat cross-legged, leaning against the mast. He had sunken cheeks, a yellow complexion, a straight back, and, with his arms dropped, the palms of his hands outwards, resembled an idol. The Director, satisfied the anchor had good hold, made his way forward and sat down amongst us. We exchanged a few words lazily. Afterwards there was silence on board the yacht. For some reason or another we did not begin that game of dominoes. We felt meditative, and fit for nothing but placid staring.

“And this also,” said Marlow suddenly, “has been one of the dark places of the earth.” He was the only man of us who still “followed the sea.” The worst that could be said of him was that he did not represent his class—always the same. In their unchanging surroundings, the foreign shores, the foreign faces glide past, veiled not by a sense of mystery but by a slightly disdainful ignorance; for there is nothing mysterious

to a seaman unless it be the sea itself, which is the mistress of his existence and as inscrutable as destiny. For the rest, after his hours of work, a casual stroll or a casual spree on shore suffices to unfold for him the secret of a whole continent, and generally he finds the secret not worth knowing. The stories of seamen have a direct simplicity, the whole meaning of which lies within the shell of a cracked nut. But Marlow was not typical, and to him the meaning of an episode was not inside like a kernel but outside, enveloping the tale, which brought it out only as a glow brings out a haze, in the likeness of one of these misty halos that sometimes are made visible by the spectral illumination of moonshine.

His remark did not seem at all surprising. It was just like Marlow. It was accepted in silence. No one took the trouble to grunt even; and presently he said, very slow—“I was thinking of very old times, when the Romans first came here, nineteen hundred years ago.” And at last, in its curved and imperceptible fall, the sun sank low, and from glowing white changed to a dull red without rays and without heat, as if about to go out suddenly, stricken to death by the touch of that gloom brooding over a crowd of men.

Marlow broke off. Flames glided in the river, small green flames, red flames, white flames, pursuing, overtaking, joining, crossing each other—then separating slowly or hastily. The traffic of the great city went on in the deepening night upon the sleepless river. We looked on, waiting patiently—there was nothing else to do; but it was only after a long silence, when he said, in a hesitating voice, “I suppose you fellows remember I did once turn fresh-water sailor for a bit,” that we knew we were fated, before the ebb began to run, to hear about one of Marlow's inconclusive experiences.

- The narrator's point of view is that of:
 - an omniscient observer.
 - a member of the ship's crew.
 - another ship's captain.
 - a person watching from shore.

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2. It can reasonably be inferred from the passage that the crew most likely did not play dominoes because:
- F. they were simply too tired.
 - G. they did not get along well enough to play a game together.
 - H. the Director would not have approved of game-playing.
 - J. the sea was too rough.
3. Which of the following are explanations given by the narrator as to why the Lawyer used the ship's only cushion?
- I. He was very old.
 - II. He would not allow anyone else to use it.
 - III. He was greatly respected by the ship's crew.
- A. I and II only
 - B. I only
 - C. I and III only
 - D. II only
4. As it is used in line 32 of the passage, the word *placid* most nearly means:
- F. calm.
 - G. straightforward.
 - H. nervous.
 - J. playful.
5. According to the passage, how was Marlow unlike typical seamen?
- A. Marlow was content to stay in one place, while most men of the sea prefer to roam and explore.
 - B. Marlow believed his home was the ship, while most sailors believed their home was the sea.
 - C. Marlow found the sea inexplicable and full of secrets, while a typical sailor understands the mysteries of the water.
 - D. Marlow wove complicated and ambiguous tales, while most seamen prefer to tell simple and clear tales.
6. It can be reasonably inferred from the passage that Marlow is about to tell a story:
- F. that explains why he is now a freshwater sailor.
 - G. that is short and funny, like most of the stories he tells.
 - H. that had a profound effect on him.
 - J. about a man that he saved from drowning in a river.
7. According to the passage, how did the men aboard the *Nellie* feel about the Director?
- A. They respected and trusted him.
 - B. They felt that he was lazy.
 - C. They despised and rejected him.
 - D. They thought that he was gloomy.
8. The reaction of the narrator to Marlow's story can be most accurately described as:
- F. malicious annoyance.
 - G. resigned tolerance.
 - H. genuine interest.
 - J. sincere appreciation.
9. According to the passage, which of the following was not an effect of the "bond of the sea" (line 15)?
- A. It allowed the men to look past each other's criminal backgrounds.
 - B. The men did not mind listening to each other's meandering tales.
 - C. It eased the loneliness of extended periods of time away from each other.
 - D. The men were able to be more tolerant of each other's beliefs.
10. The main point of the second paragraph is:
- F. The ship's captain is better suited to be an aviator than a sailor.
 - G. The captain is unaware of the great amount of hard work that lies ahead of him.
 - H. An unqualified and inexperienced businessman is serving as the captain of the *Nellie*.
 - J. The narrator and other crew members greatly respect their ship's captain.

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PASSAGE II

SOCIAL SCIENCE: *This passage discusses some social and economic issues regarding liquid natural gas as an energy source.*

Although oil and gasoline remain important energy sources, it is natural gas that currently supplies around 25 percent of America's energy needs. A recent study shows that natural gas use was roughly 22 trillion cubic feet (TCF) annually. Natural gas demand is increasing at phenomenal rates because of its ability to create cleaner fuel for electrical power. Experts predict that annual demand is likely to increase to almost 32 TCF in less than a decade. At a consumption rate of 32 TCF per year, the United States would only have about a five-year supply of natural gas. Known natural gas reserves in North America are quickly becoming exhausted. In fact, in the past thirty years, known supplies have dwindled from almost 300 TCF to around 150 TCF.

It is no wonder that natural gas has become a controversial and critical topic of discussion among politicians, business leaders, and consumers. It is apparent that the United States will need to drastically increase imports of natural gas to relieve shortages. One way that economists believe this can be done is by importing liquid natural gas. Experts predict that liquid natural gas imports will increase by almost 500 percent in a few short years. Currently, the country imports very little liquid natural gas. The process of transporting liquid natural gas is complicated and expensive. This is the most obvious reason why America has been reluctant to choose liquid natural gas over other energy sources. Converting natural gas into liquid natural gas involves cooling natural gas as it is collected to -260°F . This transforms the gas into a liquid, which is then injected into a specially designed vessel for transport. When the liquid natural gas reaches its destination, the liquid is reheated into its original gaseous state and allowed to flow into a pipeline. Even though new technology has considerably decreased transportation costs for liquid natural gas, it is still often uneconomical. This is especially true for nations with other energy sources.

One of the largest misconceptions about liquid natural gas is that it is an abundant source of natural gas. While liquid natural gas imports continue to increase, the public demand for natural gas increases at an even higher rate. Even though the United States has several facilities that can process liquid natural gas, these facilities are consistently unable to obtain enough liquid natural gas to operate at their fullest capacity. Even when liquid natural gas is obtainable, there is a fear that low natural gas prices in the United States will make liquid natural gas uneconomical. Most business leaders and politicians are reluctant to create new facilities to process liquid natural gas because these facilities are expensive and risky. This limits the capacity to process liquid natural gas even if it becomes more readily available.

The United States also faces competition from Asia in securing liquid natural gas. Competition for liquid natural gas will most likely become even more ferocious as other populous countries like Japan and

China become more desperate for fuel sources. Some of the more daring politicians and business leaders believe that building new liquid natural gas facilities will help companies and consumers take advantage of future increased liquid natural gas imports. Currently, Canada is the largest liquid natural gas supplier for the United States. However, liquid natural gas imports from Canada will decrease considerably in the next decade as Canadian consumption increases and supplies of natural gas dwindle. Therefore, consumers and business leaders should not rely on liquid natural gas to solve America's energy needs and consumers should continue to expect high prices as demand grows and supplies decline.

11. According to the passage, current known North American supplies of natural gas are:
 - A. sufficient to provide the United States with natural gas for the next thirty years.
 - B. down approximately 50 percent from thirty years ago.
 - C. decreasing at a rate of 25 percent per year.
 - D. extremely difficult to access.
12. The author of the passage would most likely agree with which of the following statements?
 - F. Liquid natural gas will never be a viable source of energy in the United States.
 - G. America's energy needs will not be met by the use of liquid natural gas alone.
 - H. The populations of Japan and China are growing too rapidly to be served by liquid natural gas.
 - J. Until another reliable energy source is discovered, liquid natural gas is the best solution to the world's energy problems.
13. One of the main ideas of the passage is that:
 - A. energy sources are dwindling around the world.
 - B. natural gas supplies one-quarter of America's energy needs.
 - C. liquid natural gas takes millions of years to form.
 - D. the known supply of liquid natural gas is limited.
14. It can be inferred from the second paragraph (lines 16–38) that America's reluctance to choose liquid natural gas over other energy sources will:
 - F. not prevent America from importing more liquid natural gas from other countries.
 - G. induce Japan and China to build new liquid natural gas processing facilities.
 - H. most likely continue until the cost and problems associated with liquid natural gas can be reduced.
 - J. lead to a decrease in the current demand for liquid natural gas in other countries, such as Canada.

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15. According to the passage, which of the following countries supplies the most liquid natural gas to the United States?
- A. Japan.
 - B. China.
 - C. Canada.
 - D. Asia.
16. According to the third paragraph (lines 39–54), misconceptions exist about liquid natural gas regarding:
- I. its abundance.
 - II. the expense of converting it.
 - III. public demand for it.
- F. I only
 - G. II only
 - H. II and III only
 - J. I, II, and III
17. As it is used in line 6, the word *phenomenal* most nearly means:
- A. annual.
 - B. efficient.
 - C. extraordinary.
 - D. inconsequential.
18. The passage states that all of the following are reasons for America's reluctance to choose liquid natural gas EXCEPT:
- F. the expense of transporting liquid natural gas.
 - G. the increasing demand for liquid natural gas.
 - H. the difficulty in processing liquid natural gas.
 - J. the possibility of low natural gas prices.
19. The passage states that which of the following is true about natural gas?
- A. It currently supplies more than half of America's energy needs.
 - B. The United States has an unlimited supply of natural gas.
 - C. Canada is the world's largest exporter of natural gas.
 - D. Annual demand for natural gas is increasing at a rapid rate.
20. As it is used in line 32, the word *vessel* most nearly means:
- F. process.
 - G. source.
 - H. facility.
 - J. container.

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PASSAGE III

HUMANITIES: *This passage is adapted from The Nature of Goodness by George Herbert Palmer ©1903.*

My reader may well feel that goodness is already the most familiar of all the thoughts we employ, and yet he may at the same time suspect that there is something about it perplexingly remote. Familiar it certainly is. It attends all our wishes, acts, and projects as nothing else does, so that no estimate of its influence can be excessive. When we take a walk, read a book, pick out a dress, visit a friend, attend a concert, cast a vote, enter into business, we always do it in the hope of attaining something good. Since they are so frequently encountering goodness, both laymen and scholars are apt to assume that it is altogether clear and requires no explanation. But the very reverse is the truth. Familiarity obscures. It breeds instincts and not understanding. So woven has goodness become with the very web of life that it is hard to disentangle.

Consequently, we employ the word or some synonym of it during pretty much every waking hour of our lives. Wishing some test of this frequency I turned to Shakespeare, and found that he uses the word "good" fifteen hundred times, and its derivatives "goodness," "better," and "best," about as many more. He could not make men and women talk right without incessant reference to this concept.

How then do we employ the word "good"? I do not ask how we ought to employ it, but how we actually do. For the present, we shall be engaged in a psychological inquiry, not an ethical one. We need to get at the plain facts of usage. I will therefore ask each reader to look into his own mind, see on what occasions he uses the word, and decide what meaning he attaches to it. Taking up a few of the simplest possible examples, we will through them inquire when and why we call things good.

Here is a knife. When is it a good knife? Why, a knife is made for something, for cutting. Whenever the knife slides evenly through a piece of wood, and with a minimum of effort on the part of him who steers it, when there is no disposition of its edge to bend or break, but only to do its appointed work effectively, then we know that a good knife is at work. Or, looking at the matter from another point of view, whenever the handle of the knife neatly fits the hand, following its lines and presenting no obstruction, we may say that in these respects also the knife is a good knife. That is, the knife becomes good through adaptation to its work, an adaptation realized in its cutting of the wood and in its conformity to the hand. Its goodness always has reference to something outside itself, and is measured by its performance of an external task.

Or take something not so palpable. What glorious weather! When we woke this morning, drew aside our curtains and looked out, we said "It is a good day!" And of what qualities of the day were we thinking? We meant, I suppose, that the day was well fitted to its various purposes. Intending to go to our office, we saw there was nothing to hinder our doing so. We knew that the streets would be clear, people in an amiable mood,

business and social duties would move forward easily. In fact, whatever our plans, in calling the day a good day we meant to speak of it as excellently adapted to something outside itself.

A usage more curious still occurs in the nursery. There when the question is asked, "Has the baby been good?" one discovers by degrees that the anxious mother wishes to know if it has been crying or quiet. This elementary life has as yet not acquired positive standards of measurement. It must be reckoned in negative terms, a failure to disturb.

This signification of goodness is lucidly put in the remark of Shakespeare's Portia, "Nothing I see is good without respect." We must have some respect or end in mind in reference to which the goodness is compared. Good always means good "for." That little preposition cannot be absent from our minds, though it need not audibly be uttered. The knife is good for cutting and the day for business. Omit the "for," and goodness ceases. To be bad or good implies external reference. To be good means to be an efficient means; and the end to be furthered must be already in mind before the word good is spoken.

In short, whenever we inspect the usage of the word good, we always find behind it an implication of some end to be reached. Good is a relative term. The good is the useful, and it must be useful for something. Silent or spoken, it is the mental reference to something else which puts all meaning into it. So Hamlet says, "There's nothing either good or bad, but thinking makes it so." No new quality is added to an object or act when it becomes good.

21. One of the main arguments the author is trying to make in the passage is that:
- A. the word *good* always connotes the same idea no matter the context of the usage, whether people realize it or not.
 - B. although the word *good* is used frequently, the exact definition and connotation of the word is difficult to identify precisely.
 - C. things or people are either good or not good; goodness is not a quality that is debatable.
 - D. a debate of ethics, not psychology, will most clearly identify the exact definition and connotation of the word *good*.
22. The main idea of the sixth paragraph (lines 63–69) is that:
- F. it is irrelevant for a mother to inquire if her baby has been well-behaved or not.
 - G. a baby has not been alive long enough to be judged as either good or bad.
 - H. since the baby is so young, it is not judged as good by what it does, but rather what it does not do.
 - J. whether or not a baby has been crying is not a significant standard upon which to determine its goodness.

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23. According to the passage, why does the author concern himself with Shakespeare's usage of the word *good*?
- A. He was seeking confirmation for his belief that both the use of the word and the concept of *good* are strikingly common.
 - B. He was looking for a definition of the concept of *good* and turned to Shakespeare for inspiration.
 - C. He was trying to understand the lack of the concept of *good* and *goodness* in the works of Shakespeare.
 - D. He was seeking support for his belief that Shakespeare was able to use the concept of *good* more effectively than any other author.
24. The author of the passage asserts that the weather and a knife are similar because:
- F. both are defined as good if and only if they can be helpful to many people for a variety of reasons.
 - G. neither can be defined as good unless they remain consistent and unchanged in the wake of fluctuating circumstances.
 - H. both are defined as good when their characteristics serve appropriate external circumstances.
 - J. neither one can be good unless a universal definition of the concept is accepted.
25. As it is used in line 70, the word *lucidly* most nearly means:
- A. obscurely.
 - B. inappropriately.
 - C. enthusiastically.
 - D. coherently.
26. The author argues that a knife may be described as good:
- F. only if it cuts wood.
 - G. only if it is made for something other than cutting.
 - H. only as it relates to something other than itself.
 - J. only if it requires extra effort in its use.
27. As it is used in the passage, the word *palpable* most nearly means:
- A. apparent.
 - B. powerful.
 - C. drab.
 - D. complicated.
28. The main argument that the author tries to make in the seventh paragraph (lines 70–81) is that:
- F. it is always clear what is meant when someone describes something as *good*.
 - G. the concept of being *good* is entirely different than the concept of being *good for*.
 - H. it is often easier to understand the concept of *good* without using the phrase *good for*.
 - J. the word *good* is relative, finding meaning only when there is a specific end in mind.
29. It can be reasonably inferred from the passage that the author would agree that the word *good* actually means:
- A. measurable.
 - B. significant.
 - C. persistent.
 - D. practical.
30. When, referring to the role of goodness in life, the author states, "no estimate of its influence can be excessive" (lines 6–7), he most likely means that:
- F. people must be careful not to allow the search for goodness to monopolize their lives.
 - G. it is impossible to over-emphasize the power that the quest for goodness has on us.
 - H. it is impossible to conceptualize and grasp the definition of the word *good*.
 - J. people often inaccurately describe the role that goodness plays in their own lives.

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PASSAGE IV

NATURAL SCIENCE: *The Armored Armadillo*

Meandering along the shoulder of the highway, the armadillo is surprisingly unaffected by its surroundings. This nomad of the desert appears to have no cares in the world, and really, why should he, when he carries on his back a natural suit of armor? He looks far more awkward than do most animals, yet this alien creature handles himself remarkably well. For such a small animal, the armadillo can withstand a surprising amount of aggression from most predators. Although his shell is far from impenetrable, the armadillo can rest assured that he is safer than many animals who wander the Texas roads.

The *Dasyopus novemcinctus*, or nine-banded armadillo, is characterized by the bands that arch across its back. The bands are made of bony plates and are covered with leathery skin—these plates, in fact cover the animal's back, sides, tail, and the top of its head, creating a somewhat turtle-like shell. The interesting thing about the nine-banded armadillo is that the number of bands on its back may be anywhere between seven and eleven; nine is just the most common number. Contrary to popular belief, only one species of armadillo can roll itself into a ball; the three-banded armadillo does this as its primary defense against predators. Other armadillos often scurry under thorn bushes, rather like tanks strengthening their position.

Armadillos are, on average, two and a half feet long and they typically weigh between eight and sixteen pounds, although across different species those numbers can vary dramatically. Nine-banded females give birth once a year, generally to four identical young, which come from a single fertilized egg. The nine-banded armadillo is the only species of animal in which this remarkable trait occurs. The four-month-long gestation period is more than enough time for the offspring to develop, as they are born fully formed with their eyes open. After a few hours they begin to walk and are able to distance themselves from their mothers after only a few months. Few animals are able to outrun a startled armadillo, and if chased into its burrow, the animal is able to arch its armor against the burrow walls, making the armadillo nearly impossible to become dislodged; this is quite frustrating to dogs and other animals who would like to eat the armadillo. In addition to threats of being eaten by an opportunistic predator, the armadillo must also endure a more severe danger: automobiles. A significant number of armadillos die each year after being struck by cars.

Armadillos can be found in the northern parts of South America and as far north as the State of Texas. Nine-banded armadillos prefer warm climates and like to build burrows in the wet soil near streambeds, which they often share with other species, such as rabbits and opossums. Armadillos are nocturnal, and they spend their evenings digging for grubs and other invertebrates which make up the majority of their diet.

Most Texans see the armadillo as a pest, since the creatures have a tendency to ruin corn by eating the parts of the plants that are low to the ground; they

occasionally will eat other farm vegetables as well. Armadillos provide some benefits however, as they eat many annoying and harmful insects and are often used in medical research. Interestingly enough, they are the only mammal besides humans that can contract leprosy.

While armadillos are seen as strange and often troublesome animals, they are unique and valuable for research. This armored native of the south will most likely continue to fascinate and charm people for many years to come.

31. The author likens armadillos scurrying under thorn bushes to “tanks strengthening their positions” in Paragraph 2 because:
- armadillos are well armored and thorn bushes give them even more protection.
 - an armadillo's shell is as hard as steel.
 - the scurrying of an armadillo sounds like a tank rolling over land.
 - the armadillo resembles a tank in appearance.
32. The author calls the armadillo an “alien creature” in the first paragraph because:
- not much is known about armadillos.
 - armadillos come from another planet.
 - armadillos are very aggressive.
 - an armadillo's unique appearance makes it stand out.
33. The passage indicates that, unlike some other desert animals, the armadillo:
- lacks a means of defending itself.
 - can go without drinking water for long periods of time.
 - reproduces many times each year.
 - can withstand most predators' attacks.
34. As it is used in the passage (line 42), the phrase “arch its armor” most nearly means:
- to construct.
 - to curve.
 - to dig.
 - to fight.
35. Based on information in the passage, the author feels that the nine-banded armadillo is especially unique because:
- it can curl into a ball.
 - it is the rarest type of armadillo.
 - it gives birth to four identical young.
 - its diet consists entirely of grubs.

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36. The passage indicates that most Texans consider the armadillo to be both:
F. rare and sacred.
G. strange and interesting.
H. annoying and helpful.
J. valued and dangerous.
37. What does the passage state is one of armadillo's greatest threats?
A. farmers.
B. cars.
C. opossums.
D. dogs.
38. The passage states that, in the Southern United States, armadillos do damage to:
F. crops.
G. deserts.
H. rivers.
J. houses.
39. The passage indicates that, at birth, armadillos:
A. are utterly helpless.
B. are identical to adults.
C. are able to see.
D. are totally independent.
40. According to the passage, the scientific name *Dasypus novemcinctus* is unique to:
F. the three-banded armadillo.
G. the six-banded armadillo.
H. all armadillos.
J. the nine-banded armadillo.

END OF THE READING TEST.

STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.

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4

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

Some students performed three studies to measure the average speed on a flat surface of a remote-controlled car with different types of wheels. Each study was conducted indoors in a temperature-controlled room. A straight track was constructed and measured to be 75 feet long. The car's travel time was measured from start to finish with a stopwatch. The temperature in the room was kept constant at 20° F and the surface was returned to its original condition after each trial. No modifications were made to the car aside from changing the wheels, and the car's batteries were fully charged before each trial.

Study 1

The students fitted the car with hard rubber wheels, which had deep treads, and placed it on the surface. One student started the car as another student simultaneously started the stopwatch. The student stopped the stopwatch as the car crossed the 75-foot mark. The students calculated the results of three separate trials and averaged the results (see Table 1).

| Trial | Time (s) | Speed (ft/s) |
|----------|----------|--------------|
| 1 | 22.8 | 3.28 |
| 2 | 23.2 | 3.23 |
| 3 | 22.5 | 3.33 |
| Average: | 22.8 | 3.28 |

Study 2

The students repeated the procedure used in Study 1, except they fitted the car with soft rubber wheels, which were smooth and lacked treads. The results are shown in Table 2.

| Trial | Time (s) | Speed (ft/s) |
|----------|----------|--------------|
| 1 | 57 | 1.31 |
| 2 | 56.4 | 1.33 |
| 3 | 56.7 | 1.32 |
| Average: | 56.7 | 1.32 |

Study 3

The students repeated the procedure used in Study 1, except they fitted the car with hard rubber wheels, which had studs imbedded into them instead of treads. The results are shown in Table 3.

| Trial | Time (s) | Speed (ft/s) |
|----------|----------|--------------|
| 1 | 11.3 | 6.64 |
| 2 | 11.6 | 6.47 |
| 3 | 12.1 | 6.20 |
| Average: | 11.7 | 6.44 |

- The fastest times resulted from using which wheels?
 - The speeds remained constant.
 - Hard rubber wheels with studs imbedded in them.
 - Soft rubber wheels with no treads.
 - Hard rubber wheels with deep treads.

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2. According to Study 1, the average speed for all three trials was:
- F. greater than the speed measured in Trial 3.
 - G. less than the speed measured in Trial 1.
 - H. greater than the speed measured in Trial 2.
 - J. equal to the speed measured in Trial 2.
3. Which of the following statements is best supported by the results of all three studies?
- A. The average speed of a car with deeply treaded hard rubber wheels is approximately $\frac{1}{2}$ the average speed of car with soft rubber wheels.
 - B. The average speed of a car with studded, hard rubber wheels is approximately $\frac{1}{2}$ the average speed of car with deeply treaded hard rubber wheels.
 - C. The average speed of a car with soft rubber wheels lacking treads is approximately twice the average speed of car with deeply treaded hard rubber wheels.
 - D. The average speed of a car with studded, hard rubber wheels is approximately twice the average speed of car with deeply treaded hard rubber wheels.
4. Based on the passage, the higher average speeds were probably the result of:
- F. greater friction.
 - G. temperature variations.
 - H. too much sunlight.
 - J. statistical error.
5. During which of the following was the travel time of the car the slowest?
- A. Study 2, Trial 1
 - B. Study 2, Trial 2
 - C. Study 3, Trial 1
 - D. Study 1, Trial 2

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PASSAGE II

The ninth planet of our solar system, Pluto, was discovered in 1930. It is the smallest planet in the solar system, with a surface area more than 300 times smaller than Earth's. Recently, Pluto's categorization as a planet has been debated. Two scientists discuss whether Pluto is a planet or another celestial object.

Scientist 1

Pluto is most certainly a planet. Some astronomers have suggested that Pluto be stripped of its planetary status, arguing that it is more accurately categorized as an asteroid or comet. However, with a 1,413 mile diameter, Pluto is almost 1,000 times bigger than an average comet, and it does not have a tail of dust and gas as comets do. A planet can be described as a non-moon, sun-orbiting object that does not generate nuclear fusion and is large enough to be pulled into a spherical shape by its own gravity. Strictly by definition alone, Pluto is a planet. Pluto is clearly not a moon, as it does not orbit another planet. Although Pluto's orbital path is irregular as compared with the other planets of the solar system, it undisputedly orbits the sun. Pluto does not generate heat by nuclear fission, distinguishing it from a star. It is large enough to be pulled into a spherical shape by its own gravitational force, distinguishing it from either a comet or an asteroid.

Scientist 2

There are many facts about Pluto suggesting that it is actually not a planet but a member of the Kuiper Belt, a group of sizable comets that orbit the sun beyond Neptune. First, Pluto is composed of icy material, as are the comets in the Kuiper Belt, while the other planets of the solar system fall into one of two categories: rocky or gaseous. The four inner planets, Mercury, Venus, Earth, and Mars are rocky planets; Jupiter, Saturn, Uranus, and Neptune are gaseous. Pluto is neither rocky nor gaseous but has an icy composition. In addition, Pluto is much too small to be a planet. It is less than half the diameter of the next smallest planet, Mercury. The Earth's moon is even larger than Pluto. Finally, the eccentricity of Pluto's orbit indicates that it is not a planet. Pluto is generally considered the ninth planet, but for twenty years of its 249 year orbit, it is actually closer to the sun than is Neptune, making it the eighth planet during that period of time. This irregular orbit is shared by over seventy Kuiper Belt comets.

6. Which of the following phrases best describes the major point of difference between the two scientists' viewpoints?
- F. The actual location of Pluto in the solar system.
 - G. The length of Pluto's orbit.
 - H. The shape of Pluto.
 - J. The classification of Pluto as a planet.
7. According to Scientist 2's viewpoint, compared to other planets of the solar system, Pluto's surface is:
- A. less icy.
 - B. more icy.
 - C. more gaseous.
 - D. more rocky.
8. Scientist 1's viewpoint indicates that Pluto differs from asteroids and comets in all of the following ways EXCEPT:
- F. Pluto can generate heat through nuclear fission.
 - G. Pluto is pulled into a spherical shape by its own gravitational force.
 - H. Asteroids and comets have a tail of gas and dust particles.
 - J. Asteroids and comets are much smaller than Pluto.
9. The polar ice caps on Pluto's surface melt one time during every 249-year orbit, exposing Pluto's truly rocky surface, which is similar to that of Mars. Based on the information provided, this finding, if true, would most likely weaken the position(s) of:
- A. Scientist 1 only.
 - B. Scientist 2 only.
 - C. both Scientist 1 and Scientist 2.
 - D. neither Scientist 1 nor Scientist 2.
10. With which of the following statements would both scientists most likely agree?
- F. The size of Pluto indicates that it could actually be a satellite of another planet.
 - G. Pluto should be classified as neither a planet nor a comet; a new category is indicated.
 - H. The surface composition of Pluto is irrelevant and should not be considered in its classification.
 - J. Pluto's erratic orbit differentiates it from all other planets in the solar system.
11. Scientist 1's viewpoint would be weakened by which of the following observations, if true?
- A. Scientists have recently discovered a Kuiper Belt comet with a radius of almost 1,500 miles.
 - B. Pluto only has one moon, Charon, which is half the size of Pluto.
 - C. Planets can be distinguished from comets by the lack of gas and dust particles in the wake of their orbits.
 - D. Comets and asteroids are capable of generating nuclear fission.
12. Which of the following statements best describes how Scientist 2 likens Pluto to a Kuiper Belt comet?
- F. Neither Pluto nor Kuiper Belt comets have identifiable atmospheres.
 - G. Neither Pluto nor Kuiper Belt comets are trailed by a cloud of gases and dust.
 - H. Both Pluto and Kuiper Belt comets have similar eccentric orbital patterns.
 - J. Both Pluto and Kuiper Belt comets are roughly half the size of the next smallest planet, Mercury.

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PASSAGE III

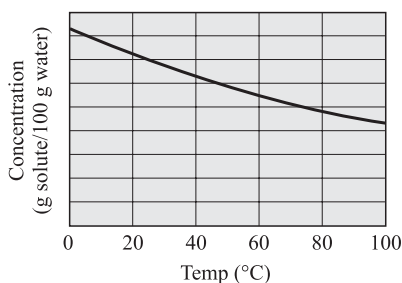
A *solute* is any substance that is dissolved in another substance, which is called the *solvent*.

A student tested the *solubility* (a measure of how much solute will dissolve into the solvent) of six different substances. The solubility of a substance at a given temperature is defined as the concentration of the dissolved solute that is in equilibrium with the solvent.

Table 1 represents the concentration of dissolved substances in 100 grams of water at various temperatures. The concentrations are expressed in grams of solute per 100 grams of water.

| Temp (°C) | Concentration of solute (g/100 g H ₂ O) | | | | | |
|-----------|--|-------------------|-----|--------------------|------|-----------------|
| | KCl | NaNO ₃ | HCl | NH ₄ Cl | NaCl | NH ₃ |
| 0 | 28 | 72 | 83 | 29 | 37 | 90 |
| 20 | 33 | 86 | 72 | 37 | 37 | 55 |
| 40 | 39 | 105 | 63 | 46 | 38 | 36 |
| 60 | 45 | 125 | 55 | 55 | 38 | 23 |
| 80 | 51 | 145 | 48 | 66 | 39 | 14 |
| 100 | 57 | 165 | 43 | 77 | 40 | 8 |

13. According to Table 1, the concentrations of which of the following substances varies the least with temperature?
- HCl
 - NH₃
 - NaCl
 - KCl
14. The graph below best represents the relationship between concentration and temperature for which of the following substances?



- HCl
- NaNO₃
- NaCl
- KCl

15. The data shown in Table 1 support the conclusion that, for a given substance, as the temperature of the water increases, the amount of solute that can be dissolved:
- increases only.
 - decreases only.
 - varies, but there is a trend depending on the substance.
 - varies, but with no particular trend.

16. According to Table 1, HCl would most likely have which of the following concentrations at 70°C?
- 25.5 g/100g H₂O
 - 37.0 g/100g H₂O
 - 48.5 g/100g H₂O
 - 51.5 g/100g H₂O

17. A scientist wants to dissolve at least 50 grams of NH₄Cl in 100 g of water in order for the solution to be the proper concentration for use in an experiment. A reasonable minimum temperature for the solution would be:
- 25°C
 - 30°C
 - 35°C
 - 50°C

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PASSAGE IV

Salt pans are unusual geologic formations found in deserts. They are formed in *endorheic basins*, which are lowland areas where water collects but has no outflow. Any rain that falls or any water that is collected in an *endorheic basin* remains there permanently, except for what is lost through evaporation. This type of closed system often leads to a high concentration of salt and other minerals.

Study 1

Four different salt pans around the world were studied. The volumes of mineral deposits were estimated from the surface areas of the salt pans and the average thickness of the deposits. The ages of the salt pans were also estimated based on the mineral volume. The estimates are shown in Table 1.

| Salt pan | Estimated mineral volume (km ³) | Estimated age (million years) |
|----------|---|-------------------------------|
| A | 2,000,000 | 4.5 |
| B | 4,500,000 | 5.7 |
| C | 5,700,000 | 10.8 |
| D | 12,150,000 | 21.0 |

Study 2

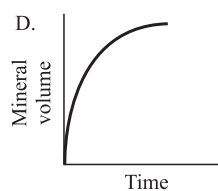
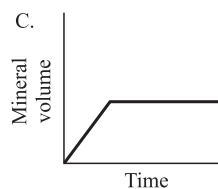
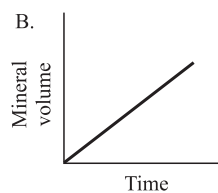
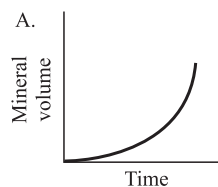
The same four salt pans were excavated for fossils. Fossil remnants of extinct plant species were found within each of the salt pans. The ages of the fossils found were similar to the ages of the salt pans (See Table 2). Scientists hypothesize that flooding of each salt pan may have led to the extinction of the plant species.

| Salt pan | Type of fossils found | Estimated age of fossils (million years) |
|----------|------------------------|--|
| A | Plant species <i>q</i> | 4.4 |
| B | Plant species <i>r</i> | 5.5 |
| C | Plant species <i>s</i> | 10.2 |
| D | Plant species <i>t</i> | 19.9 |

18. Which of the following statements is best supported by information in the passage?

- F. Water that has collected in *endorheic basins* is at least 21.0 million years old.
- G. The age of fossilized plant species cannot be precisely estimated.
- H. More water has collected in and evaporated from older salt pans.
- J. Any *endorheic basin* that is less than 2.0 million years old contains no fossils.

19. Which one of the following graphs best represents the relationship between the mineral volume and the age of the salt pans, according to Study 1?



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20. Is the conclusion that Salt pan A contains more extinct plant fossils than does Salt pan D supported by information in the passage?
- F. Yes, because Salt pan A is younger than Salt pan D.
 - G. Yes, because the passage suggests that it is easier for plants to grow in areas with a lower mineral volume.
 - H. No, because Salt pan D contains a different type of fossilized plant.
 - J. No, because the passage does not include data regarding the quantity of plant fossils found in the salt pans.
21. From the results of Table 1, you could conclude that a salt pan formed more than 21 million years ago would have a mineral value:
- A. between 5,700,000 km³ and 12,150,000 km³.
 - B. equal to approximately $\frac{1}{2}$ the mineral volume of Salt pan B.
 - C. greater than 12,150,000 km³.
 - D. less than 2,000,000 km³.
22. A fossilized plant approximately 9.7 million years old was recently discovered in a salt pan in North America. It was most likely found in a salt pan similar to:
- F. Salt pan A.
 - G. Salt pan B.
 - H. Salt pan C.
 - J. Salt pan D.

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PASSAGE V

Petroleum, or crude oil, is refined by separating it into different by-products. This process is called *fractional distillation*, whereby the crude oil is heated and each different product is distilled, or drawn off, at different stages. Each product is distilled at certain temperature ranges and collected in separate receivers. Petroleum refining is carried out in a boiler and a fractionating tower. The crude oil is super-heated in the boiler to about 600°C , which vaporizes the crude oil. The vapors then rise in the tower to certain levels where they cool and condense, according to their chemical structure. When the vapor reaches a height in the tower where the temperature in the column is equal to the boiling point of the substance, the vapor turns into liquid (condenses), collects in troughs, and flows into various tanks for storage, as shown in Figure 1. Table 1 below summarizes the characteristics of the by-products obtained from the fractional distillation of petroleum.

| Petroleum by-product | Condensation temperature ($^{\circ}\text{C}$) |
|------------------------|---|
| Petroleum gas | 20–40 |
| Gasoline | 40–70 |
| Kerosene | 100–120 |
| Gas oil | 120–200 |
| Lubricating oil stocks | 200–300 |
| Residue | 600 |

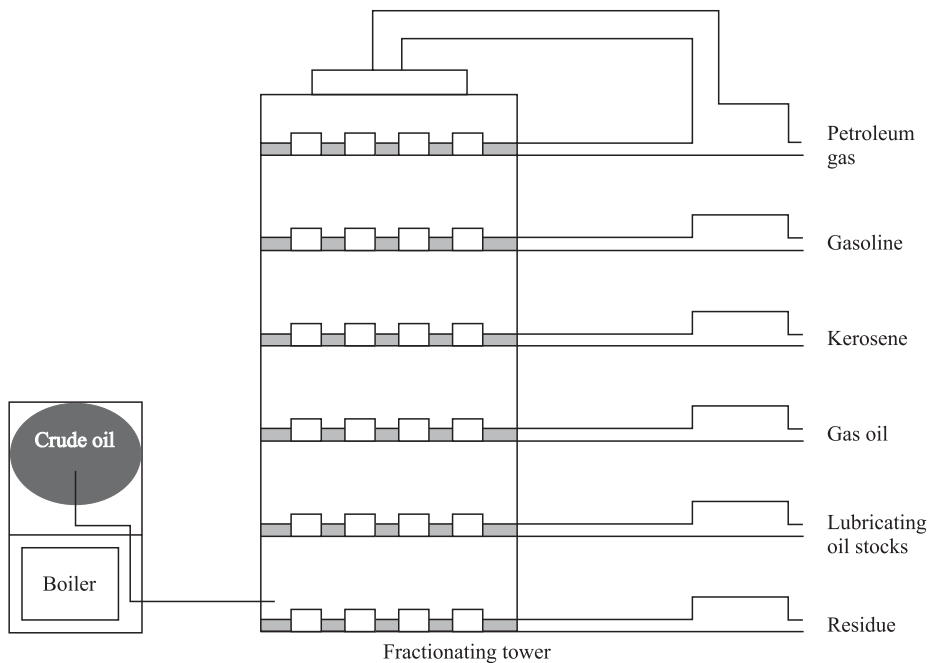


Figure 1

23. According to the passage, the temperature at which gasoline condenses is most likely:
- less than 0°C .
 - less than 40°C .
 - greater than 20°C .
 - greater than 70°C .
24. According to the passage, which by-product formed in the fractionating tower condenses first?
- Petroleum gas
 - Kerosene
 - Gas oil
 - Residue

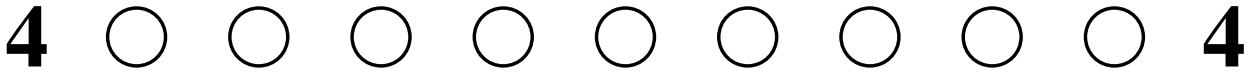
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25. According to Figure 1, fractional distillation uses which of the following as a raw material?
- A. Gasoline
 - B. Residue
 - C. Crude oil
 - D. Gas oil
26. Given that naphtha, another by-product of petroleum distillation, has a condensation point of approximately 90°C , between which two petroleum by-products would this substance be found in a fractionating tower?
- F. Gasoline and kerosene
 - G. Lubricating oil stocks and gas oil
 - H. Kerosene and gas oil
 - J. Residue and lubricating oil stocks
27. According to the passage, at what temperature is most of the crude oil vaporized?
- A. 600°C
 - B. 300°C
 - C. 100°C
 - D. 20°C
28. According to the passage, as the vapor rises in the fractionating tower:
- F. the condensation temperature increases only.
 - G. the condensation temperature decreases only.
 - H. the condensation temperature increases quickly, then slowly decreases.
 - J. the condensation temperature remains stable at 600°C .



PASSAGE VI

Scientists theorize that the release of X-rays by distant stars and the amount of distortion or “bending” the X-rays endure as they travel out of their solar system can help indicate the presence of planets orbiting these stars. The distortion of the X-rays would be caused by the gravitational pull exerted by the planets. Specifically, high ‘bending’ in these rays would indicate the presence of large planets, while a low level of bending would most likely signify the presence of smaller planets.

In addition to determining whether or not there are planets circling a distant star, the amount of X-ray distortion can determine the planets’ orbital pattern. A circular orbit produces increasing or decreasing distortions of the same level. For instance, if a star’s X-rays are bent 1 meter the first day, 2 meters the fourth day, 4 meters the seventh day, and so on, it indicates a circular orbit. See Figure 1. If however, the pattern of bending is random, as in a bending of 5 meters the first day, 3 meters the second day, 0 meters the third day, and 7 meters the fourth day, then the planet’s orbit is elliptical. See Figure 2. Further, if the paths of the X-rays are not bent in any way, it is assumed that the star lacks any planets.

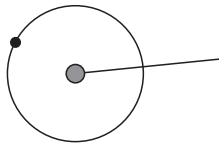


Figure 1 Circular orbit

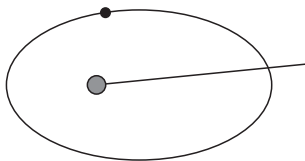


Figure 2 Elliptical orbit

Table 1 shows the amount of distortion of X-rays released by 4 different stars over a period of 10 days.

| | X-ray distortion (m) | | | |
|--------|----------------------|-------|-------|--------|
| | Day 1 | Day 4 | Day 7 | Day 10 |
| Star 1 | 1.00 | 1.75 | 2.50 | 3.25 |
| Star 2 | 0.00 | 0.00 | 0.00 | 0.00 |
| Star 3 | 8.00 | 4.00 | 2.00 | 1.00 |
| Star 4 | 0.20 | 0.10 | 0.11 | 0.11 |

Note: Assume that there are no other objects that could affect the X-rays.

29. According to Table 1, which star most likely has no planets?
 - A. Star 1
 - B. Star 2
 - C. Star 3
 - D. Star 4

30. Based on the information in the passage, how many of the stars listed in Table 1 have at least one planet with a circular orbit?
 - F. 0
 - G. 2
 - H. 3
 - J. 4

31. Which of the following statements is best supported by information in the passage?
 - A. Star 3 is likely orbited by at least one large planet.
 - B. Star 4 has a circular orbit.
 - C. Star 1 has an elliptical orbit.
 - D. Star 2 is likely orbited by several small planets.

32. If X-ray distortion were observed for an additional three days, one could predict that the path of the X-rays produced by Star 1 on day 13 would be distorted by:
 - F. 0.75 meters.
 - G. 1.00 meter.
 - H. 3.75 meters.
 - J. 4.00 meters.

33. According to information in the passage, which of the following assumptions could be true?
 - A. X-rays are affected by certain physical forces.
 - B. X-rays are simply bits of energy and are, therefore, unaffected by physical forces.
 - C. Planets with elliptical orbits are more common than are planets with circular orbits.
 - D. The presence of planets orbiting a star can only be detected using X-ray distortion.

34. Based on information in the passage, which of the following stars most likely has at least one planet with an elliptical orbit?
 - F. Star 2 only
 - G. Star 4 only
 - H. Stars 1 and 3 only
 - J. Stars 1, 3, and 4 only

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PASSAGE VII

Bacteria can be categorized by how they respond, as indicated by reproduction and growth, to certain temperatures. They are grouped into four categories—psychrophiles, psychrotrophs, mesophiles, and thermophiles—based on their growth response to certain temperatures. Minimal growth temperature is the lowest point at which the bacteria will reproduce. Optimum growth point is the temperature at which the bacteria reproduce most efficiently. Maximum growth point is the very highest temperature to which the bacteria will respond, beyond which the bacteria will not reproduce at all. Table 1 lists the types of bacteria as well as the growth points for each.

Table 2 represents a list of common bacteria and their growth points.

| Table 1 | | | |
|------------------------------|---------|---------|----------|
| Growth points or ranges (°C) | | | |
| Classifications | Minimum | Optimum | Maximum |
| Psychrophile | below 0 | 10–15 | below 20 |
| Psychrotroph | 0–5 | 15 | 30 |
| Mesophile | 5–25 | 18–45 | 30–50 |
| Thermophile | 25–45 | 50–60 | 60–90 |

| Table 2 | | | |
|-----------------------------------|---------|---------|---------|
| Cardinal growth points (°C) | | | |
| Bacteria name | Minimum | Optimum | Maximum |
| <i>Anoxybacillus flavithermus</i> | 30 | 60 | 72 |
| <i>Bacillus flavothermus</i> | 30 | 60 | 72 |
| <i>Clostridium perfringens</i> | 15 | 45 | 50 |
| <i>Escherichia coli</i> | 10 | 37 | 45 |
| <i>Listeria monocytogenes</i> | 1 | 34 | 45 |
| <i>Micrococcus cryophilus</i> | 0 | 15 | 30 |
| <i>Staphylococcus aureus</i> | 10 | 37 | 45 |
| <i>Streptococcus pyogenes</i> | 20 | 37 | 40 |
| <i>Streptococcus pneumoniae</i> | 25 | 37 | 42 |

35. The category of bacteria appearing the most frequently in Table 2 is:
- psychrophile.
 - psychrotroph.
 - mesophile.
 - thermophile.
36. The type of bacteria found in Table 2 that does not fit exactly into any of the categories listed in Table 1 is:
- Clostridium perfringens*.
 - Listeria monocytogenes*.
 - Micrococcus cryophilus*.
 - Streptococcus pneumoniae*.
37. Average human body temperature is 40°C. According to Table 2, which of the following bacteria would grow most successfully in the human body?
- Anoxybacillus flavithermus*.
 - Clostridium perfringens*.
 - Escherichia coli*.
 - Listeria monocytogenes*.
38. A new bacteria was discovered by scientists. It reproduces best at 55°C and does not show any new growth if exposed to temperatures above 65°C. This bacteria can most likely be categorized as a:
- psychrophile.
 - psychrotroph.
 - mesotroph.
 - thermophile.

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39. Based on the information in Table 2, which bacteria has the smallest growth range?

- A. *Listeria monocytogenes*.
- B. *Micrococcus cryophilus*.
- C. *Streptococcus pneumoniae*.
- D. *Streptococcus pyogenes*.

40. According to information provided in the passage, *Listeria monocytogenes* stop reproducing at what temperature?

- F. $>1^{\circ}\text{C}$, but $<10^{\circ}\text{C}$
- G. $>10^{\circ}\text{C}$, but $<34^{\circ}\text{C}$
- H. $>34^{\circ}\text{C}$, but $<45^{\circ}\text{C}$
- J. $>45^{\circ}\text{C}$

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