## ENGLISH TEST

*45 Minutes—75 Questions*

**DIRECTIONS:** In the five passages that follow, certain words and phrases are underlined and numbered. In the right-hand column, you will find alternatives for the underlined part. In most cases, you are to choose the one that best expresses the idea, makes the statement appropriate for standard written English, or is worded most consistently with the style and tone of the passage as a whole. If you think the original version is best, choose "NO CHANGE." In some cases, you will find in the right-hand column a question about the underlined part. You are to choose the best answer to the question.

You will also find questions about a section of the passage, or about the passage as a whole. These questions do not refer to an underlined portion of the passage, but rather are identified by a number or numbers in a box.

For each question, choose the alternative you consider best and fill in the corresponding oval on your answer document. Read each passage through once before you begin to answer the questions that accompany it. For many of the questions, you must read several sentences beyond the question to determine the answer. Be sure that you have read far enough ahead each time you choose an alternative.

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PASSAGE I

**Our "Grand" Vacation**

"We're going on a vacation," I told my husband.

"Really?" he said, not putting down the newspaper, "Where are *you* going?"

I wasn't deterred. "The Grand Canyon," I announced firmly. Actually[1], I hadn't decided anything of the sort. We'd just received a package offer in the mail for hotel accommodations and meals at Grand Canyon Village, and I was desperate for a break. The location didn't matter, the[2] important thing was to get out of town. Fortunately, after a little cajoling, my husband took the bait. Neither of us had ever saw[3] the Grand Canyon, and we thought it would be a great experience for the whole family.

In less than two weeks, we were on our way to northwest Arizona, home of Grand Canyon National Park. Our first stop was Williams, Arizona. From there, we would take the train (the one we had seen earlier)[4] up to Grand Canyon Village, spend the night, than return[5] to Williams the following day. It sounded simple. What it

1. (A) NO CHANGE
   B. With that
   C. All in all
   D. Supposedly

2. F. NO CHANGE
   G. matter the
   (H) matter; the
   J. matter, just the

3. A. NO CHANGE
   B. have saw
   C. seeing
   (D) had seen

4. F. NO CHANGE
   G. train (which was fast)
   H. train (the best way to travel)
   (J) train

5. A. NO CHANGE
   (B) then return
   C. than returning
   D. then be returned



GO ON TO THE NEXT PAGE.

ended up being was wonderful.

The adventure began as soon as we arrived. The steam train took us approximately sixty winding miles up to the Village. Emma, our youngest, was <u>in seventh heaven,</u> [6] "It's just like Thomas," she grinned. It was a little harder to impress her older sister, <u>so that</u> [7] a banjo player and a cheese Danish soon put a smile on Grace's face as well. I settled in, determined to enjoy this vacation.

Once at the Village, the views <u>captivated</u> [8] my husband, who became lost in the workings of his camera. Emma was most fascinated by watching the <u>animals wild</u> [9] deer wandered past our hotel room, and rabbits and squirrels ran seemingly everywhere. Grace, on the other hand, decided to climb every tree she could swing herself into. I was enchanted <u>by</u> [10] the tiniest thing of <u>all looking:</u> [11] down, while my husband tried to snap the perfect sunset, I thought I saw a miniature seashell buried in the rock at my feet. The inside of the shell had an <u>iridescent</u> [12] sheen, and I quickly took the camera from my husband to photograph such an odd-looking "rock."

The next day, we walked out to one of the spectacular view sites overlooking the Grand Canyon. While my husband took more photos of the sprawling vista, I again looked down at my feet. This time, there was no <u>confusion or</u> [13] doubt. The ground was covered with dozens

6. Which of the alternatives provides the most specific information while maintaining the tone of the essay?
   - F. NO CHANGE
   - G. decidedly intrigued.
   - H. happy.
   - J. most interested.

7.
   - A. NO CHANGE
   - B. whereby
   - C. but
   - D. except for

8. Which of the following alternatives to the underlined portion would be LEAST acceptable?
   - F. enthralled
   - G. confined
   - H. bewitched
   - J. dazzled

9.
   - A. NO CHANGE
   - B. animals, wild
   - C. animals. Wild
   - D. animals, the wild

10.
   - F. NO CHANGE
   - G. of
   - H. for
   - J. OMIT the underlined portion.

11.
   - A. NO CHANGE
   - B. all: looking
   - C. all, while looking
   - D. all looking;

12.
   - F. NO CHANGE
   - G. (Place after *inside*)
   - H. (Place after *sheen*)
   - J. (Place after *husband*)

13.
   - A. NO CHANGE
   - B. doubt by which to be confused
   - C. confusing doubt
   - D. OMIT the underlined portion.



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of tiny shells and the traces of tiny plants, all seemingly fused into the surrounding rock, which, strangely, looked like a frozen sea bed. I was amazed – surely I was imagining things. [14] There was no sea anywhere near here. How could these be shells?

As it turns out, they were, indeed, shells: 260 million-year-old seashells, as a matter of fact. A park ranger informed us that the entire region was once covered in a shallow sea. The shells I had found were fossils – reminders of a time when the West was a different place with a very different environment. I had accidentally stumbled upon a visible reminder of a long ago era. With that glimpse, my little vacation to the Grand Canyon became far grander than I had expected.

14. Given that all are true, which of the following additions to the preceding sentence (replacing the period) would be most relevant?

F. because the ocean is full of interesting creatures.
G. because my imagination often got the better of me, especially while on vacation.
(H) because we had driven through the dry, barren Mojave Desert to reach the Grand Canyon.
J. because the Grand Canyon was a very popular tourist attraction.

Question 15 asks about the preceding passage as a whole.

15. Suppose the writer's goal had been to write a brief essay comparing the Grand Canyon to other national parks. Would this essay successfully fulfill that goal?

(A) No, because the essay focuses on the writer's personal experiences at the Grand Canyon only.
B. No, because there is no mention of the Grand Canyon being a national park.
C. Yes, because the primary focus of the essay is how interesting Grand Canyon National Park can be.
D. Yes, because the essay mentions the Mojave Desert, which is also a national park.



GO ON TO THE NEXT PAGE.

PASSAGE II

## George Bernard Shaw and Spelling Reform

[1]

George Bernard Shaw was one of the most prominent figures in 20th-century literature. His literary accomplishments ranging[16] from creating numerous influential dramatic works to composing several essays and novels. He won the Nobel Prize in 1925 for literature. In addition to being an influential author, Shaw was an outspoken supporter of socialist reform. He defended a multitude of causes, including women's rights, the abolishment of private property, and most surprising[17], the modification of the English alphabet.

[2]

[1] Like other advocates of spelling reform, Shaw believed that the English system of orthography, or spelling, was needlessly complicated. [2] Some words, like "threw" and "through," sound the same but have different spellings. [3] Others, like "read" or "wind," have different sounds depending on their meaning. [18] [4] Even individual letters may have more than one sound associated with it[19], or, depending on the word, may not be sounded at all. [5] Shaw believed that this complexity made the English language unnecessarily difficult to learn and write correctly. [6] He wanted a more phonetic approach to English spelling, where each sound would have a distinct symbol to represent it. [7] Besides which, Shaw[20] was not content merely to simplify the current system of letters.

16. F. NO CHANGE
    G. will range
    H. in ranging
    **J. ranged**

17. A. NO CHANGE
    **B. most surprisingly**
    C. the more surprising
    D. more of a surprise

18. If the writer deletes the phrase ", like 'threw' and 'through,'" from sentence 2 and also deletes ", like 'read' or 'wind,'" from sentence 3, the essay would lose details that are:

    F. inconsistent in tone.
    **G. helpful in understanding the essay.**
    H. essential dialogue.
    J. irrelevant in context.

19. A. NO CHANGE
    B. for it
    **C. with them**
    D. OMIT the underlined portion.

20. F. NO CHANGE
    G. Due to this, Shaw
    **H. However, Shaw**
    J. Being that Shaw

[8] He thought a radical break was necessary, otherwise people might think the new system was just a series of misspellings. [9] Shaw wanted a new alphabet, completely separate from the Latin (based) system familiar to us all.
21

[3]

Shaw died in 1950, and having never invented the
22
simplified alphabet he imagined. However, he set aside a £500 cash prize in his will for the winner of a competition to create it. In 1958, Kingsley Read won the prize with a
23
completely new alphabet of over 40 characters. More money from Shaw's estate was used to transcribe one of
24
his plays using this unique alphabet. However, Shaw's heirs disagreed with the wisdom of spending so
25
much money to replace a perfectly useful alphabet. They successfully contested the will, and no further plays were published in what became called by and known as the
26
Shaw Alphabet.

[4]

As developed by Read, the Shaw Alphabet contains 48 letters – each with only one pronunciation, as well as eight
27
different vowel markers. As Shaw had specified, it is essentially a purely phonetic system. Although it is
28
unlikely that it will ever completely replace the current English alphabet, many linguists remain fascinated with

21. A. NO CHANGE
(B.) Latin-based
C. Latin, based
D. Latin based,

22. F. NO CHANGE
G. for having
H. but having
(J.) having

23. A. NO CHANGE
B. them.
(C.) such an alphabet.
D. this.

24. Which of the following alternatives to the underlined portion would be LEAST acceptable?

F. reproduce
G. duplicate
(H.) record
J. re-write

25. (A.) NO CHANGE
B. the heirs of Shaw had a disagreement with the wisdom
C. Shaw's heirs, with the wisdom, they disagreed
D. the heirs of Shaw, they disagreed with the wisdom

26. F. NO CHANGE
G. named for Shaw and
H. the name of and
(J.) OMIT the underlined portion.

27. A. NO CHANGE
B. pronunciation as well –
(C.) pronunciation – as well
D. pronunciation as well,

28. (F.) NO CHANGE
G. pure phonetic
H. purely phonetically
J. pure phonetically



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the Shaw Alphabet and it's[29] attempt to produce word constructions that correspond precisely to spoken sounds.

29. A. NO CHANGE
B. its
C. its'
D. their

Question 30 asks about the preceding passage as a whole.

30. For the sake of the logic and coherence of the essay, Paragraph 4 should be placed:
F. where it is now.
G. before Paragraph 1.
H. before Paragraph 2.
J. before Paragraph 3.

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PASSAGE III

**Dangerous Mold**

I first read about toxic mold years ago, but never thought much of it. Until, that is, a pipe burst in my office's basement, flooding cardboard boxes filled with old files. The water damage[31] wasn't noticed right away, and by the time we started cleaning up, thick black mold was growing on the walls. Standing there with my colleague, staring and[32] gawking at the fuzzy patterns of growth, the words "toxic mold" echoed in my mind. I immediately decided to do a little research. It turns out that toxic mold is actually a fungus. Scientists[33] call it *Stachybotrys chartarum*. It would just be a greenish-black reminder to fix your pipes if it weren't for one thing: *Stachybotrys chartarum* produces a nasty substance called a *mycotoxin*. *Mycotoxins* are extremely dangerous to human and animal health. The toxins produced by *Stachybotryschartarum* have been found to cause illnesses.[34] Not my idea of fun.

31. A. NO CHANGE
B. damaged by
C. damaging
D. whose damage

32. F. NO CHANGE
G. staring while
H. gazing intently and
J. OMIT the underlined portion.

33. Which of the following alternatives to the underlined portion would NOT be acceptable?
A. fungus; scientists
B. fungus, and scientists
C. fungus that scientists
D. fungus; the scientists

34. At this point, the writer would like to provide specific information about the harmful effects of toxic mold. Which alternative does that best?
F. NO CHANGE
G. suppress the immune system, disrupt cell function, and cause numerous other health problems.
H. be caused by fungus proliferation under the proper conditions.
J. create health issues for people who come into contact with it.



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With a little digging, I found the story I had read so many years ago. [35] In the late 1980s, an outbreak of toxic mold had occurred in an American home.

The family, it knew [36] something was wrong when the members all started suffering from flu-like symptoms: fever, diarrhea, and fatigue. Unlike usual flu symptoms, that [37] did not go away. Eventually, scientists discovered that the home was contaminated with *Stachybotrys chartarum*. The fungus had been growing on moist debris being that it was in [38] a cold air duct and on some wood fiber ceiling material. When the fungus was eliminated from the home, the family's symptoms [39] vanished.

Not everyone that [40] comes into contact with toxic mold is so lucky. In the mid 1990s, cases of pulmonary hemorrhage (bleeding in the lungs) occurred in Ohio in infants. Scientists later find [41] that all the homes of these babies had high levels of *Stachybotrys chartarum*. Not every scientist believes that toxic mold was directly responsible for making the Ohio children sick. Still, many researchers point to [42] this case and others to link mold exposure to bleeding in the lungs.

[43] I was convinced I wanted him to hire a professional crew to clean up our basement; I was still curious, however. How did this dangerous fungus get into the building in the first place? Had it been there all along?

35. (A) NO CHANGE
    B. many years ago, and read it again in the present time.
    C. so long ago before today.
    D. a very long time ago; in fact, many years ago.

36. F. NO CHANGE
    (G) family knew
    H. family, they knew
    J. family, knowing

37. A. NO CHANGE
    B. which
    (C) these
    D. it

38. F. NO CHANGE
    (G) in
    H. that being in
    J. and it was in

39. (A) NO CHANGE
    B. families symptoms
    C. family's symptoms'
    D. family's symptoms,

40. F. NO CHANGE
    G. which
    (H) who
    J. when it

41. A. NO CHANGE
    B. to be found
    C. would of found
    (D) found

42. (F) NO CHANGE
    G. at
    H. from
    J. OMIT the underlined portion.

43. Which of the following would provide the best transition here, guiding the reader from the topic of the previous paragraph to the new topic of this paragraph?
    A. My boss frequently took my advice about making improvements in the office.
    (B) Armed with this new information, I approached my boss about the subject of toxic mold.
    C. Although our office was not in Ohio, both my boss and I were concerned about those children.
    D. Toxic mold appeared to be very dangerous indeed.



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More research was needed. I discovered that *Stachybotrys chartarum* comes from the soil and generally enters clean buildings through floodwaters, dust, and dirt. Moreover, the fungus is there from the beginning, brought in on the materials when the structure is built. It's usually only noticed after water damage occurs, like in our basement. Now I knew how the fungus got there – and I was keeping my distance!

44. F. NO CHANGE
G. Sometimes
H. Additionally
J. However

45. A. NO CHANGE
B. They're
C. Its
D. Its'

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PASSAGE IV

**The "Readjustment" Policy**

Most people know about how the civil rights movement changed life of African Americans. However, they might not know that the same ideas were turned towards other minorities during the same time period. For example, the government developed a policy called "readjustment" for Native Americans. This policy came about as a direct result of the larger African American civil rights movement, their was greater awareness that all Americans should be allowed to exercise the rights guaranteed by the United States Constitution. To its credit, the readjustment policy recognized that life on reservations prevented Native Americans from exercising those rights. Unfortunately, not everyone was convinced that readjustment was the best solution.

Well before the 1950s, reservations had created segregation that was just as damaging as the racially segregated schools found all across the country. The

46. F. NO CHANGE
G. into
H. for
J. with

47. A. NO CHANGE
B. there
C. they're
D. It

48. F. NO CHANGE
G. being that it was just as damaging
H. just by being more damaging
J. OMIT the underlined portion.

supporters of readjustment believed that this segregation had to end in order to benefit both Native Americans; and [49] society as a whole. They argued that ending the federal government's involvement in Native American affairs would help assimilate [50] Native Americans into mainstream society. In their view, if it was beneficial for African American children to be placing in [51] schools with white children, then it was also beneficial for Native Americans to become integrated into white society.

[1] Similarly, [52] unlike the African American civil rights movement, which arose from black people themselves, readjustment was a policy from the American government that was imposed on Native Americans without their input. [2] Thus, the [53] policy failed to recognize a new generation of Native American leadership. [3] In fact, this new leadership did not want assimilation but rather more segregation. [4] The Native American community feel [54] it was in its best interest to reclaim its distinct identity and separate itself from mainstream America, while developing tribal institutions and reaffirming tribal identity. [55]

These two trends began to clash as the federal government began pushing tribal communities to accept readjustment. The government suggested to tribal leadership that it would be in the tribes' best interest to own real property and pay taxes on it like all property owners. Legally, the government owned tribal lands but offered to donate it to the tribes without charge. [56]

49. A. NO CHANGE
    B. Native Americans: and
    C. Native, Americans, and
    D. Native Americans and

50. Which of the following alternatives to the underlined portion would be LEAST acceptable?
    F. incorporate
    G. fit
    H. conform
    J. blend

51. A. NO CHANGE
    B. placed in
    C. placed for
    D. placing

52. F. NO CHANGE
    G. Unfortunately
    H. Likewise
    J. Thankfully

53. A. NO CHANGE
    B. Thus – the
    C. Thus; the
    D. Thus the

54. F. NO CHANGE
    G. feels
    H. felt
    J. in feeling

55. Which of the sentences in this paragraph would most effectively introduce a new paragraph detailing the contrasting goals of the federal government and the Native Americans?
    A. Sentence 1
    B. Sentence 2
    C. Sentence 3
    D. Sentence 4

56. F. NO CHANGE
    G. free of charge
    H. without charging them
    J. OMIT the underlined portion.



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The Native American leadership did not except[57] the offers of land ownership. They believed that land ownership would cause reservation territory to recede.[58]

57. A. NO CHANGE
(B) accept
C. with the exception of
D. have an acceptance of

58. Which of the alternatives to the underlined portion would be LEAST acceptable?

F. be reduced
G. shrink
(H) draw back
J. decrease

Land could be lost because of taxation which[59] could create new financial burdens resulting in foreclosures. Land could also be lost when property owners sold to non-Native Americans. For this and other reasons, Native American leadership saw individual land ownership as a sure route[60] to the destruction of their community and culture.

59. A. NO CHANGE
(B) taxation, which
C. taxation; which
D. taxation. Which

60. (F) NO CHANGE
G. route surely
H. route by being sure
J. sure enough route

---

PASSAGE V

## The Secret Life of Cells

All living things are made of cells. In fact, the cell is the basic unit of life and is the simplest unit capable of independent existence. Some one-celled organisms can lead independent lives. Others[61] live in loosely organized groups, depending on one another in order to function. In more complex organisms like plants and animals, cells are no longer independent. Instead, they become specialized, with strict organization and specific jobs to perform. Certain cell types are grouped into tissues, and these tissues form organs. Other cell types stay more or less discrete, becoming blood cells or antibodies, for example.

61. Which of the following alternatives to the underlined portion would NOT be acceptable?

A. lives; others
B. lives, while others
(C) lives, others
D. lives, but others

Regardless of specialization, cells all work together to form the body of one living thing. [62]

62. At this point, the writer is considering adding the following true statement:

    In this, they are remarkably similar to their distant, one-celled cousins.

    Should the writer make this addition here?

    F. Yes, because all living things are made up of cells.
    G. Yes, because it provides information necessary to the understanding of cells.
    (H) No, because it will distract the reader from the main idea of the essay.
    J. No, because it contradicts statements made previously in the essay.

All cells, even those that are [63] specialized cells in a large, multi-cellular creature, have several things in common. For example, all cells are composed of approximately 90% water. A thin, protective covering called a membrane enclosing [64] every cell. In plant cells, this membrane is called the *cell wall*. The complete contents of a cell is [65] called the *protoplasm*. Most cells have a structure called a *nucleus*, which contains the cell's [66] genetic program, or instructions, that tell a cell what to do. The part of the protoplasm outside the nucleus is called the *cytoplasm*.

63. A. NO CHANGE
    (B) even the
    C. even the ones being
    D. even if they are

64. F. NO CHANGE
    G. enclose
    (H) encloses
    J. encloses with

65. A. NO CHANGE
    B. will be
    C. being
    (D) are

66. (F) NO CHANGE
    G. cells'
    H. cells
    J. cell

Just as all living things are made up of cells, every new cell is produced from an existing cell. Cells reproduce by dividing. So [67] that one cell becomes two, and so on. When a cell divides, each of the two newly produced cells get [68] a copy of the genetic program. While a human body is made up of more than 10 trillion cells with thousands of specialized functions, each cell has exactly the same genetic program in their [69] nucleus. It's just that, for reasons

67. A. NO CHANGE
    (B) dividing, so
    C. dividing; so
    D. dividing so,

68. F. NO CHANGE
    (G) gets
    H. getting
    J. got

69. A. NO CHANGE
    B. they're
    C. it's
    (D) its



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not completely understood, certain cells follow one set of genetic directions, while other cells, they follow other directions. [70]

The genetic program is "written" in a chemical substance called DNA. All DNA looks much alike and is made up of the same protein building blocks. But the genetic program carried in DNA makes almost every living thing unique. [71] Scientists understand much about a cell's genetic program and the chemical code carried by its DNA. It [72] can alter a cell's genetic program so that the organism develops new characteristics. These new traits can have commercially important uses. For example, researchers have developed by creating [73] genetically engineered varieties of tomatoes that stay fresh longer than normal varieties. Scientists even hope to eventually control cancer and other diseases by correcting [74] mistakes in the genetic program of certain cells.

70. F. NO CHANGE
    G. but some other cells follow other directions that are different.
    H. and a different set of directions are followed by other cells.
    J. and other cells follow a different set of directions.

71. Which of the following alternatives to the underlined portion would be LEAST acceptable?
    A. special
    B. singular
    C. solitary
    D. different

72. F. NO CHANGE
    G. One
    H. These researchers
    J. When they

73. A. NO CHANGE
    B. created
    C. and creating
    D. OMIT the underline portion.

74. F. NO CHANGE
    G. that corrected
    H. who corrected
    J. in the correction of

Question 75 asks about the preceding passage as a whole.

75. Suppose the writer's goal had been to write an essay detailing the research being conducted in genetic engineering. Would this essay successfully fulfill the writer's goal?
    A. Yes, because genetic engineering is outlined in the last paragraph.
    B. Yes, because such research is currently being conducted.
    C. No, because the essay refutes the existence of genetic engineering.
    D. No, because that topic is beyond the scope of the essay.

**END OF TEST 1**

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

## MATHEMATICS TEST

*60 Minutes—60 Questions*

**DIRECTIONS:** Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose, but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

---

**DO YOUR FIGURING HERE.**

1. $|6-9| - |9-6| = ?$

   A. $-8$
   B. $-6$
   C. $-3$
   D. $0$
   E. $6$

*Explanation:*
$|-3| - |3| = 3 - 3 = 0$

2. An accountant charges \$38 for each hour she works on a client's taxes, plus a flat \$25 fee. How many hours of work are included in a \$215 bill?

   F. $3\frac{2}{5}$
   G. $5$
   H. $5\frac{3}{5}$
   J. $7$
   K. $8\frac{3}{5}$

*Explanation:*
Total = 38h + 25
215 = 38h + 25
5 = h

3. Vehicle X is traveling at a rate of 75 miles per hour, and Vehicle Y is traveling at a rate of 60 miles per hour. At these rates, how much longer will it take Vehicle Y to make a 900-mile trip?

   A. 3 hours
   B. 8 hours
   C. 12 hours
   D. 15 hours
   E. 27 hours

*Explanation:*
Vehicle X: $900 = 75T$; $T = 12$
Vehicle Y: $900 = 60T$; $T = 15$
15 - 12 = 3 hours

4. $3b^3 - 27b^2 + 49 - 18b^3 + 32b^2$ is equivalent to:

   F. $39b^3$
   G. $39b^{11}$
   H. $-15b^3 + 5b^2 + 49$
   J. $-15b^6 - 5b^2 + 49$
   K. $-21b^3 + 5b^2 + 49$

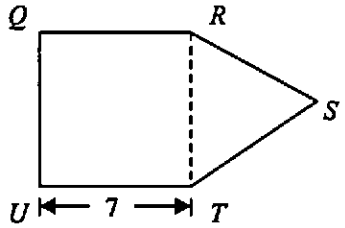
*Explanation:*
Rearrange and collect like terms:
$= 3b^3 - 18b^3 - 27b^2 + 32b^2 + 49$
$= -15b^3 + 5b^2 + 49$



GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

5. The figure below is composed of square *QRTU* and equilateral triangle $\Delta RST$. The length of *TU* is 7 centimeters. What is the perimeter of *QRSTU*, in inches?




A. 49
B. 42
C. 35
D. 28
E. 21

*Explanation:*

Perimeter = 3 sides of square + 2 sides of triangle

P = 3(7) + 2(7) = 35

6. The expression $(3n + 4)(n - 3)$ is equivalent to:

F. $3n^2 - 7$
G. $3n^2 - 12$
H. $3n^2 - 4n - 7$
J. $3n^2 - 5n - 12$
K. $3n^2 + 5n - 12$

*Explanation:*

FOIL

$3n^2 - 9n + 4n - 12 = 3n^2 - 5n - 12$

7. If 60% of a given number is 18, then what is 21% of the given number, to the nearest tenth?

A. 2.3
B. 3.8
C. 4.0
D. 6.3
E. 7.0

*Explanation:*

(60/100)*n = 18; n = 30

(21/100)*30 = x; x = 6.3

8. Seven consecutive integers add up to 588.

$x - 2$
$x - 1$
$x$
$x + 1$
$x + 2$
$x + 3$
$x + 4$

What is the value of the largest integer?

F. 88
G. 87
H. 85
J. 83
K. 81

*Explanation:*

(x-2) + (x-1) + x (x+1) + (x+2) + (x+3) + (x+4) = 588

7x + 7 = 588; x = 83

x + 4 = 83 + 4 = 87 (largest integer)

9. In the standard $(x, y)$ coordinate plane, point *E* with coordinates (4, 1) is the midpoint of *CD*, and *C* has coordinates (–3, 4). What are the coordinates of *D*?

A. (–11, 2)
B. (–10, 7)
C. (0.5, 2.5)
D. (1, 5)
E. (11, –2)

*Explanation:* Use midpoint formula

4 = (-3+x)/2; x = 11

1 = (4+y)/2; y = -2

10. Rectangle *LMNO* has vertices at *L*(2, 6), *M*(5, 3), and *N*(0, –4). What are the coordinates of vertex *O*?

F. (–3, –1)
G. (–1, 3)
H. (0, 0)
J. (1, –5)
K. (3, –7)

*Explanation:*

Quickly sketch the graph and see that O must lie in the third quadrant with a negative x-value and y-value.



GO ON TO THE NEXT PAGE.

**11.** The student bookstore carries books for three courses (A, B, and C) offered at a local community college. Each course is offered in two semesters (X and Y). The matrices below show the number of books required for each course and the number of students enrolled in each course section. What is the minimum total number of books the bookstore needs to have in stock to meet the demand for both semesters?

DO YOUR FIGURING HERE.

$$\begin{array}{c} \\ X \\ Y \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 120 & 250 & 165 \\ 105 & 269 & 135 \end{bmatrix} \end{array} \qquad \begin{array}{c} \text{Books} \\ \begin{array}{c} A \\ B \\ C \end{array}\begin{bmatrix} 3 \\ 5 \\ 7 \end{bmatrix} \end{array}$$

A. 6,810
B. 5,370
C. 4,157
D. 2,765
E. 2,605

*Explanation:*

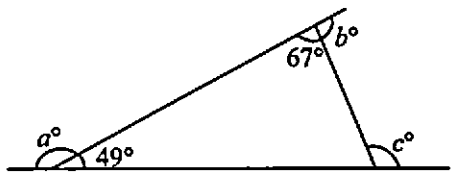
Course A: 120(3) + 105(3) = 675

Course B: 250(5) + 269(5) = 2595

Course C: 165(7) + 135(7) = 2100

TOTAL = 675 + 2595 + 2100 = 5370

**12.** Given the triangle shown below with exterior angles that measure $a°$, $b°$, and $c°$ as shown, what is the sum of $a$, $b$, and $c$?




F. 180
G. 244
H. 311
J. 360
K. Cannot be determined from the given information.

*Explanation:*

***d* = not labelled third interior angle**

a = 180 - 49 = 131

b = 180 - 67 = 113

c = 180 – d

d = 180 - (67 + 49) = 64

c = 180 - 64 = 116

116 + 113 + 131 = 360



GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

Use the following information to answer questions 13-15.

A poll of 150 registered voters was taken before the election for the school board president for Jennings School District. All 150 voters indicated which one of the four candidates they would vote for. The results of the poll are given in the table below.

| Candidate | Number of voters |
|---|---|
| Guerrero | 45 |
| Sandoval | 30 |
| Perez | 60 |
| Anderson | 15 |

13. What percent of the voters polled chose Guerrero in the poll?

A. 10%
B. 20%
C. 30%
D. 40%
E. 45%

*Explanation:*

Percent = 45/150 * 100 = 30%

14. If the poll is indicative of how the 17,500 registered voters of Jennings School District will actually vote in the election, which of the following is the best estimate of the number of votes Perez will receive in the election?

F. 10,500
G. 7,000
H. 4,000
J. 3,500
K. 1,750

*Explanation:*

(60 Perez Voters)/(150 total voters) = x Perez voters/17,500 total

1,050,000 = 150x

7,000 = x

15. If the information in the table were converted into a circle graph (pie chart), then the central angle of the sector for Sandoval would measure how many degrees?

A. 20°
B. 30°
C. 60°
D. 72°
E. 108°

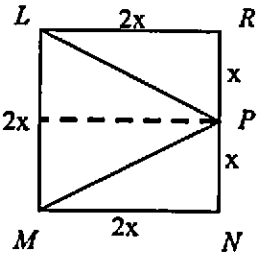
*Explanation:*

(30 Sandoval voters)/(150 total voters) = x degrees/360 degrees

x = 72 degrees

DO YOUR FIGURING HERE.

16. In square *LMNR* shown below, *P* is the midpoint of *RN*. Which of the following is the ratio of the area of $\Delta MPL$ to the area of $\Delta MPN$?




F. 1:2
G. 1:1
H. 2:1
J. 3:1
K. 4:1

*Explanation:* NOTE dashed line and x and 2x labels added to figure

Area triangle MPL = 1/2(2x)(2x) = $2x^2$

Area triangle MPN = 1/2(x)(2x) = $x^2$

$2x^2 : x^2$; 2:1

17. Which of the following is the slope of a line parallel to the line $y = \frac{3}{4}x - 2$ in the standard $(x, y)$ coordinate plane?

A. –2

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

C. 3

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

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

*Explanation:*

m = 3/4

Parallel lines have the same slopes.

18. Ashia cut 27 feet of fabric into three pieces. The ratio of the lengths of the three pieces is 2:3:4. What is the length, to the nearest foot, of the shortest piece?

F. 3
G. 6
H. 9
J. 12
K. 15

*Explanation:*

2x + 3x + 4x = 27; x = 3

Shortest piece = 2(3) = 6

19. What is the largest integer less than $\sqrt{73}$?

A. 37
B. 10
C. 9
D. 8
E. 7

*Explanation:*

Use calculator

Sqrt(73) = 8.544

20. A local county park wants to build a beach volleyball court. The dimensions of the court are 49.5 feet by 79 feet. The sand must be 1.5 feet deep. If a bag of sand covers 500 cubic feet, how many bags of sand does the county park need to buy?

F. 6
G. 8
H. 10
J. 12
K. 14

*Explanation:*

V = (79*49.5*1.5) = 5865.75

5865.75/500 = 11.7 = 12 bags



GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

21. What values of $x$ are solutions for $x^2 - 2x = 15$ ?

A. –5 and 3
B. –3 and 5
C. –2 and 3
D. –2 and 5
E. 13 and 15

*Explanation:*

$x^2 - 2x - 15 = 0$ FACTOR

$(x - 5)(x + 3) = 0$

$x = 5$ and $-3$

22. For all $z > 1$, the expression $\frac{4z^3}{4z^7}$ equals:

F. $\frac{1}{z^4}$
G. $-\frac{1}{z^4}$
H. $z^4$
J. $-z^4$
K. $\frac{1}{4}$

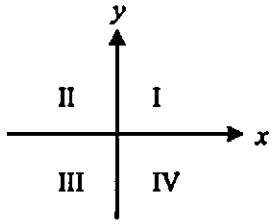
*Explanation:*

$(4z^3)/(4z^7) = z^3/z^7$

$z^{(3-7)} = z^{-4} = 1/z^4$

23. If point $A$ has a nonzero $x$-coordinate and a nonzero $y$-coordinate and the coordinates have the same sign, then point $A$ *must* be located in which of the four quadrants labeled below?

quadrants of the standard $(x, y)$ coordinate plane




A. I only
B. III only
C. I or III only
D. I or IV only
E. II or IV only

*Explanation:*

For example point A could be (-2,-6) or (10,16) in either the first or third quadrant

24. The fixed costs of manufacturing tennis rackets in a factory are \$1,600.00 per day. The variable costs are \$7.25 per tennis racket. Which of the following expressions can be used to model the cost of manufacturing $t$ tennis rackets in 1 day?

F. $\$1,607.25t$
G. $\$7.25t - \$1,600.00$
H. $\$1,600.00t + \$7.25$
J. $\$1,600.00 - \$7.25t$
K. $\$1,600.00 + \$7.25t$

*Explanation:*

Pick a number; $t = 100$

Cost = $1,600 + 7.25(100) = 2325$

(K) = 2325

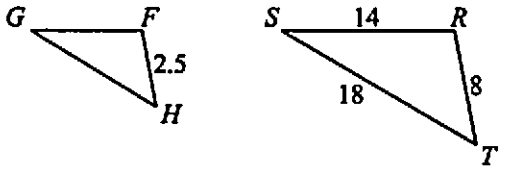


GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

25. In the figure below, $\Delta FGH \sim \Delta RST$ (the lengths given are in inches). What is the perimeter, in inches, of $\Delta FGH$?

(Note: The symbol ~ means "is similar to.")




A. 12.5
B. 15
C. 20
D. 40
E. 65.5

*Explanation:*

Perimeter of triangle SRT = 14 + 18 + 8 = 40

2.5/8 = Perimeter of triangle GFH/40

P = 12.5

26. If $\frac{4\sqrt{6}}{c\sqrt{6}} = \frac{4\sqrt{6}}{6}$ is true, then $c$ = ?

F. 36
G. 24
H. 6
J. $\sqrt{6}$
K. 1

*Explanation:*

If numerators are equal, then denominators are equal to

c(sqrt6) = 6

c = sqrt6

27. Car *A* is traveling north at 75 miles per hour. Car *B* is traveling south at 65 miles per hour. If the two cars were 700 miles apart when they started traveling, how long, in hours, will it take for them to meet?

A. 18
B. 14
C. 9
D. 8
E. 5

*Explanation:*

700 = 75T + 65T

T = 5

28. The senior class at Summerville High School is planning its 3-day senior trip. On the first day, class members can choose 1 of 5 restaurants at which to eat. On the second day, they can choose from 7 different trails to hike. On the final day, the students can shop at 1 of 8 stores. How many different schedules of activities can the senior class plan for?

F. 280
G. 140
H. 120
J. 58
K. 20

*Explanation:*

REST: 5C1 = 5

HIKE: 7C1 = 7

SHOP: 8C1 = 8

5*7*8 = 280

29. Cube C has an edge length of 3 centimeters. Cube D has an edge length triple that of Cube C. What is the surface area, in square centimeters, of Cube D?

A. 162
B. 324
C. 486
D. 648
E. 729

*Explanation:*

Cube D Length = 3*3cm = 9cm

Surface Area = $6(s^2) = 6(9^2) = 486$



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DO YOUR FIGURING HERE.

30. It costs \$1.29 to purchase $x$ ink pens and \$1.10 to purchase $y$ pencils. Which of the following is an expression for the cost of 12 ink pens and 14 pencils?

F. $\frac{\$1.29}{12+x}+\frac{\$1.10}{14+y}$

G. $\frac{14(\$1.29)}{x}+\frac{12(\$1.10)}{y}$

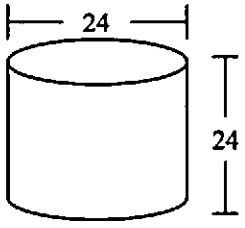
H. $\frac{14(x)}{\$1.29}+\frac{12(y)}{\$1.10}$

(J.) $\frac{12(\$1.29)}{x}+\frac{14(\$1.10)}{y}$

K. $\frac{12(\$1.10)}{x}+\frac{14(\$1.29)}{y}$

*Explanation:*
Plug in numbers: x = 4, y = 7
Buy 3 packs x and 2 packs y
1.29(3) + 1.10(2) = 6.07
(J) 12(1.29)/4 + 14(1.10)/7 = 6.07

31. A right circular cylinder is shown in the figure below, with dimensions given in inches. What is the total volume of this cylinder, in cubic inches?
(Note: $V = \pi r^2 h$)




A. $576\pi$
B. $1{,}152\pi$
C. $2{,}304\pi$
(D.) $3{,}456\pi$
E. $13{,}824\pi$

*Explanation:*
V = pi (12²)(24)
V = 3456 pi

32. Given $f(x) = 5x + 2$ and $g(x) = x^2 - 3$, which of the following is an expression for $f(g(x))$?

F. $-x^2 + 5x + 5$
G. $x^2 + 5x - 1$
(H.) $5x^2 - 13$
J. $5x^2 - 1$
K. $25x^2 + 20x + 1$

*Explanation:*
f(g(x)) = f(x² - 3) = 5(x² - 3) + 2
f(g(x)) = 5x² - 13

33. The table below shows the total number of deer seen each day during a 28-day camping trip. What is the average number of deer seen per day, to the nearest whole number?

| Total number of deer seen in a day | Number of days with this total |
|---|---|
| 0 | 5 |
| 1 | 7 |
| 2 | 3 |
| 3 | 6 |
| 4 | 4 |
| 5 | 3 |

A. 1
(B.) 2
C. 3
D. 5
E. 12

*Explanation:*
TOTAL DEER:
0(5) + 1(7) + 2(3) + 3(6) + 4(4) + 5(3) = 62
Avg. = 62/28 days = 2.214



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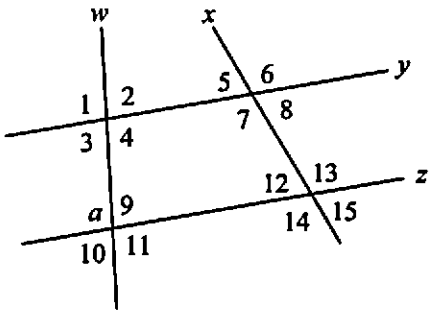
DO YOUR FIGURING HERE.

**34.** Lines $w$, $x$, $y$, and $z$ are shown below, and $y \| z$. Which of the following is the set of all angles that *must* be supplementary to $\angle a$ ?




F. {9, 10}
G. {2, 3, 9, 10}
H. {9, 10, 13, 14}
J. {2, 3, 9, 10, 13, 14}
K. {2, 3, 5, 7, 9, 10, 13, 14}

*Explanation:*

Supplementary angles = 2 angles that added together equal 180 degrees.

**35.** $(2x^2)^3$ is equivalent to:

A. $\frac{2}{3x^{\frac{2}{3}}}$
B. $6x^5$
C. $6x^6$
D. $8x^5$
E. $8x^6$

*Explanation:*

$(2x^2)^3 = 2^3 * (x^2)^3 = 8x^6$

**36.** Which of the following is equivalent to the inequality $3x - 7 < 6x + 14$ ?

F. $x > 7$
G. $x > 3$
H. $x < -3$
J. $x > -7$
K. $x < -7$

*Explanation:*

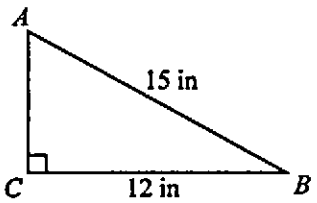
$3x - 7 < 6x + 14$

$3x < 6x + 21$

$-3x < 21$; $x > -7$

**37.** For the right triangle $\Delta ABC$ below, what is $\cos \angle A$ ?

A. $\frac{9}{15}$
B. $\frac{9}{12}$
C. $\frac{12}{15}$
D. $\frac{15}{9}$
E. $\frac{12}{9}$




*Explanation:*

$12^2 + b^2 = 15^2$

$b^2 = 81$; $b = 9$

cosA = adj/hyp = 9/15



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DO YOUR FIGURING HERE.

**38.** The graph of the solution set for the system of linear equations below is a single line in the standard $(x, y)$ coordinate plane.

$$28x - 36y = 76$$
$$7x + by = 19$$

What must be the value of $b$?

**F.** –9
**G.** –7
**H.** $\frac{1}{4}$
**J.** 4
**K.** 9

*Explanation:* Multiple second equation by 4:

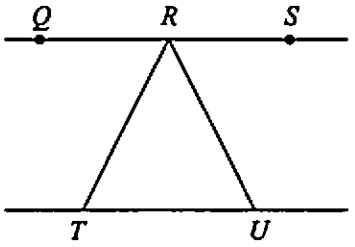
4*(7x + by = 19); 28x + 2by = 76

Set left-hand sides of both equations to one another

28x + 4by = 28x - 36y

4by = -36y; 4b = -36; b = -9

**39.** In the figure below, $R$ lies on $QS$, $RT$ bisects $\angle QRU$, and $RU$ bisects $\angle SRT$. What is the measure of $\angle QRU$?




**A.** 120°
**B.** 90°
**C.** 60°
**D.** 30°
**E.** Cannot be determined from the given information.

*Explanation:*

Angle QRT = angle TRU = angle URS

180/3 = 60 degrees per angle

Angle QRU = 60 + 60 = 120

**40.** If there are $9 \times 10^{18}$ helium molecules in a volume of $3 \times 10^{6}$ cubic centimeters, what is the average number of helium molecules per cubic centimeter?

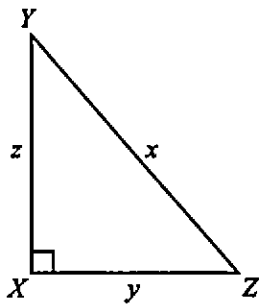
**F.** $6 \times 10^{-12}$
**G.** $3 \times 10^{3}$
**H.** $3 \times 10^{12}$
**J.** $27 \times 10^{24}$
**K.** $27 \times 10^{108}$

*Explanation:*

Avg. = $(9 \times 10^{18})/(3 \times 10^{6}) = (9/3)*(10^{18})/(10^{6}) = 3 \times 10^{12}$

**41.** A right triangle that has its sides measured in the same unit of length is shown below. For any such triangle, (tan $Z$)(cos $Y$) is equivalent to:

**A.** $\frac{z}{x}$
**B.** $\frac{yz}{x^2}$
**C.** $\frac{z^2}{xy}$
**D.** $\frac{y^2}{xz}$
**E.** $\frac{x}{z}$




*Explanation:*

Tan = opp/adj  cos = adj/hyp

TanZ = z/y  cosY = z/x

tanZ*cosY = (z/y)(z/x) = $z^2/(xy)$



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42. What rational number is halfway between $\frac{1}{6}$ and $\frac{1}{4}$ ?

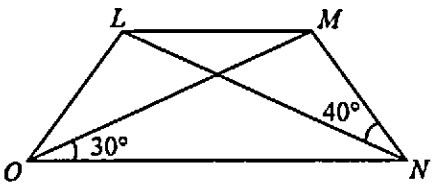
DO YOUR FIGURING HERE.

F. $\frac{1}{2}$
G. $\frac{10}{24}$
H. $\frac{5}{24}$
J. $\frac{1}{5}$
K. $\frac{3}{24}$

*Explanation:*
1/6 = 4/24 1/4 = 6/24
In the middle = 5/24

43. In isosceles trapezoid *LMNO*, *LM* is parallel to *NO*, $\angle MON$ measures 30° , and $\angle MNL$ measures 40° . What is the measure of $\angle OMN$ ?

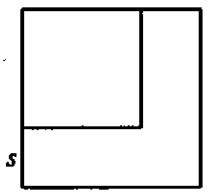
A. 120°
B. 110°
C. 90°
D. 80°
E. 70°




*Explanation:*
180 = 30 + 30 + 40 + angle OMN
180 = 100 + angle OMN
Angle OMN = 80

44. In the figure below, the area of the larger square is 48 square inches and the area of the smaller square is 12 square inches. What is *s*, in inches?

F. 36
G. 18
H. $6\sqrt{3}$
J. $2\sqrt{3}$
K. 3




*Explanation:*
Area = side$^2$
48 = b$^2$; b = 4(sqrt3)
12 = a$^2$; a = 2(sqrt3)
a + s = b; 2(sqrt3) + s = 4(sqrt3)
s = 2(sqrt3)

45. Which of the following is a rational number?

A. $\sqrt{3}$
B. $\sqrt{5}$
C. $\sqrt{\frac{36}{49}}$
D. $\sqrt{\frac{7}{49}}$
E. $\sqrt{-4}$

*Explanation:*
(sqrt36)/(sqrt49) = 6/7

46. If $d > c$, then $|c - d|$ is equivalent to which of the following?

F. $c + d$
G. $-(c + d)$
H. $\sqrt{c - d}$
J. $d - c$
K. $c - d$

*Explanation:* Pick Numbers
c = 4, d = 7
|c - d| = |4 - 7| = |-3| = 3
(J) 7 - 4 = 3



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47. The average of 6 numbers is 81. By adding a seventh number, the average decreases to 79. What is the value of the 7th number?

A. 80
B. 79
C. 77
D. 71
E. 67

DO YOUR FIGURING HERE.

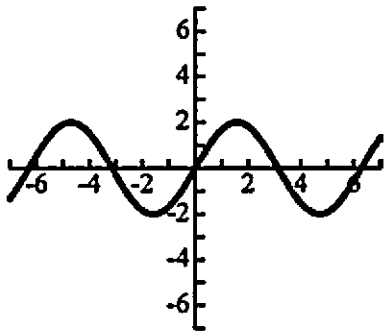
*Explanation:*
81 = sum/6; sum = 486
79 = sum/7; sum = 553
553 - 486 = 67

48. For all real numbers, what is the solution of the equation $16^{(2+x)} = 8^{(3x+3)}$ ?

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

*Explanation:*
$(2^4)^{(2+x)} = (2^3)^{(3x+3)}$
$2^{(8+4x)} = 2^{(9x+9)}$
Bases are same, set powers equal
$8 + 4x = 9x + 9$; $x = -1/5$
Alternate solution: plug in answer choices and backsolve.

49. The graph of the trigonometric function $y = 2\sin x$ is show below.




The function is:

A. even (that is, $f(x) = f(-x)$ for all $x$).
B. odd (that is, $f(-x) = -f(x)$ for all $x$).
C. neither even nor odd.
D. the inverse of a cotangent function.
E. none of the above.

*Explanation:*
Pick a value of x and check answer choices
x = 1/2
f(1/2) = 1; f(-1/2) = -1; f(-x) = -f(x)

50. If $\log_x 64 = 3$, then $x = ?$

F. 4
G. 16
H. $\frac{64}{3}$
J. $\frac{81}{\log 3}$
K. $64^3$

*Explanation:*
$\log_x 64 = 3$
$x^3 = 64$; $x = 4$



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51. An integer from 100 through 799, inclusive, is to be chosen at random. What is the probability that the number chosen will have 1 as at least one digit?

A. $\frac{70}{700}$
B. $\frac{133}{700}$
C. $\frac{214}{700}$
D. $\frac{233}{700}$
E. $\frac{317}{800}$

DO YOUR FIGURING HERE.

*Explanation:*

All numbers from 100-199 have 1 in the hundreds place = 100 numbers

From 200-799 all numbers ending : 01, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 31, 41, 51, 61, 71, 81, and 91 contain at least one 1 in a digits place

100 + 19(6) = 214 numbers contain a 1 and there are 700 total numbers from 100 to 799; Probability = 215/700

52. In the standard $(x, y)$ coordinate plane, what is the slope of the line that passes through the origin and the point $(\frac{1}{3}, \frac{3}{4})$?

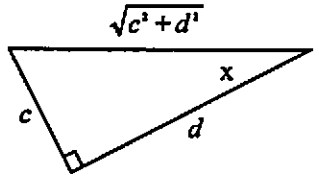
F. $\frac{1}{4}$
G. $\frac{1}{3}$
H. $\frac{4}{9}$
J. $\frac{3}{4}$
K. $\frac{9}{4}$

*Explanation:*

m = (3/4 - 0)/(1/3-0) = (3/4)/(1/3) = 9/4

53. In the right triangle below, $0 < d < c$. One of the angles in the triangle is $\tan^{-1}\frac{c}{d}$. What is $\sin(\tan^{-1}\frac{c}{d})$?

A. $\frac{c}{d}$
B. $\frac{d}{c}$
C. $\frac{d}{\sqrt{c^2+d^2}}$
D. $\frac{c}{\sqrt{c^2+d^2}}$
E. $\frac{\sqrt{c^2+d^2}}{d}$




*Explanation:* NOTE label x added to figure

tan = opp/adj

tanx = c/d

$x=\tan^{-1}(c/d)$

$\sin x = \text{opp/hyp} = c/(\sqrt{c^2 + d^2})$

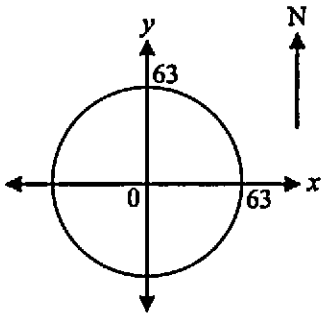


GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

Use the following information to answer questions 54-56.

The radio signal from airport A's control tower can be received only within a radius of 63 miles in all directions of the control tower. A map of the region of coverage of the radio signal is shown below in the standard $(x, y)$ coordinate plane, with the transmitter site at the origin and 1 coordinate unit representing 1 mile.




54. Which of the following is closest to the area, in square miles, of the region of coverage of the radio signal?

F. 500
G. 3,100
H. 12,500
J. 24,500
K. 49,900

*Explanation:*

$A = \text{pi}\ (r^2)$

$A = \text{pi}\ (63^2) = 12{,}468.98 = 12{,}500$

55. Which of the following is an equation of the circle shown on the map?

A. $x + y = 63$
B. $(x + y)^2 = 63$
C. $(x + y)^2 = 63^2$
D. $x^2 + y^2 = 63$
E. $x^2 + y^2 = 63^2$

*Explanation:*

$(x-a)^2 + (y-b)^2 = r^2$

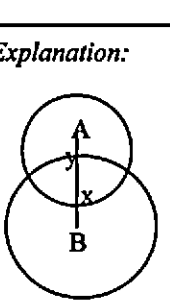
(a,b) = center; r = radius

$x^2 + y^2 = 63^2$

56. Airport B is located 125 miles directly south of airport A. The radio signal from airport B's control tower can be received only within a radius of 71 miles in all directions. If an airplane is traveling from airport A to airport B, for how many miles does the pilot receive a signal from both control towers?

F. 8
G. 9
H. 54
J. 58
K. 62

*Explanation:*




AB = 125; AX = 63; then BX = 125 - 63 = 62

BY = 71, then AY = 125 - 71 = 54

AB = AY + YX + BYX

125 = 54 + YX = 62; YX = 9



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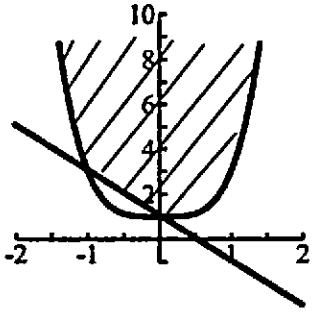
57. The graphs of the equations $y = 2x^4 + 1$ and $y = -2x + 1$ are shown in the standard $(x, y)$ coordinate plane below. What real values of $x$, if any, satisfy the inequality $(2x^4 + 1) > (-2x + 1)$?




A. No real values
B. $x < -1$ and $x > 0$
C. $x < -1$ and $x > 1$
D. $x > 0$
E. $-1 < x < 1$

DO YOUR FIGURING HERE.

*Explanation:*

$y = 2x^4 + 1$ is the parabola - use the graph to see where the parabola is above the line

58. Below is the data from the census of a small town, looking at the average number of children per woman, based on age.

| Age | Number of women | Average Number of Children |
|---|---|---|
| less than 25 years old | 100 | 1 |
| 25-35 years old | 150 | 2 |
| over 35 years old | 125 | 4 |

What is the average number of children per woman in this small town?

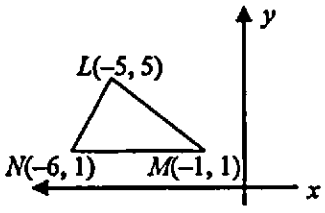
F. 2.0
G. 2.1
H. 2.2
J. 2.3
K. 2.4

*Explanation:*

Total Kids = 100(1) + 150(2) + 125(4) = 900

Avg. = 900/(100 + 150 + 125) = 2.4

59. In the figure below, the vertices of $\Delta LMN$ have $(x, y)$ coordinates of $(-5, 5)$, $(-1, 1)$, and $(-6, 1)$, respectively. What is the area of $\Delta LMN$?




A. 10
B. $10\sqrt{2}$
C. 15
D. 20
E. $20\sqrt{2}$

*Explanation:*

A = 1/2bh = 1/2(5)(4) = 10



GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

**60.** The sum of an infinite geometric series with first term $n$ and common ratio $r < 1$ is given by $\frac{n}{1-r}$. The sum of a given infinite geometric series is 185, and the common ratio is 0.2. What is the third term of this series?

F. 148.0
G. 147.6
H. 29.6
J. 7.4
(K.) 5.92

*Explanation:*

185 = n/(1-r)

185 - 185r = n; r = 0.2

n = 148 = 1st term

2nd term = 1st term * 0.2

2nd term = 148*0.2 = 29.6

3rd term = 29.6*0.2 = 5.92

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.

## READING TEST

*35 Minutes—40 Questions*

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

### Passage I

**PROSE FICTION:** The Sky's the Limit!

Kevin lay on his bed and thought of the afternoon that had just ended. Even after months of preparation, he could hardly believe that he had finally done it: his first solo flight as a licensed pilot! The flight had seemed so short even though he knew it lasted over an hour.

Kevin could hear the sounds of his family performing their early evening rituals. His sister was in her room, talking on the phone and messaging several of her closest friends; their younger brother was in the living room hacking on his gameset with all the glee of a rampaging Cossack. His mom and dad were discussing dinner: who would make what or, better yet, which delivery menu to consult. After a brief debate, there was silence. It was a good sign. He hoped it meant pizza.

"No homework tonight, champ?" Kevin's dad stuck his head around the bedroom door.

"Uh, no.... Nothing important," Kevin added, quickly. It was almost true. After what he'd done this afternoon, nothing could be *important*!

His dad chuckled and ducked back his head: "See you downstairs. Dinner's in thirty."

Kevin pumped a fist. It was definitely pizza. He glanced at the clock to check the time. Next to it was a model of the plane his grandfather had once flown. Across his desk was another. Kevin's eyes traveled around his room, lazily scanning the hanging airplane models, posters of flight plans, and, across from his bed, a diagram of a Cessna 172 cockpit control panel. Everything in his room seemed to exist just to lead up to this incredible afternoon. His eyes came back to rest on the tiny model.

Kevin's dad was a pilot, of course. His father, Kevin's grandfather, had been a pilot before him, flying F-86s against Soviet-made planes back in the Korean War. After the war, he became a military test pilot. Kevin had never met him; he died testing a new design plane before Kevin was born. He reached over to his grandfather's plane, and "flew" it slowly above his head, just as he had when he was little.

"How come Grandad decided to be a pilot?" Kevin had asked one afternoon, while his father was in the attic, sorting through cardboard boxes. His dad set down a carefully packed bassinet with a grunt, and gently took the yellowing, black-and-white photo from his son's small hand.

"Well, lots of reasons, I guess. The military probably had some say in it," he cast a sly smile at his little boy. He looked down again, and added, quietly, "He used to say flying was about as close in this world as you could get to God..."

He handed the photo back to his son and got back on his feet, "Leave it there, son, and help me set this up for your new brother." Kevin stared at his smiling grandfather, standing next to his plane, with nothing seemingly behind him but black tarmac and open sky. It seemed to be the most beautiful place in the world. Slowly, he set the photo down and followed his father out of the attic.

Kevin sailed the model back to its perch. His grandfather had sure been right about flying. Nothing could be better than that. He looked over at the controls diagram his father had bought for him soon after he'd decided to become a pilot. He'd lost track of the number of hours he'd spent pouring over everything there was to know about the Cessna 172. It was the plane he had learned to fly.

Why a Cessna? Luck, he supposed. Kevin's dad had not gone the military route, but was an experienced pilot nonetheless. He and his brother had gone in on a Cessna 172 4-seater years ago. He bought it outright when Kevin's uncle had started his own family and decided it was time, as he said, to "become practical." Kevin's dad had resisted that urge. Instead, Kevin and his family had gone out on flights for as long as Kevin could remember. At least once a month, they'd all pile in together: he and his father up front, his mother and sister in the rear, and, later, wedged far in the back, within reach of his mother's hand, his baby brother strapped tight in his car seat. Sometimes they'd go visit family. Other times, they'd just drop by the city for a day of museums and shopping. The destination never mattered much to Kevin. All he cared about was flying.

Kevin could hardly believe that it had been over two



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years ago, when he was just 14, that his dad had first let him take the controls – just for a minute. Kevin had loved it. Soon after, he learned that student pilots have generous age restrictions. In fact, if he worked hard and proved he was responsible, he could get his pilot's license before he was even eligible to start Driver's Ed.

So for two years he had worked – after school, on weekends, every possible moment – delivering papers or mowing lawns, just so he could afford the flight lessons and fuel. His dad wasn't going to let him have it cheap. He said it would make Kevin appreciate it more. Maybe he was right; Kevin didn't know. But he knew deep down that his grandfather would have been proud.

1. When the narrator says, "student pilots have generous age restrictions" (lines 85-86), he most likely means that:

A. student pilots have limits on how much time they can spend in the air.
B. Kevin had already passed the age limit for starting flight school.
C. pilots may begin their training at a very young age.
D. younger pilots must pay more for flight school than older ones.

2. The narrator most nearly portrays Kevin's grandfather's view of flying as:

F. a patriotic duty.
G. a transcendental experience.
H. an unpleasant experience.
J. a wonderful hobby.

3. Kevin knows his grandfather would have been proud of him because:

A. Kevin and his grandfather had flown the same type of plane.
B. Kevin's grandfather had taught him how to fly.
C. Kevin and his grandfather had often shared conversations about flying.
D. Kevin had worked hard to experience the magic of flying his own plane.

4. Which of the following best describes Kevin's feelings about earning his pilot's license that afternoon?

F. Happiness touched with regret
G. Joy tinged with pride
H. Excitement laced with fear
J. Boastfulness overwhelmed by anticipation

5. The main theme of this passage concerns the:

A. importance of growing up and carrying on family traditions.
B. role played by grandparents in a young man's life.
C. problems caused when parents set high expectations for their children.
D. procedure for learning how to fly and earning a pilot's license.

6. Which of the following questions is NOT answered by information in the passage?

F. What type of plane did Kevin's grandfather fly in Korea?
G. What was the family likely to have for dinner that night?
H. What odd jobs did Kevin do to pay for his training?
J. How many hours did Kevin train in order to earn his pilot's license?

7. Kevin draws which of the following comparisons between the items in his room and the events of that afternoon?

A. The items in his room seemed to foretell his success.
B. The items in his room reflected his desire to be like his father.
C. The items in his room were given to him by his grandfather.
D. The items in his room were unrelated to his becoming a pilot.

8. It can most reasonably be inferred from the passage that when Kevin's father says, "the military probably had some say" in his own father's life as a pilot (lines 45-46), he is most nearly:

F. complaining about the role of the military in his father's life, which prevented Kevin from getting to know his grandfather.
G. indicating, in a humorous way, that the military often makes decisions on behalf of its service members.
H. admitting that he doesn't know much about his father's life in Korea.
J. describing the methodology used by the military when selecting pilots.

9. In terms of developing the narrative, lines 39-52 primarily serve to:

A. give historical information about Kevin's grandfather.
B. show Kevin bonding with his father.
C. establish Kevin's interest in flying from an early age and to place it in the context of his family's history.
D. provide information about how hard-working and diligent Kevin's father is.

10. According to the narrator, which of the following statements is true about Kevin's uncle?

F. He gave up part-ownership of the Cessna when his children were born.
G. He had flown the Cessna with his father and brother.
H. He had three children.
J. He had also learned to fly as a teenager, when his father was in the war.



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## Passage II

SOCIAL SCIENCE: Perchance to Dream: The Psychology of Dreaming

Why do we dream? According to ancient and medieval philosophers, dreams provide a connection to the divine, if properly understood. Dreaming was considered to be consequential, often foretelling the future. However, it could also be ambiguous and a dangerous guide for personal action. Indeed, great writers from Virgil to Chaucer have placed dream interpretation squarely at the thematic center of some of their most important works, while simultaneously illustrating the slippery nature of that interpretation. Modern scientists, on the other hand, have tended to define dreaming as a sort of presentation during sleep of events that we experienced while we were awake. The events of dreams usually form a story that, while often based on waking events, is put together in new and unexpected ways. The significance of these stories and the means to interpret them, however, remain a matter of great debate.

Much of the power dreams have over the popular imagination comes from the indefinite nature of dreams themselves. In some dreams, the dreamer takes part in the story; in others, the dreamer merely watches the story unfold. Most dreamers cannot control the events taking place in the dream and often awake feeling disoriented and confused, which no doubt contributed to the ancient theory of dreams being divinely inspired. In dreams there is little logical thought, and many of the events that occur could not actually happen in real life.

Although dreams are often very strange and complicated, many modern theorists still believe that dreams are related to events and feelings that the dreamer has experienced during waking life. Some experts who study dreams also feel that dreams illuminate the deep wishes and hidden fears of the dreamer. Sigmund Freud, for example, developed a theory of dream interpretation that suggested that dreams are the unconscious fulfillment of deeply personal wishes, usually in disguised form. According to Freud, the dreamer combines several desires into one image and shifts feelings from one character to another within the dream. Dreams can also include the use of symbols to represent anything that cannot be pictured directly. To Freud, the best way to interpret the significance of dreams was psychoanalysis, based on free association of ideas to uncover the truth behind these shifts in representation.

Freud's theories have been propounded, with various alterations, by many of his followers. Carl Jung added the view that dreams tap into personal and cultural archetypes that, properly understood, can offer insight into unconscious attitudes and lead to greater self-awareness. Other analysts have seen dreams as offering insight into general cognitive processes or the immediate anxieties of the dreamer. Some analysts have misused the works of Freud and Jung to return to an interpretation of dreaming that most closely approximates the ancients. While these later writers may hold that dreams are a window into the future, serious analysts do not promote this argument.

While Freud's general theory of the origin and meaning of dreams still underlies most psychoanalytical approaches, it has been roundly criticized by several researchers in the biological sciences. Their approach is through physiology, not psychology, which marks it as fundamentally different from that of psychoanalysts, resulting in radically different conclusions. For instance, biological scientists, led by J. Allan Hobson, have suggested that dreams are simply a meaningless response of the cerebral cortex to random stimulation from the brain stem. The chaotic nature of dreams results from the brain trying to make sense of this haphazard input. Without control from the awake, "thinking part" of the brain, dreams are far more strange and peculiar than the events that take place in real life, but they are not commentary on real life. They have no innate significance.

Nobel laureate Francis Crick further extended Hobson's theory of dreams. Instead of being a meaningless response, Crick and his research associates claimed that dreams are the brain's way of erasing unnecessary or harmful memories. While Crick's theory does provide an active role for human dreaming, the role is negative because it undoes experience, not orders it. Crick's insistence on the validity of his research has led him to compare even Freud's theory of dream analysis to ancient superstitions that dreams can foretell the future.

Despite Crick's assurance, experiments have shown that waking thought is also a response of the cerebral cortex to stimulation from the brain stem. That means there is not necessarily an absolute gap between sleep state and waking state, and therefore, that these biological explanations may not offer a complete analysis. Moreover, psychoanalysts believe that, whatever the biology of dreaming, their psychological consequence is distinct and significant. Science has shown that, in a lifetime, an individual human will dream approximately 100,000 times. And while the function of dreaming is still not completely understood, psychoanalysts argue that it is clear that these dreams are littered with information and understanding, not only of ourselves but also of our relationships with others. The possibility of tapping into that information, of making it truly useful, will continue to inspire research into this topic and further the dialectic of the debate.

11. As it is revealed in the passage, the science of dreaming is best described as:

A. culturally interesting but scientifically irrelevant.
B. politically courageous and socially focused.
C. historically significant but still controversial.
D. driven by strong personalities but somewhat chaotic.



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12. The author presents Freud's theories as significant because Freud:

F. produced work that was used as a model by subsequent dream analysts.
G. was individually responsible for changing the way scientists interpret dreams.
H. was proven to be incorrect by biologists like Francis Crick.
J. proved that dreams are unreliable guides for personal behavior.

13. According to the passage, ancient and medieval philosophers believed that dream interpretation involved all of the following EXCEPT:

A. an ambiguous guidance for action.
B. foretelling the future.
C. a connection to the divine.
D. a presentation of events experienced while awake.

14. Based on the passage, Freud's approach to dream interpretation can best be characterized as:

F. based on an understanding of western mythology.
G. based in symbolism that can be read to reveal the dreamer's hopes and fears.
H. completely dependent upon an understanding of the biology of the dream state.
J. insignificant when compared to the discoveries of later dream analysts.

15. It can reasonably be inferred from the passage that Crick's attitude toward Freud's theories was:

A. generally dismissive and disapproving.
B. agreeing in general, with small points of contention.
C. fully approving and very supportive.
D. unstated, as he was unaware of most of Freud's works.

16. According to the fifth paragraph (lines 57-73), which of the following statements would the author most likely make with regard to biological researchers in the field of dreaming?

F. Biological scientists like Hobson believe that Freud was misleading and scientifically dishonest.
G. The "thinking part" of the brain is what makes dreams seem far more strange and peculiar than waking life.
H. Biological scientists approach the study of dreams from a different perspective than psychoanalysts and, therefore, often have different results.
J. Biological scientists like Hobson believe that the study of dreaming is scientifically meaningless.

17. In terms of the passage as a whole, one of the main functions of the first paragraph (lines 1-17) is to:

A. suggest that literature is irrelevant to modern dream theory.
B. argue for the legitimacy of ancient and medieval philosophy.
C. present evidence supporting modern dream theory.
D. provide historical context and outline each perspective of the current debate.

18. According to the passage, the primary principle underlying Crick's theory of dreaming is that:

F. dreaming is a purely passive activity with no scientific relevance.
G. dreams are the result of random stimulation of the cerebral cortex, as proven by Hobson.
H. dreaming is fundamentally harmful to the human psyche.
J. dreams are harbingers of dangerous and harmful waking events.

19. The passage states that modern psychoanalysts believe that the relationship between physiological and psychoanalytical interpretations of dreaming should be:

A. framed so that psychoanalytical interpretations are considered more important.
B. distinct, but mutually significant.
C. considered to be a closed topic and removed from public debate.
D. resolved through an independent mediator.

20. In the context of the passage, the author's statement that some analysts have "misused the works of Freud and Jung to return to an interpretation of dreaming that most closely approximates the ancients" (lines 52-54) most nearly means that:

F. some modern analysts wrongly claim that the works of Freud and Jung show that dreams can predict the future.
G. Freud and Jung, like the ancient philosophers and scientists, believed that dreams could predict the future.
H. some modern analysts have never read the works of Freud and Jung.
J. Freud and Jung were ignorant of the theories of ancient and medieval philosophers.



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## Passage III

**HUMANITIES:** The following passage discusses Henrik Ibsen and his revolutionary impact on modern theater.

Henrik Ibsen (1828-1906) is considered by many the father of modern theater. He revolutionized the world stage by dramatizing the social issues of his day, from the role of women to the destructive self-involvement of Romanticism. He was another of the forces that periodically arise, using the language of the people to reclaim an art form from stilted ideas expressed in stilted language. Most importantly, Ibsen broke the Victorian tradition by refusing to write conventional morality plays, going beyond rewarding noble heroes and punishing evil villains to explore complex and realistic contemporary moral issues.

To place Ibsen in his cultural context, it is helpful to note that the 19th century produced not only the expected, modest Victorian morality tales, but elaborate, medieval fables, light musical comedies, comedies of manners, and even tragic religious allegories. While these works often took sidelong glances at contemporary issues, or even subtly condemned particular social conventions, they always maintained a polite distance even from issues that ought to cause outrage. Ibsen, however, burned away social hypocrisies with a caustic flame he brought to bear in the theatre. He was not looking to present society through the gauze of ironic representation. Along with a few, deeply challenging artists of his time, Ibsen wanted to make the theatrical experience *real*. Through his efforts and his uncompromising vision for his plays, he helped create a new genre of drama: Realism.

The ultimate goal of Realism is to make the viewer believe that what occurs on stage is absolutely true. To that end, it has strict conventions. First, only dialogue is allowed. There are no asides, no soliloquies, no monologues. Second, the characters are individuals first and foremost (as opposed to caricatures or types, as used in other genres), but their struggles illustrate broader social problems. Third, characters are to speak and move naturally, not in monotone or clustered around a prompt box. Fourth, and finally, the "fourth wall" is always maintained. In theatrical tradition, the players are separated from the audience by an imaginary "fourth wall" of the stage. This allows the players to present the characters as if they are unaware of being observed. However, many playwrights have "broken" the fourth wall, usually for comic or ironic effect. This is never done with Realism.

Ibsen's best-known dramas refined the focus of Realism. This is particularly true in the four plays published between 1877 and 1882: *Pillars of Society, A Doll's House, Ghosts,* and *An Enemy of the People.* In these works, Ibsen consciously addressed the problems in society, especially by illustrating its hypocrisies and casual cruelties. He maintained the immediacy of his criticisms by insisting on contemporary settings. Lastly, he attempted to make his message more applicable to his audience by creating characters that were ordinary people, as opposed to the social elite, to explore the issues.

In these four works, truth, emancipation, self-realization, and personal freedom are the keys to escaping manipulative forces in the general culture. In *A Doll's House*, the lead female, Nora, finally understands that her husband is incapable of accepting her as a fellow adult or respecting her as an equal. As various truths are revealed, she accepts that she must leave him in order to achieve full autonomy. The decision is wrenchingly difficult, as by the standards of her society, she must also leave their children. Yet, in Ibsen's vision, she has no choice. Ibsen's ending was tremendously controversial. Some actresses refused to play the role without an alternate, "happy" ending. Ibsen, however, insisted on the authenticity of his story. Its brutality was simply a mirror for the audience to see the choices forced upon women at that time.

Nora's story has become a model for feminist literature in the western world. However, its basis was not just in Realism, but in reality itself. Ibsen knew personally the woman upon whom he modeled Nora. She was a real woman, of the middle class, and she did not speak in verse or use asides to an imagined audience. She was someone anyone could have known, and by writing *A Doll's House*, Ibsen forced his audience to accept that they all did know someone like her. Thus, Ibsen's plays were realistic, but they were also dark. Unlike some contemporary works, there is little optimism to take away from an Ibsen play.

Not everything Ibsen did was absolutely new. After all, he was not the ultimate progenitor of modern drama. That honor belongs to Shakespeare. However, like Shakespeare, Ibsen created plays from material with much contemporary relevance. He fearlessly commented on the existing social regime. And what better reminder could we seek than in plays like *Hamlet*, as in *A Doll's House*, that in life, the just are not always rewarded nor the wicked always punished.

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

A. It compares and contrasts Ibsen's perspective on society with those of contemporary playwrights.
B. It consists of the analysis and rejection of a contemporary playwright.
C. It contains an analysis of the works of a specific artist, framed by historical context.
D. It begins and ends with a detailed critique of English artists whose works are used to illuminate the writings of one particular dramatist.

**22.** In terms of tone, which of the following best describes lines 17-26?

F. A dispassionate analysis of theatrical technique
G. A consistently high level of outrage expressed through narrative analysis
H. A growing feeling of outrage that is finally broken
J. An opinionated description of Victorian theatrical genre



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23. The author develops the third paragraph (lines 29-45) mainly through:

A. a narrative analysis of dramatic technique.
B. an itemized list of characteristics.
C. a thematic overview of Victorian theatre.
D. a detailed analysis of Ibsen's major works.

24. The author indicates that the reason many playwrights have broken the "fourth wall" was that:

F. the playwrights wanted to create a specific humorous or ironic effect.
G. the playwrights did not understand the conventions of Realism.
H. the playwrights were not aware that they were being observed.
J. the playwrights preferred to view actors as real people.

25. It can reasonably be inferred from the passage that some of the actresses chosen to play Nora wanted an alternate ending because:

A. they didn't know anyone like Nora and thought the ending was unrealistic.
B. they saw the original ending as too harsh and brutal for the heroine of the story.
C. they thought the ending was too boring to engage the audience.
D. they thought the ending gave too much emphasis to the role of the husband.

26. It can most reasonably be inferred that the image of Ibsen "burn[ing] away social hypocrisies with a caustic flame" (lines 21-22) symbolizes:

F. Ibsen's unwillingness to listen to legitimate criticism and concerns from his directors and actors.
G. Ibsen's willingness to promote social conventions in an attempt to increase the public's passion for theater.
H. Ibsen's willingness to reveal society's wrongs in the hopes that open discussion will lead to improved conditions for those who are oppressed.
J. Ibsen's intense dislike of common courtesies, which often led to conflict with his associates.

27. As it is used in line 64, the word *autonomy* most nearly means:

A. independence.
B. sovereignty.
C. immunity.
D. controversy.

28. The author describes Ibsen's take on social problems (lines 46-56) as:

F. fierce debates with his colleagues about the content of his dramas.
G. vital self-examination of his own personal flaws.
H. useful analysis of the weaknesses of other playwrights.
J. deliberate revelation of hidden problems on the stage.

29. Which of the following statements best paraphrases lines 75-77?

A. The woman who was the model for Nora was a famous actress of the times, who often remained in character in her daily life.
B. The woman who was the model for Nora was an ordinary woman who acted in ordinary ways.
C. Nora was a brave woman whom Ibsen knew personally.
D. Nora was a conglomerate of the Victorian Englishwomen Ibsen encountered in his daily life.

30. From the statements in lines 81-82, the author is most nearly asserting that:

F. Ibsen would have been happier had he written optimistic plays, like those of his colleagues.
G. All of Ibsen's contemporaries were writing plays in praise of society.
H. The characters in Ibsen's plays were based on real people, and so did not resonate with the audience.
J. Ibsen presented a far more pessimistic view of the world than other playwrights of his time.



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## Passage IV

NATURAL SCIENCE: The following passage discusses some aspects - both positive and negative - of a raw food diet.

In recent years, many alternative diets have emerged, each touting itself as the paragon of healthy eating. Many of them – vegan, vegetarian, and fruitarian diets, among others – restrict the ingredients that they claim comprise healthy nutrition. "Raw foodism," on the other hand, does not necessarily restrict ingredients. Instead, it restricts the methods of food preparation. As its name suggests, raw foodism consists entirely of foods that have not been heated above a certain temperature, usually 116° F, though sometimes as low as 104° F. Its followers generally opt for unprocessed, uncooked fruits, vegetables, nuts, seeds, sprouts, herbs, grains, and legumes, which must comprise at least 70% of their diet in order for them to be considered raw foodists. Often, but not always, raw food dieters are also vegans, who exclude meat, fish, poultry, dairy, and eggs. Both raw foodists and those who oppose the practice agree that applying heat to a food usually, though not always, chemically transforms it, thus changing its flavor, texture, appearance, and nutritional properties. What they disagree on is whether the practice of cooking is positive or negative.

Reasons for practicing raw foodism are as diverse as the individuals who support it. Some raw foodists are pragmatists, claiming that the pursuit reduces food and energy costs. They also say it saves time, though some raw food recipes can require considerable advance preparation. Others have been swayed by health arguments. They claim that raw food is the optimal fuel for the human body, since the digestive system evolved before humans started cooking with fire. Benefits are thought to range from lower weight and blood pressure to reduced allergies and cancer risks.

Mainstream scientists who oppose raw foodism cite anthropological evidence showing that human beings have been cooking their food for over 250,000 years. Food cooked accidentally, by lightning strikes or brush fires, has been consumed for even longer. These critics claim that widespread use of cooking has changed human anatomy, especially around the jaw, and that the resulting improved nutrition has even led to increased brain size. They recognize that the structure of some foods, like tomatoes and carrots, makes it virtually impossible to access the available nutrients without cooking. Moreover, following a raw food diet can make it difficult to get adequate amounts of calcium, vitamin D, vitamin B12, iron, zinc, and protein. In fact, many raw foodists have to rely on supplements in order to maintain good nutritional balance. Additionally, raw food may contain harmful bacteria and parasites, and certain products, such as kidney beans and buckwheat, are unsafe to consume in their raw form. Ignorance on the matter could result in poisoning. Finally, opponents criticize raw food advocates as promoting supporting data that is anecdotal, rather than scientific in nature. Indeed, many raw foodists claim the best support for a raw food diet is personal experience.

While mainstream scientists have generally not supported the raw food movement, there is some scientific evidence that can be seen to support raw food claims. Proponents of raw food believe that it contains enzymes that aid its own digestion and help populate the digestive tract with beneficial florae that stimulate the human immune system. Raw food enzymes include amylases, proteases, and lipases, which are enzymes that break down starches, proteins, and fats, respectively. Keeping these and other biological components, such as antibodies, intact helps prevent degenerative diseases, slow the effects of aging, enhance energy, and boost emotional balance. Raw foodists point to several scientific studies that have linked high temperature meat preparation to increased cancer risks. Researchers at the National Cancer Institute have found that human subjects who ate beef rare or medium-rare had less than one-third the risk of stomach cancer than those who ate beef medium-well or well-done. Other research has indicated significant benefits in reducing breast cancer risk when large quantities of raw vegetables are included in the diet.

One striking point of contention has involved pasteurization. Depending on the process used, pasteurization heats milk and other liquid products to between 145° F and 280° F in order to reduce or kill dangerous bacteria, such as *Salmonella*, *E. coli*, and *Listeria*. The U.S. Food and Drug Administration (FDA) notes that pasteurization has been highly successful in reducing the prevalence of diseases, including listeriosis, typhoid fever, tuberculosis, diphtheria, and brucellosis. The FDA strongly recommends that children, the elderly, pregnant women, and persons with weakened immune systems avoid raw milk products and other raw liquids, as these diseases can cause serious injury or even death.

Raw foodists do not discount the effect of dangerous bacteria, but they claim that the real threat lies in unsanitary dairy and other production conditions. If the milk, for example, is collected and stored cleanly, they believe milk-borne diseases will not be a problem. They believe the same holds for other commonly pasteurized products, such as apple juice. More to the point, raw foodists hold that the risk is worth the benefit. Raw milk is claimed to have antibodies that provide resistance to many viruses, bacteria, and bacterial toxins and may help reduce the severity of asthma symptoms. They discount studies that show no significant nutritional difference between pasteurized and nonpasteurized milk. Ultimately, until more hard research is done, mainstream science and raw food advocates will continue to be at odds.

**31.** Which of the following conclusions about raw foodism can reasonably be drawn from the passage?

**A.** Scientific research overwhelmingly supports raw foodism.
**B.** No scientific research has been found to support raw foodism.
**C** The benefits of raw foodism are a topic of intense scientific debate.
**D.** Raw foodists renounce the dangerous effects of bacteria.

32. According to the passage, which of the following best describes how traditional scientists perceive raw foodists?

F. They believe that raw foodists are unscientific proponents of poor nutrition.
G. They believe that raw foodists are unwilling to accept that unsanitary production conditions can lead to illness.
H. They believe that raw foodists don't properly appreciate the flavors and textures of cooked food.
J. They believe that raw foodists will ultimately come to accept mainstream scientific views.

33. The passage indicates that raw foodists view traditional science with:

A. scorn, because traditional scientists fail to appreciate anecdotal evidence.
B. respect, though they don't always agree with traditional scientists' conclusions.
C. admiration, because traditional science has always supported the raw foodism movement.
D. contempt, because raw foodism is a movement that is necessarily opposed to the mainstream.

34. The author uses the second paragraph (lines 22-32) primarily to:

F. suggest that most raw foodists cannot fully comprehend the value of a healthy diet.
G. show that some raw foodists have better reasons for practicing raw foodism than others.
H. illustrate the diversity among practitioners of raw foodism.
J. prove that raw foodism is an excellent diet for weight loss.

35. According to the passage, all of the following are true about raw foodism EXCEPT:

A. raw foodists reject the notion that some bacteria can be dangerous.
B. at least 70% of the diet must be raw food in order for someone to be considered a raw foodist.
C. raw foodists generally eat unprocessed, uncooked fruits, vegetables, nuts, and seeds.
D. raw foodists claim that cooking changes the flavor, texture, and nutritional properties of food.

36. The main function of lines 59-62 in terms of the fourth paragraph as a whole is to:

F. misinterpret basic biology in the interest of the raw foodism cause.
G. prove outright that raw foodism is scientifically sound nutrition.
H. humiliate opponents in the mainstream scientific community.
J. present examples of the scientific soundness of raw foodism.

37. It can reasonably be inferred from the passage that raw foodists believe which of the following regarding pasteurization?

A. Nonpasteurized nondairy products, like apple juice, do not pose the same risks as nonpasteurized milk.
B. Pasteurization is a crutch used by the FDA to avoid enforcing cleaner production conditions.
C. There are enough benefits from consuming nonpasteurized products to justify any potential dangers from unsanitary production conditions.
D. There has not been enough scientific research regarding the costs and benefits of nonpasteurized liquids.

38. The author places the words "raw foodism" in quotation marks (line 5) most likely to:

F. indicate that she is not quite sure what they mean.
G. mark them as a technical term with a specific definition.
H. force the reader to pay more attention to the term.
J. cast aspersions on raw foodism's legitimacy as a scientific movement.

39. When the passage says that raw foodists "discount studies that show no significant nutritional difference between pasteurized and nonpasteurized milk" (lines 100-102), it most nearly means that:

A. debate over pasteurized milk is irrelevant because most raw foodists do not consume dairy products.
B. raw foodists always disagree with FDA findings regarding food processing.
C. FDA studies are frequently suspect and cannot be relied upon when making nutritional decisions.
D. at times, raw foodists ignore scientific data that does not support their beliefs.

40. The conclusion that can reasonably be inferred from the fifth paragraph (lines 77-89) is that:

F. pasteurization is the only known method of killing *E. coli* bacteria.
G. raw milk is the most dangerous food for children and pregnant women.
H. extreme heat can be an effective means of destroying harmful bacteria.
J. pasteurization at a lower temperature would make pasteurized milk acceptable to raw foodists.

**END OF TEST 3**

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

**DO NOT RETURN TO A PREVIOUS TEST.**

## SCIENCE TEST

*35 Minutes—40 Questions*

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

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

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### Passage I

A major source of air pollutants is exhaust from motor vehicles. CO and $SO_2$ are two pollutants found in car exhaust. Environmentalists performed two experiments to determine the levels and behavior of these two pollutants near busy roadways.

*Experiment 1*

Environmentalists studied the correlation between CO levels and vehicle use. They measured CO levels hourly for 24 hours, 1/2 mile (mi) downwind from six different roadways. The combination of speed limit and vehicle usage (number of vehicles per day) differed between each roadway. An average CO value for each roadway was calculated in parts per billion (ppb). The results are shown in Table 1.

Table 1

| Roadway speed limit (mi/hr) | Vehicle usage (vehicles/day) | Average CO level (ppb) |
|---|---|---|
| 45 | 15,000 | 107 |
| | 20,000 | 112 |
| | 25,000 | 117 |
| 70 | 15,000 | 110 |
| | 20,000 | 117 |
| | 25,000 | 125 |

*Experiment 2*

Environmentalists measured the levels of CO and $SO_2$ at 0, 1, and 2 miles downwind from the 70 mi/hr roadway that averaged 25,000 vehicles per day. The level of CO decreased from 134 ppb at 0 mi to 120 ppb at 2 mi. The level of $SO_2$ decreased from 52 ppb at 0 mi to 12 ppb at 2 mi.

(Note: The average levels of CO and $SO_2$ found more than 2 miles from pollution sources are 118 ppb and 5 ppb, respectively.)

1. Which of the following factors was varied in Experiment 2?

   A. Number of roadways
   B. Number of vehicles per day traveling on the roadway
   C. Distance from the roadway
   D. Speed limit on the roadway

2. According to the environmentalists' results, they would suggest which of the following to decrease levels of CO in an area?

   F. Increase the number of cars traveling on the roadways
   G. Reduce speed limits on the roadways
   H. Raise speed limits on the roadways
   J. Do not allow building of houses near roadways

3. Based on the experimental results, if one compared $SO_2$ levels near a major roadway to those in a remote forest, $SO_2$ levels:

   A. near the roadway would be higher than in the forest.
   B. near the roadway would be lower than in the forest.
   C. near the roadway would be the same as those in the forest.
   D. would be detectable only in the forest.

4. Motor vehicle exhaust also introduces formaldehyde into the air. If formaldehyde behaves similarly to CO and $SO_2$ in the experiments, the environmentalists would hypothesize that formaldehyde levels:

   F. would decrease over time.
   G. would stay the same over time.
   H. are higher when closer to roadways compared to farther away.
   J. are lower when closer to roadways compared to farther away.



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5. According to the results obtained by the environmentalists, as the distance from the roadway increases:

   A. CO and $SO_2$ levels both increase.
   B. CO and $SO_2$ levels both decrease.
   C. CO levels decrease and $SO_2$ levels increase.
   D. CO levels increase and $SO_2$ levels decrease.

6. A seventh road was added to the experiment. It has a speed limit of 45 mi/hr and a vehicle usage of 50,000 vehicles per day, One would hypothesize that 1/2 mi downwind from this roadway CO levels are:

   F. less than 107 ppb.
   G. between 107 and 112 ppb.
   H. between 112 and 117 ppb.
   J. above 117 ppb.



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## Passage II

The following experiments examine the relationship between the buoyancy (floating properties) of an object and the object's mass and volume. The densities (mass/volume) of various solid balls and liquids are listed in Table 1.

| Table 1 | |
|---|---|
| Substance | Density (g/cm$^3$) |
| Solid balls | |
| Cork | 0.24 |
| Maple (wood) | 0.61 |
| Copper (metal) | 8.94 |
| Liquids | |
| Olive oil | 0.81 |
| Fresh Water | 1.00 |
| Citric acid | 1.66 |

*Experiment 1*

A beaker was filled to the top with one of the three liquids. Each ball, with a volume of 5 cm$^3$, was individually immersed in each liquid. The balls that floated were held under (noted in the table with *). The volume of fluid that was displaced (overflowed out of the beaker) was measured. The procedure was repeated for all liquids. Results are displayed in Table 2.

| Table 2 | | | |
|---|---|---|---|
| Solid ball | Volume of liquid displaced (cm$^3$) | | |
| | Olive oil | Water | Citric acid |
| Cork | 5* | 5* | 5* |
| Maple (wood) | 5* | 5* | 5* |
| Copper (metal) | 5 | 5 | 5 |

*Experiment 2*

A small square wooden platform with an indentation was placed in a beaker. The beaker was filled to the top, and the platform floated at the brim. Each of the solid balls was individually placed in the indentation on the platform, which continued to float. The amount of liquid displaced was measured and recorded. The procedure was repeated for the remaining liquids. Results are displayed in Table 3.

| Table 3 | | | |
|---|---|---|---|
| Solid ball | Volume of liquid displaced (cm$^3$) | | |
| | Olive oil | Water | Citric acid |
| Cork | 2.96 | 2.40 | 1.45 |
| Maple (wood) | 9.24 | 6.10 | 3.67 |
| Copper (metal) | 135.45 | 89.40 | 53.86 |

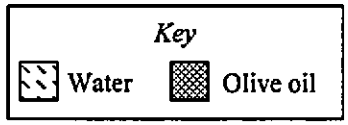
7. According to Table 1, the substance with the highest density is:

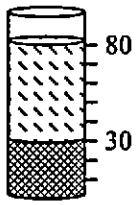
   A. cork.
   B. olive oil.
   C. fresh water.
   D. copper.

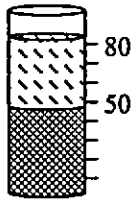
8. If a solid cork with a volume of 5 cm$^3$ were placed in a beaker of salt water (density = 1.03) the cork would displace:

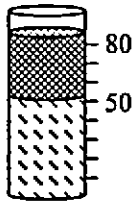
   F. the same amount of liquid as it did when placed in fresh water.
   G. less liquid than it did when placed in fresh water.
   H. more liquid than it did when placed in fresh water.
   J. all of the salt water in the beaker.

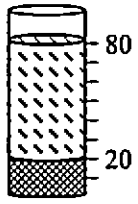
9. Water and olive oil do not mix. If 30 cm$^3$ of olive oil were added to a graduated cylinder containing 50 cm$^3$ of water, which of the following would best illustrate the layers formed?




A.



B.



C.



D.


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10. In Experiment 1, the volume of olive oil displaced by a 5 $cm^3$ solid cork ball was:

F. 2.96 $cm^3$.
G. 5.0 $cm^3$.
H. 9.24 $cm^3$.
J. 15.0 $cm^3$.

11. Based on the results of the experiments, one can conclude that placing the solid balls on the platform in the beaker:

A. had no effect on the volume of liquid displaced.
B. increased the volume of the liquid displaced for all liquids.
C. decreased the volume of the liquid displaced for all liquids.
D. increased the volume of the liquid displaced for some liquids only.

12. Suppose that a fourth solid ball comprised of a substance with a density of 6.3 $g/cm^3$ was tested in Experiment 2. The volume of citric acid displaced would be closest to:

F. 3.0 $cm^3$.
G. 5.0 $cm^3$.
H. 37.0 $cm^3$.
J. 90.0 $cm^3$.



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## Passage III

Certain caterpillars have been observed eating specific crops, thereby reducing the total harvest of the crops. Table 1 is a key for identifying caterpillars (according to their classification in the animal kingdom) commonly found across the U.S.

Table 1

| Step | Trait | Appearance | Result |
|---|---|---|---|
| 1 | Hair thickness | Dense | Go to Step 2 |
| | | Thin | Go to Step 5 |
| 2 | Length of hair | Long (> 3cm) | Go to Step 3 |
| | | Short (< 3 cm) | Go to Step 4 |
| 3 | Color | Yellow | *Spilosoma virginica* |
| | | Green | *Automeris io* |
| 4 | Stripe Color | Orange | *Pieris rapae* |
| | | Pink | *Colias eurytheme* |
| 5 | Hornlike projections | Present | Go to Step 6 |
| | | Absent | Go to Step 8 |
| 6 | Position of hornlike projection | Behind the head | *Papilio polyxenes* |
| | | Posterior end | Go to Step 7 |
| 7 | Color of hornlike projection | Blue | *Manduca quinquemaculata* |
| | | Red | *Manduca sexta* |
| 8 | Spots on Head | Present | Go to Step 10 |
| | | Absent | Go to Step 9 |
| 9 | Skin texture | Wrinkled | *Melittia cucurbitae* |
| | | Rough | *Helicoverpa zea* |
| 10 | Color of Spots | Brown | *Plutella xylostella* |
| | | White | *Spodoptera ornithogalli* |



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A farmer tending to his fields discovered four caterpillars. The characteristics of each caterpillar are listed in Table 2.

Table 2

| Caterpillar | Traits |
|---|---|
| A | • 5 cm in length<br>• thick hair<br>• long hair<br>• green |
| B | • 6 cm in length<br>• thin hair<br>• hornlike projections on posterior end<br>• blue hornlike projections |
| C | • 4 cm in length<br>• thin hair<br>• no projections<br>• head solid color<br>• skin is wrinkled |
| D | • 4 cm in length<br>• thick hair<br>• hair is short<br>• pink stripe |

13. Table 1 is used to identify organisms that belong to which kingdom?

A. Animal
B. Protozoa
C. Plant
D. Fungus

14. According to Table 1, which of the following traits will a caterpillar have if it is closely related to *Colias eurytheme*?

F. yellow body
G. pink stripe
H. rough skin
J. white spots

15. According to Tables 1 and 2, which trait of Caterpillar C distinguishes it from *Spodoptera ornithogalli*?

A. thin hair
B. no hornlike projections
C. head is a solid color
D. skin is wrinkled

16. Caterpillar B and Caterpillar C diverge at which of the steps listed in Table 1?

F. Step 2
G. Step 3
H. Step 4
J. Step 5

17. According to Tables 1 and 2, Caterpillar A is most likely a(n):

A. *Spilosoma virginica.*
B. *Automeris io.*
C. *Papilio polyxenes.*
D. *Manduca sexta.*



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## Passage IV

Black holes are theoretical entities that physicists predict using the equations of general relativity. Black holes have never been directly observed, but observations of their predicted effects have been made. Two scientists discuss different theories regarding black holes, and whether they even exist at all.

*Scientist 1*

Since the 1920s, physicists have believed that stars more massive than 1.44 solar masses would eventually collapse, creating a "black hole." This entity would have all of its mass compressed in a small area of space and have such a powerful gravitational field that not even light could escape it. Anything that got too close to the center of the black hole where it is most dense – the *event horizon* – would be trapped by the strong gravitational pull. This general relativity theory, which is commonly held today, shows that nothing which passes the event horizon can ever escape the black hole. In effect, matter falls out of the universe, never to be seen again.

*Scientist 2*

The current relativity theory regarding black holes contradicts the equations of quantum mechanics. It is not possible for information to "disappear" into a black hole. Instead, as a super-massive star collapses, the gravity produced disrupts the quantum vacuum, which reduces the total mass of the star. As a result, the entity that is created is not as dense as once thought, and the event horizon never forms. What is left of the collapsing star is a "black star," which behaves like a black hole, except that as matter is pulled toward where the event horizon would be, the matter is distorted and stretched so much that it becomes nearly impossible to detect. In other words, the matter does not actually disappear completely; it simply fades.

18. About which of the following points do the two scientists agree?

F. The event horizon has a strong gravitational pull.
G. Extremely massive stars will eventually collapse.
H. Black holes defy the equations of general relativity.
J. Black holes have been observed near collapsed stars.

19. According to Scientist 2, when information enters a black hole it:

A. fades away, becoming very difficult to measure.
B. disrupts the quantum vacuum, causing the star to collapse.
C. becomes trapped by the event horizon.
D. is never seen again.

20. Which of the following is a criticism that Scientist 2 would make of the theory of Scientist 1?

F. It ignores the fact that black holes have never been directly observed.
G. Matter never gets distorted in space.
H. It does not take into account an important rule of physics.
J. The role of the event horizon is ignored.

21. Which of the following assumptions was made by Scientist 2?

A. General relativity must allow for the creation of black holes.
B. As density at the center of the black hole increases, gravitational pull decreases.
C. As a massive star collapses, its energy is transformed into gravity.
D. Quantum mechanics can be applied to the study of cosmological phenomena.

22. According to the theory of Scientist 1, it can be concluded that when a star reaches a mass greater than 1.44 solar masses:

F. it will become a black star.
G. the star will most likely collapse.
H. its gravitational field will disappear.
J. the star will be pulled into the event horizon.

23. Compared to the general relativity theory, the quantum mechanics theory:

A. allows for the complete disappearance of matter in the universe.
B. preserves matter in the universe.
C. cannot account for the collapse of super-massive stars.
D. describes the creation of the event horizon.

24. According to Scientist 1, the formation of a black hole involves:

F. the stretching of matter until it becomes nearly invisible.
G. the direct observation of a collapsing star.
H. the disruption of the quantum vacuum.
J. the compression of mass into a small area.



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## Passage V

Falling to earth, an object has an acceleration of 9.8 meters/second$^2$ (m/sec$^2$) when gravity is the only force acting upon the object.

Students designed experiments to determine the acceleration of two spheres falling to earth. They used a stopwatch to accurately measure to the 0.01 of a second the time it took for the spheres to reach the ground and then used the times to calculate acceleration.

*Experiment 1*

Students dropped a 180 g metal sphere and a 45 g plastic sphere from a height of 2.5 meters. The spheres both had a radius of 10 cm. (Note: A sphere's surface area and volume are both proportional to the radius of the sphere.) The times required for the spheres to reach the ground were recorded in Table 1 below.

Table 1

| Trial | Measured time of fall (sec) | |
|---|---|---|
| | metal sphere | plastic sphere |
| 1 | 0.77 | 0.80 |
| 2 | 0.85 | 0.78 |
| 3 | 0.79 | 0.79 |
| 4 | 0.75 | 0.84 |
| 5 | 0.80 | 0.80 |

For the metal sphere, the average time was 0.79 sec and the average acceleration was 8.0 m/sec$^2$. The average time and acceleration for the plastic sphere were 0.80 sec and 7.8 m/sec$^2$, respectively.

*Experiment 2*

Following the procedure from Experiment 1, students dropped the spheres from a height of 9.7 m. The recorded times are shown in Table 2.

Table 2

| Trial | Measured time of fall (sec) | |
|---|---|---|
| | metal sphere | plastic sphere |
| 6 | 1.51 | 1.61 |
| 7 | 1.50 | 1.58 |
| 8 | 1.42 | 1.62 |
| 9 | 1.45 | 1.65 |
| 10 | 1.42 | 1.56 |

For the metal sphere, the average time was 1.46 sec and the average acceleration was 9.1 m/sec$^2$. The average time and acceleration for the plastic sphere were 1.60 sec and 7.6 m/sec$^2$, respectively.

25. An additional trial was conducted in Experiment 1, using the metal sphere. The sphere's measured fall time would likely be closest to:

A. 0.59 sec.
B. 0.65 sec.
C. 0.79 sec.
D. 0.95 sec.

26. Based on the results of Experiments 1 and 2, in which of the following trials were the measured fall times of the metal sphere the same?

F. Trials 1 and 5
G. Trials 3 and 5
H. Trials 6 and 7
J. Trials 8 and 10

27. According to information in the passage, were there additional forces acting on the spheres as they fell?

A. No, because the differences in accelerations were due to the differences in the mass of the two spheres.
B. No, because the average accelerations were equal to 9.8 m/sec$^2$.
C. Yes, because the differences in accelerations of the two spheres were too small to measure.
D. Yes, because the average accelerations were less than 9.8 m/sec$^2$.

28. Experiment 1 was repeated, dropping the spheres from a height of 1.5 meters. The students should expect the average time for the metal sphere to hit the ground to be:

F. less than 0.79 sec.
G. approximately 0.86 sec.
H. approximately 1.22 sec.
J. more than 1.46 sec.

29. Which of the following is most likely the reason the students needed a stopwatch that reliably measured out to 0.01 of a second in Experiment 1?

A. Neither sphere would have fallen if allowed more than 1 second to fall.
B. Both spheres required less than 1 second to fall.
C. Both spheres would have dropped further if allowed less than 1 second to fall.
D. Both spheres averaged a drop time of 1 second.

30. In Experiment 2, a result of dropping the spheres from a height of 9.7 m was that the:

F. metal sphere fell faster than in Experiment 1.
G. plastic sphere fell faster than the metal sphere.
H. spheres took longer to fall.
J. average velocity of the spheres decreased.



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## Passage VI

Mongooses are small, terrestrial carnivores related to weasels. The banded mongoose (*Mungos mungo*) is found in much of the African grasslands. It is a very sociable animal, typically found in packs of 20 to 50 members. Each member stays in constant sight of one another, and at least one member keeps vigil while the rest of the troop is hunting or resting. The banded mongooses sniff out their enemies and send out alarm calls. They are also quite territorial and lay down their scent marks during a "dance" in which they drag their rumps along the ground while urinating. Recent research has been conducted into the breeding habits and extended-family group lifestyle of *Mungos mungo*.

An intact family group was studied over a period of three months. At the time observation began, six females had given birth, each to three pups. The newborns were provided nourishment and protection in a communal den, suckling any of the lactating females present. At approximately one month of age, the pups ventured out of the den to forage with the adults. Each of the pups began to associate with one particular adult, not necessarily its birth mother. Researchers separated pups from their chosen adult escort and held them captive for two days. During that time, the pups interacted freely with each other. When the pups were returned to the troop, each pup re-established its relationship with its original adult escort. Figure 1 shows how long each pup took to find an adult escort.

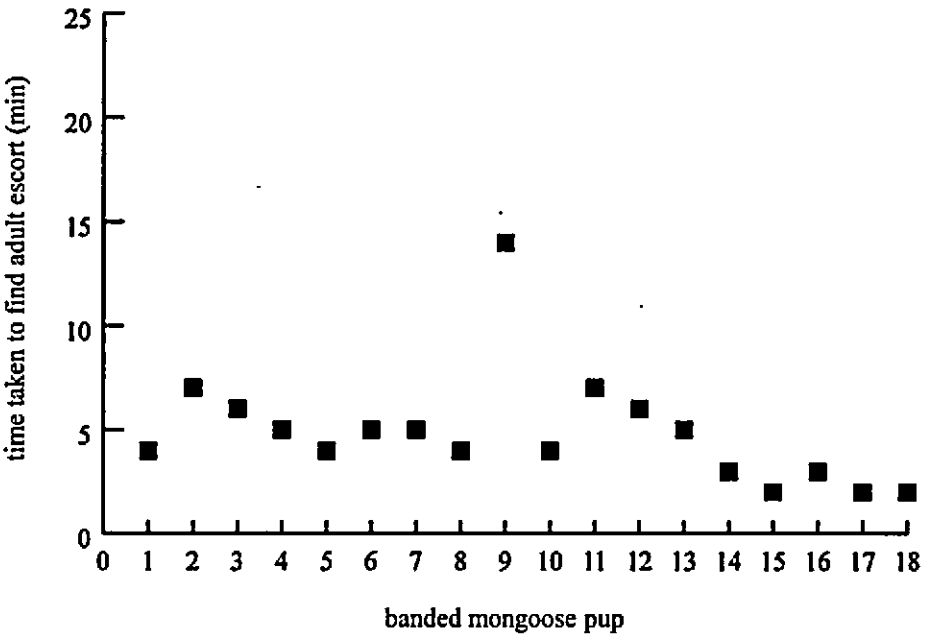


Figure 1



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31. According to Figure 1, each of the pups took less than 10 minutes to locate its adult escort EXCEPT:

A. Pup 1.
B. Pup 6.
C. Pup 9.
D. Pup 16.

32. Based on the information in the passage, *Mungos mungo* pups first become attached to their adult escorts:

F. at approximately 3 months of age.
G. at approximately 1 month of age.
H. after 2 days in captivity.
J. at birth.

33. According to Figure 1, the pups spent about how much time searching for their adult escorts?

A. 25 minutes
B. 15 minutes
C. 10 minutes
D. 5 minutes

34. Which of the following is the MOST significant assumption made when observing certain behaviors of banded mongoose pups?

F. Female banded mongooses give birth to at least 3 pups.
G. Banded mongoose pups must be easy to capture.
H. Banded mongoose pups choose their own parents.
J. All members of a banded mongoose tribe send out alarm calls.

35. Which of the following best explains why the banded mongoose is a sociable animal?

A. This behavior ensures a safe environment in which to raise young.
B. Banded mongooses can only hear alarm calls when they are near each other.
C. This behavior allows them to inhabit much of the African grassland.
D. Breeding habits can be more easily observed.



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## Passage VII

The movement of gas through a small opening from an area of high pressure to an area of low pressure is called *gas effusion*. A high school science class measured the rate of effusion of certain gases in milliliters per second (mL/sec).

A 25 mL gas sample was placed into a syringe, and effusion occurred through the needle into a beaker. Information on each of the gases tested, as well as the time required for the entire sample to effuse into the beaker, is listed in Table 1.

Table 1

| Gas | Effusion time (sec) | Molecular mass (a.m.u.) | Density (g/L) | Average molecular speed (m/sec) |
|---|---|---|---|---|
| $H_2$ | 5.2 | 2.0 | 0.08 | 1,929 |
| He | 7.1 | 4.0 | 0.16 | 1,360 |
| $CH_4$ | 14.5 | 18.0 | 0.68 | 671 |
| Ne | 16.9 | 20.0 | 0.85 | 557 |
| CO | 18.7 | 28.0 | 1.18 | 504 |
| $O_2$ | 19.3 | 32.0 | 1.32 | 481 |
| $O_3$ | 25.6 | 48.0 | 2.14 | 363 |

Students then graphed the relationship between effusion rate and the molecular mass of the gases. Their graph is represented in Figure 2.

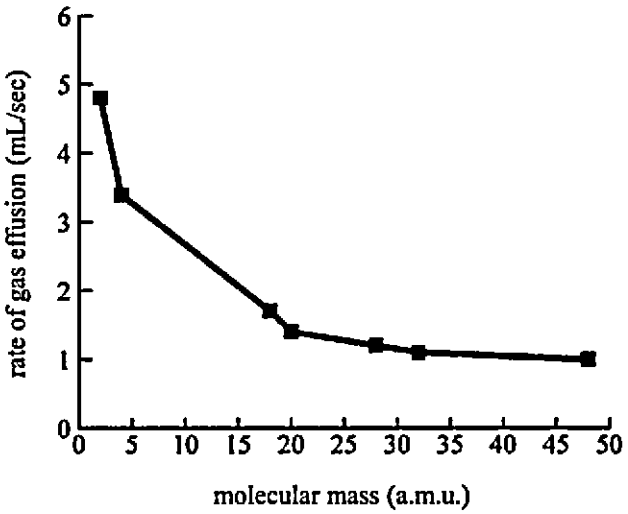


Figure 2

36. Given the information in Table 1, the difference in effusion time is *smallest* between which of the following pairs of gases?

F. $H_2$ and He
G. $H_2$ and $O_3$
H. CO and $O_2$
J. Ne and CO

37. The students perform a second experiment to test how long each gas will take to completely effuse through the microscopic pores in rubber balloons. Four identical balloons are separately infused with 0.5 L of $CH_4$, Ne, CO, and $O_2$. According to the data in Table 1, if these are kept under the same conditions, which balloon should deflate last?

A. $CH_4$
B. Ne
C. CO
D. $O_2$

38. A second high school science class conducts the experiment, trying to replicate the results in Table 1. After 7.25 seconds of effusion, what percentage of $CH_4$ gas will remain in a syringe that originally contained 25 mL of $CH_4$ gas?

F. 75%
G. 50%
H. 25%
J. 12.25%

39. Students must estimate the effusion time of an unknown gas. If the molecular mass is 37 a.m.u., approximately how long will it take for a 25 mL sample to effuse into the beaker?

A. Between 7.1 and 14.5 sec.
B. Between 16.9 and 18.7 sec.
C. Between 19.3 and 25.6 sec.
D. More than 25.6 sec.

40. A syringe is filled with an unknown volume of $H_2$ gas. It takes 7.8 seconds for the $H_2$ gas to effuse. According to Table 1, which of the following measurements would the unknown volume of the syringe be closest to?

F. 12.5 mL
G. 37.5 mL
H. 50 mL
J. 62.5 mL



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# Writing Test Prompt

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*DIRECTIONS*

This is a test of your writing skills. You will have thirty (30) minutes to write an essay in English. Before you begin planning and writing your essay, read the writing prompt carefully to understand exactly what you are being asked to do. Your essay will be evaluated on the evidence it provides of your ability to express judgments by taking a position on the issue in the writing prompt; to maintain a focus on the topic throughout the essay; to develop a position by using logical reasoning and by supporting your ideas; to organize ideas in a logical way; and to use language clearly and effectively according to the conventions of standard written English.

You may use scratch paper to plan your essay. These pages will not be scored. ***You must write your essay on the lined pages on the Revolution Prep answer sheet.*** Your writing on those lined pages will be scored. You may not need both of the lined pages, but to ensure you have enough room to finish, do NOT skip lines. You may write corrections or additions neatly between the lines of your essay, but do NOT write in the margins of the lined pages. ***Illegible essays cannot be scored, so you must write (or print) clearly.***

If you finish before time is called, you may review your work. Lay your pencil down immediately when time is called.

**DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.**

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# Writing Test Prompt

Some schools have an active recycling program and encourage students to recycle paper and plastic, both in the school and at home. Supporters of these programs applaud the schools' forward thinking and believe that students will become more responsible stewards of the planet as a result of participating in school recycling programs. Opponents of such programs argue that they are being funded by money that could be better used elsewhere.

Should schools spend time, money, and other resources on developing and maintaining recycling programs?

In your essay, take a position on this question. You may write about one of the points of view mentioned above, or you may give another point of view on this issue. Use specific examples and reasons for your position.

**Use this page to *plan* your essay.**
**Your work on this page will *not* be scored.**