

080660

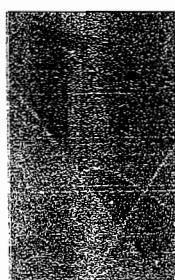
## Practice Test 3

Your Signature (do not print): \_\_\_\_\_

Print Your Name Here: \_\_\_\_\_

Your Date of Birth:									
<input type="text"/>	<input type="text"/>	-	<input type="text"/>	<input type="text"/>	-	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Months		Day		Year					

Form 3MC



The ACT®

2008 | 2009

## Directions

This booklet contains tests in English, Mathematics, Reading, and Science. These tests measure skills and abilities highly related to high school course work and success in college. **CALCULATORS MAY BE USED ON THE MATHEMATICS TEST ONLY.**

The questions in each test are numbered, and the suggested answers for each question are lettered. On the answer document, the rows of ovals are numbered to match the questions, and the ovals in each row are lettered to correspond to the suggested answers.

For each question, first decide which answer is best. Next, locate on the answer document the row of ovals numbered the same as the question. Then, locate the oval in that row lettered the same as your answer. Finally, fill in the oval completely. Use a soft lead pencil and make your marks heavy and black. **DO NOT USE A BALLPOINT PEN.**

Mark only one answer to each question. If you change your mind about an answer, erase your first mark thoroughly before marking your new answer. For each question, make certain that you mark in the row of ovals with the same number as the question.

Only responses marked on your answer document will be scored. Your score on each test will be based only on the number of questions you answer correctly during the time allowed for that test. You will **NOT** be penalized for guessing. **IT IS TO YOUR ADVANTAGE TO ANSWER EVERY QUESTION EVEN IF YOU MUST GUESS.**

You may work on each test **ONLY** when your test supervisor tells you to do so. If you finish a test before time is called for that test, you should use the time remaining to reconsider questions you are uncertain about in that test. You may **NOT** look back to a test on which time has already been called, and you may **NOT** go ahead to another test. To do so will disqualify you from the examination.

Lay your pencil down immediately when time is called at the end of each test. You may **NOT** for any reason fill in or alter ovals for a test after time is called for that test. To do so will disqualify you from the examination.

Do not fold or tear the pages of your test booklet.

**DO NOT OPEN THIS BOOKLET  
UNTIL TOLD TO DO SO.**

P.O. BOX 168  
IOWA CITY, IA 52243-0168

©2009 by ACT, Inc. All rights reserved.

NOTE: This booklet is covered by Federal copyright laws that prohibit the reproduction of the test questions without the express, written permission of ACT, Inc.

**Useful Links:**

**ACT Online Practice Tests:** <http://www.crackact.com/act/all-tests.html>

✓ **ACT English Tests:** <http://www.crackact.com/act/english/>

✓ **ACT Math Tests:** <http://www.crackact.com/act/math/>

✓ **ACT Reading Tests:** <http://www.crackact.com/act/reading/>

✓ **ACT Science Tests:** <http://www.crackact.com/act/science/>

**ACT Test Skills:** <http://www.crackact.com/act/skills/>

**ACT Writing Samples:** <http://www.crackact.com/act/writing/essay-samples.html>

**ACT Writing Prompts:** <http://www.crackact.com/act/writing/essay-prompts.html>

**ACT Downloads:**

**ACT Downloads:** <http://www.crackact.com/act-downloads/>

**Real ACT Tests Download:** <http://www.crackact.com/act-downloads/real-act-tests.html>

---

**SAT Online Practice Tests:** <http://www.cracksat.net>

**Real ACT Tests Download:** <http://www.cracksat.net/sat-downloads/>

**1000+ College Admission Essay Samples:**

<http://www.cracksat.net/college-admission/essays/>



## 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.

## PASSAGE I

## A Literary Magazine

[1]

Whether or not wanting to work for *Fairground*,

you have to be willing to push yourself. The editors of

our triannual literary magazine is kept busy all year  
with a wide variety of tasks.

[2]

Our year begins in July, with fund-raising and promotion for the magazine, which presents a mixture of poetry, short stories, and essays. Our office fills up with subscription forms and fliers that we must sort, bundle, and tote to the post office to be mailed.

[3]

In August, we send letters to our favorite authors, inviting them to send manuscripts. Meanwhile, we're receiving unsolicited submissions from other writers. During September and October,

1. A. NO CHANGE  
B. If you want to work for *Fairground*,  
C. Wanting to work for *Fairground*, if you do,  
D. Having decided whether or not you want to work for *Fairground*,

2. F. NO CHANGE  
G. keeps  
H. are kept  
J. has been keeping

3. A. NO CHANGE  
B. fliers, these we must  
C. fliers these we have to  
D. fliers, we must

GO ON TO THE NEXT PAGE.

1



1

we read and evaluate hundreds of manuscripts.

4

[4]

Some offerings are scrawled in pencil; others, are  
 expertly typed. Some arrive with letters proclaiming the  
 writer's genius; others may be written even more illegibly.  
 We base our decisions only on the work itself.

Actual typesetting will come later. The editors

7

agree that every issue has to be good and has to

8

reflect and show the varied diversity of the United States.

9

Within they're policy that's plenty of room for discussion,

10

and editors have to be ready to sprint the distance favoring  
 their choices.

11

[5]

By November, we have selected enough material  
 to fill three issues. Once we've found artwork suitable  
 for the covers, editorial production, begins. We plan

12

4. Which choice should the writer use to create the clearest and most logical transition to Paragraph 4?
  - F. NO CHANGE
  - G. the leaves fall faster than the manuscripts piling up on our desks.
  - H. you can imagine it's different from back in August.
  - J. they see hundreds of manuscript readings and evaluations.
5. A. NO CHANGE  
 B. pencil others  
 C. pencil; others  
 D. pencil so others,
6. Given that all are true, which of the choices creates the most logical and appropriate contrast in this sentence?
  - F. NO CHANGE
  - G. can't appreciate how much work our editors put in.
  - H. come with apologies for taking up our time.
  - J. arrive folded up and dog-eared.
7. A. NO CHANGE  
 B. The typesetting comes in much later.  
 C. Typesetting is handled later on.  
 D. OMIT the underlined portion.
8. F. NO CHANGE  
 G. more good  
 H. positively well  
 J. as well as we can make it
9. A. NO CHANGE  
 B. reflect and show the cultural diversity of a multi-cultural  
 C. mirror and reflect the diversity of a diverse  
 D. reflect the cultural diversity of the
10. F. NO CHANGE  
 G. our policy their is  
 H. that policy theirs  
 J. that policy there's
11. A. NO CHANGE  
 B. argue spiritedly for  
 C. contend the spirit of  
 D. be argumentative to
12. F. NO CHANGE  
 G. editorial production begin.  
 H. we begin, editorial production.  
 J. editorial production begins.

GO ON TO THE NEXT PAGE.

1

1

the contents of the year's issues, page by page.

13

It may snow just after New Year's Day; the first

14

issue is mailed to a typesetter. While that issue is

being set, we complete the next one's layout. Thus,

as soon as an issue comes back from the typesetter

for proofreading, the next can go in for typesetting.

By this time, there's plenty of material for three issues.

15

After the proofreading is done, each issue is sent to a

printer, who prints it, binds it, and delivers it to our door.

Our office fills up again with the printed copies, ready to

be mailed to subscribers, reviewers, and contributors.

Finally, in midsummer, we ship out our third and final

issue—just in time to begin another publishing year.

13. A. NO CHANGE

B. years issues,

C. years issues

D. issue's for the year,

14. F. NO CHANGE

G. After what may be a snowy New Year's Day but not by much

H. Shortly thereafter New Year's Day,

J. Just after New Year's Day,

15. A. NO CHANGE

B. Three issues' worth of material has already been selected.

C. We have chosen material sufficient for all three issues.

D. OMIT the underlined portion.

## PASSAGE II

### Are Wolves Making a Comeback?

[1]

[1] At dawn a hunter crept across a steep,

wooded, pine-covered slope in northwest Wyoming.

16

[2] He was searching for signs of elk when he noticed an

17

unusual track, broad as a human hand, in the fresher fallen

18

snow. [3] He thought it might have been made

19

16. F. NO CHANGE

G. sloping, pine-covered hill

H. pine-covered slope

J. slanting, pine-covered slope

17. A. NO CHANGE

B. elk when noticing

C. elk, when

D. elk, when seeing

18. F. NO CHANGE

G. freshly fallened

H. newly fallen

J. newer falling

19. A. NO CHANGE

B. might of

C. could of

D. could

GO ON TO THE NEXT PAGE.



by something.

20

[2]

[1] Even though wolves supposedly disappeared<sup>21</sup> from the area years ago, the hunter's story was not unusual. [2] Many reports, most of them filed by hunters<sup>22</sup> have recounted howlings, tracks, and possible wolf kills (that is, animals killed by wolves). [3] A few people even claim to have stood face-to-face with wolves before the animals faded into black timber. [23] [4] The United States Forest Service has verified thirty reports of wolf sightings in the past decade in Wyoming's Bridger-Teton National Forest.

[3]

According to Forest Service officials, the Rocky Mountain gray wolf was common throughout most of Wyoming in the 1860s and 1870s. However, ranchers and government "wolfers" made a concerted effort to eliminate the predators by trapping and poisoning<sup>24</sup>

them. [25]

[4]

Wolves are now classified as an endangered species in all the lower forty-eight states except Minnesota, after which the animals began migrating from Canada in<sup>26</sup> the 1960s. There is also a sizable population of wolves just north of the Montana border. Biologists believe that the recent flurry of possible wolf sightings in Wyoming may indicate that a few wolves are moving south.

20. Which choice provides the most specific transition to the next paragraph?

- F. NO CHANGE
- G. someone else.
- H. a wolf.
- J. a large animal.

21. A. NO CHANGE  
B. wolves, supposedly  
C. wolves supposedly,  
D. wolves' had

22. F. NO CHANGE  
G. reports—most of them filed by hunters—  
H. reports; most of them filed by hunters,  
J. reports, having been filing by hunters,

23. Which of the following true statements, if added here, would best strengthen the assertion that wolves are present in northwest Wyoming?

- A. Many other wolf sightings have no doubt gone unreported.
- B. Others have mentioned seeing garbage cans tipped over and food spilled on the ground.
- C. A camper's daughter imagined seeing wolf-shaped shadows near her tent at nightfall.
- D. Many rangers have reported hearing the soft cry of wolf cubs in the evening.

24. F. NO CHANGE  
G. through traps  
H. with traps  
J. in traps

25. Given that all of the following sentences are true, which one, if added here, would offer the best transition from Paragraph 3 to Paragraph 4?

- A. This caused some problems for the wolves.
- B. There were not too many "wolfers" employed in Wyoming, however.
- C. By the turn of the century, there was scarcely a wolf left in the state.
- D. The Rocky Mountain gray wolf was a majestic animal and, thus, not easily trapped.

26. F. NO CHANGE  
G. from which  
H. when  
J. into which

GO ON TO THE NEXT PAGE.

[5]

Although Forest Service officials consider the sightings to be honestly reported, they need to confirm the presence of wolf packs and breeding pairs in the Bridger-Teton area. So, biologists decided, to look for the wolves<sup>27</sup> themselves. They have flown to elk and deer wintering areas, ridden horses and snowmobiles through the mountains, and throwing<sup>28</sup> back their heads and called out with low, moaning howls in hopes of communicating with<sup>29</sup> the wolves. Occasionally, the wolves have answered back.

27. A. NO CHANGE  
 B. So biologists decided  
 C. So biologists decided,  
 D. So biologists, decided
28. F. NO CHANGE  
 G. throw  
 H. threw  
 J. even thrown
29. A. NO CHANGE  
 B. to hope to communicate  
 C. in hopes to communicate  
 D. in hope's communication

Question 30 asks about the preceding passage as a whole.

30. In order to explain why it is not ordinarily dangerous for people to be near wolves, the writer is considering adding the following sentence to the essay:
- (Contrary to popular belief, wolves rarely attack humans.)
- If added, this sentence would most logically be placed after:
- F. Sentence 3 in Paragraph 1.  
 G. Sentence 2 in Paragraph 2.  
 H. Sentence 4 in Paragraph 2.  
 J. the first sentence in Paragraph 3.

### PASSAGE III

#### The Suzuki Method

In the early 1930s, Dr. Shinichi Suzuki was teaching<sup>31</sup> violin at the Imperial Conservatory in Japan, a father brought in his four-year-old son for lessons. Although<sup>32</sup> Suzuki had never taught anyone so young, he reluctantly<sup>32</sup> agreed to accept the tiny violin student.

As he pondered what training might work for this preschooler, Suzuki began to think about how young

31. A. NO CHANGE  
 B. Dr. Shinichi Suzuki taught  
 C. that Dr. Shinichi Suzuki was teaching  
 D. while Dr. Shinichi Suzuki was teaching
32. At this point in the essay, the writer wants to show that Dr. Suzuki did not feel prepared to teach music at the preschool level. Given that all of the choices are true, which one best conveys that message?
- F. NO CHANGE  
 G. Generally, conservatory students were between seventeen and twenty-five years of age, and he  
 H. Given the fact that his music students were much older, he deliberately  
 J. After conversing with the boy's parents, he

**GO ON TO THE NEXT PAGE.**



children learn to use language in very sophisticated

ways. He suspected that this miraculous-seeming process

33

may or may not offer valuable insights into how all

34

learning occurs, including learning to play a musical instrument.

[1] Immersion was already understood to be a

35

key to a child's language development by Suzuki.

35

[2] Newborns are immersed in language. [3] Babies

36

first attempts at speech generate excited responses

from adults who encourage and guide the children

toward more precise and complex speech. [4] Teachers

provide in-depth language understanding, and children

are rewarded for improving his or her communication

37

skills. [5] Based on these realizations, Suzuki

developed an awareness of how children learn language.

38

[6] His program has since grown into an internationally

acclaimed philosophy of music education. 39

In the Suzuki method, students are immersed in

music. Each day students and their families listen to

40

33. A. NO CHANGE  
B. Nevertheless, he suspected  
C. He suspected, however,  
D. Instead, he suspected

34. F. NO CHANGE  
G. might offer  
H. could suggest important  
J. might indeed provide one with

35. A. NO CHANGE  
B. As Suzuki already understood, that immersion is a key to a child's language development.  
C. Suzuki already understood that immersion is a key to a child's language development.  
D. A key to a child's language development, Suzuki already understood that it was immersion.

36. F. NO CHANGE  
G. Baby's  
H. Babys  
J. Babies'

37. A. NO CHANGE  
B. one's  
C. there  
D. their

38. Given that all of the choices are true, which one would provide the most effective link between Sentences 4 and 6?  
F. NO CHANGE  
G. developed a unique approach to violin studies.  
H. transferred his knowledge into something positive.  
J. decided to see where this information might acquire more additional applications.

39. The writer is considering adding the following true statement to this paragraph:

Babies begin to coordinate hand and eye movements early in life.

Should the sentence be added to this paragraph, and if so, where should it be placed?

- A. Yes, after Sentence 1.  
B. Yes, after Sentence 2.  
C. Yes, after Sentence 3.  
D. The sentence should NOT be added.
40. F. NO CHANGE  
G. music, and that each  
H. music and that each  
J. music, each

GO ON TO THE NEXT PAGE.





recorded music that at a future date the students later  
 learn on an instrument. When the time comes to play a  
 composition, the student already feels intimately familiar  
 with it. The child's early musical accomplishments are  
 greeted with enthusiasm. Lessons provide expert  
 assistance; group sessions and concerts reward  
 students with opportunities to share music.

Even so, for a long time, Suzuki encouraged  
 students and teachers alike to strive toward lifelong  
 learning. Worldwide, he promoted the idea that  
 every child possesses the potential to develop  
 musical talent and for the joys of achievement.

All that his teaching inspired are enriched, who  
 hear the beautiful music.

41. A. NO CHANGE  
 B. subsequently  
 C. before long  
 D. OMIT the underlined portion.
42. F. NO CHANGE  
 G. rewarded  
 H. had rewarded  
 J. in rewarding
43. Given that all of the choices are true, which one would provide the most effective introductory phrase?  
 A. NO CHANGE  
 B. Recurrently with time,  
 C. For many decades,  
 D. For scores of years then,
44. F. NO CHANGE  
 G. the joys of achievement can be experienced.  
 H. for experiencing the joys of achievement.  
 J. to experience the joys of achievement.
45. A. NO CHANGE  
 B. that his teaching inspired who hear the beautiful music are enriched.  
 C. who hear the beautiful music that his teaching inspired are enriched.  
 D. are enriched by hearing the beautiful music of which his teaching inspired.

#### PASSAGE IV

##### The Beltway: Washington's Expressway

If you visit our nation's capital, recently, as I did, you  
 will probably plan trips to several of the famous memorials  
 there, many of which you have probably seen on television.  
 These celebrated landmarks were designed to inspire

feelings of patriotism and pride. Nevertheless, the structure  
 I remember most vividly from my trip was an expressway

46. F. NO CHANGE  
 G. recently visit our nation's capital, as I did,  
 H. visit recently, as I did, our nation's capital,  
 J. visit our nation's capital, as I did recently,
47. Given that all of the choices are true, which one would conclude this sentence by providing the clearest examples of some of the attractions that are available in the nation's capital?  
 A. NO CHANGE  
 B. including the ones that are readily recognizable to us.  
 C. including the Washington Monument and the Lincoln Memorial.  
 D. those structures that potentially add to the history of the capital.
48. F. NO CHANGE  
 G. Therefore,  
 H. As a result,  
 J. In addition,

GO ON TO THE NEXT PAGE.

alled the Washington Beltway, which seems to be a  
 memorial to the frenzied and crazy lunacy of modern life.

This expressway resembles an ordinary highway  
 about as much as a space shuttle resembles an airplane. At  
 ten lanes wide, they are much larger than the bypass loops  
 have driven around Indianapolis and Cincinnati. The

beltway is also far more busier, perhaps because it  
 extends through two populous states—Virginia and  
 Maryland—and intersecting with many lesser highways.

It's also fast, the thousands of Washingtonians who dash  
 from home to work and back sometimes ignore the posted  
 speed limit. The one, redeeming, feature of the beltway is  
 that it's impossible to get lost on it. If you keep driving  
 long enough, you will eventually circle the city and return  
 to the point where you began. 55

As I've already mentioned, I was on a visit to  
 Washington. I was staying with friends in their suburban  
 Virginia home, and I asked them for help with alternate,  
 more scenic routes. But by their puzzled looks, I realized

49. A. NO CHANGE  
 B. frenzy of modern  
 C. frenzy of modern contemporary  
 D. confused disarray of
50. F. NO CHANGE  
 G. it is  
 H. it was  
 J. they were
51. A. NO CHANGE  
 B. far busier,  
 C. more busier,  
 D. most busiest,
52. F. NO CHANGE  
 G. but intersects  
 H. and intersects  
 J. and
53. A. NO CHANGE  
 B. It's also fast:  
 C. Its also fast:  
 D. Its also fast,
54. F. NO CHANGE  
 G. one redeeming, feature of the beltway  
 H. one redeeming feature of the beltway,  
 J. one redeeming feature of the beltway
55. At this point, the writer is considering adding the following true statement:  
 Atlanta and Houston also are surrounded by such giant loop highways.  
 Should the writer make this addition here?  
 A. Yes, because it informs the reader that such highways are not unique to Washington, D.C.  
 B. Yes, because it helps the reader to better understand what the beltway looks like.  
 C. No, because it distracts the reader from the main focus of the paragraph.  
 D. No, because it is inconsistent with the tone and style of the essay.
56. Given that all of the choices are true, which one would most effectively introduce this paragraph?  
 F. NO CHANGE  
 G. Initially, I planned to avoid driving on the beltway.  
 H. The hustle and bustle was evident everywhere I went.  
 J. The beltway seems to turn official Washington into an island.

GO ON TO THE NEXT PAGE.



they had surrendered to the beltway long ago. Graciously, I

57

learned to navigate this expressway. I approach it as if it

58

were an unpredictable natural force that required careful

monitoring. Was it congested? Overcrowded? Moving

59

freely? Blocked completely? What about construction

zones? The radio provided me with frequent updates. Just

as some people on vacation like to keep a close watch on

the weather, I wanted to keep track of beltway conditions.

I'm not sure how much American history I learned on my trip, as my powers of concentration were taxed merely reading road signs. 60

57. A. NO CHANGE

B. Carefully, however,

C. So, unhappily,

D. In fact,

58. F. NO CHANGE

G. approached it,

H. approached it

J. approach it,

59. A. NO CHANGE

B. Jammed with cars?

C. Proceeding smoothly?

D. OMIT the underlined portion.

60. Which of the following sentences, if added here, would provide the best conclusion to the paragraph and is most consistent with the main focus of the essay?

F. However, my ability to merge in traffic improved immensely!

G. Nevertheless, I did learn a lot about the Washington Monument and the Jefferson Memorial.

H. Washington's celebrated landmarks are truly inspirational.

J. Opportunities, nevertheless, for learning this history abound in our nation's capital.

# PASSAGE V

## Modern Uses for Old Ways

[1] At first glance, Jane Mt. Pleasant's garden plots look a total mess. [2] The ground being bumpy with mounds and covered with old leaves.

61

[3] Beans hang on the cornstalks, and squash vines

had sprawled everywhere. [4] But this apparent

62

chaos is the subject of scientific research. [5] Mt.

63

61. A. NO CHANGE

B. was bumpy with mounds and is

C. is bumpy with mounds and

D. bumpy with mounds and

62. F. NO CHANGE

G. sprawl

H. sprawled

J. could have sprawled

63. A. NO CHANGE

B. chaos, is the subject

C. chaos is the subject,

D. chaos: is the subject

GO ON TO THE NEXT PAGE.

Pleasant's gardens are modeled for those grown by the  
 Iroquois and other Native peoples. [6] The data the gardens  
 are yielding may provide evidence to support the use of  
 old methods to improve modern agriculture. [65]

A Cornell University agronomist and an Iroquois  
 herself, Jane Mt. Pleasant questions some of modern  
 agriculture's practices, and she has a Ph.D. degree. Many  
 farmers and agronomists believe that the recent boom in

crop production in the last few years— fueled by the  
 intensive use of farmland and increased dependence on  
 herbicides and pesticides—have come with hidden costs.  
 Soil erosion and pollution have put our food supply and  
 our health at risk. [69]

The Iroquois method begins with corn being planted  
 at three-foot intervals. Later, soil had been mounded  
 around the young stalks, enhancing drainage and warming

64. F. NO CHANGE  
 G. on  
 H. as  
 J. by
65. For the sake of the logic and coherence of this paragraph, Sentence 6 should be placed:  
 A. where it is now.  
 B. after Sentence 1.  
 C. after Sentence 2.  
 D. after Sentence 3..
66. At this point, the writer wants to add a statement that would lead into the sentence that follows it. Given that all of the choices are true, which one would best accomplish that purpose?  
 F. NO CHANGE  
 G. her concern is shared by others.  
 H. she's enjoyed gardening since she was a child.  
 J. her opinions are based on scientific research.
67. A. NO CHANGE  
 B. production of late—  
 C. production lately—  
 D. production—
68. F. NO CHANGE  
 G. has  
 H. are  
 J. OMIT the underlined portion.
69. Which of the following sentences, if added at this point, would both reinforce the conclusions presented in the essay and create an effective transition to the next paragraph?  
 A. Iroquois farming techniques, however, offer possible solutions to such problems.  
 B. Many diseases have a direct link to these toxins in our air, land, and water.  
 C. Certain farming practices have been employed by the Iroquois people.  
 D. These social problems must be resolved one way or another.
70. F. NO CHANGE  
 G. has been  
 H. was  
 J. is
71. Which of the following alternatives to the underlined portion would NOT be acceptable?  
 A. stalks because of enhancing drainage and warming  
 B. stalks in order to enhance drainage and warm  
 C. stalks, which enhances drainage and warms  
 D. stalks. This enhances drainage and warms





the soil. Beans are then planted on the mounds, and squash  
72  
 is planted between the mounds.

Corn, beans, and squash —  
all of which might be grown in your garden—  
73  
 work as a team. The corn stalks support the bean vines, the  
 nitrogen-fixing roots of the beans enrich the soil, and the  
 squashes' broad leaves stifle the weeds. After the harvest,  
 the remains of the plants are left to rot, further enriching  
 the soil and reducing the potential for erosion. Mt. Pleasant  
 has found that total crop production in her experimental  
 plots rivals that of high-tech, single-crop farming. Her  
 research is helping farmers make better decisions about  
 planting soil-protecting cover crops.

Perhaps the best endorsement of the Iroquois  
 "three-sisters" system is that it has worked for over four  
74  
 centuries. Mt. Pleasant notes, "It is a balance between  
 production and soil protection."

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

- F. mounds, while squash
- G. mounds. Squash
- H. mounds; squash
- J. mounds squash

73. Given that all of the choices are true, which one would provide information that is most relevant and meaningful to the essay as a whole?

- A. NO CHANGE
- B. which could make a nice vegetarian dish—
- C. the Iroquois "three sisters"—
- D. representing various food families—

74. F. NO CHANGE

- G. system, is
- H. system is,
- J. system is:

Question 75 asks about the preceding passage as a whole.

75. Suppose the writer had chosen to write a brief essay about an example of how the past can inform the present. Would this essay successfully fulfill the writer's goal?

- A. Yes, because the essay compares the traditional techniques of three-sisters farming to the high-tech methods of modern farming.
- B. Yes, because the essay describes how the traditional farming practices of the Iroquois people can offer ways to improve modern agriculture.
- C. No, because the essay presents the theories of Jane Mt. Pleasant, who is currently an agronomist at Cornell University and, therefore, not a reflection of the past.
- D. No, because the essay describes the planting of cover crops, which has always been a common practice among farmers.

**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,

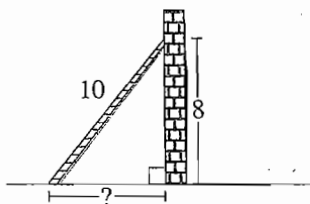
but some of the problems may best be done without using a calculator.

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. Kalino earned 85, 95, 93, and 80 points on the 4 tests, each worth 100 points, given so far this term. How many points must he earn on his fifth test, also worth 100 points, to average 90 points for the 5 tests given this term?
  - A. 87
  - B. 88
  - C. 90
  - D. 92
  - E. 97
2. What is the value of the expression  $g \cdot (g + 1)^2$  for  $g = 2$ ?
  - F. 10
  - G. 12
  - H. 18
  - J. 20
  - K. 36
3. Company A sells 60 pens for \$15.00, while Company B sells the same type of pens 40 for \$8.00. Which company's price per pen is cheaper, and what is that price?
  - A. Company A, at \$0.20
  - B. Company A, at \$0.23
  - C. Company A, at \$0.25
  - D. Company B, at \$0.20
  - E. Company B, at \$0.25
4. A ladder is 10 ft long and reaches 8 ft up a wall, as shown below. How many feet is the bottom of the ladder from the base of the wall?
  - F. 2
  - G. 3
  - H. 6
  - J.  $\sqrt{2}$
  - K.  $\sqrt{164}$



GO ON TO THE NEXT PAGE.

2



2

5. Consider the 3 statements below to be true.

All insects that are attracted to honey are ants.

Insect I is not an ant.

Insect J is attracted to honey.

Which of the following statements is necessarily true?

- A. Insect I is an ant not attracted to honey.
- B. Insect I is an ant attracted to honey.
- C. Insect I is attracted to honey.
- D. Insect J is not attracted to honey.
- E. Insect J is an ant.

6. A city utility department charges residential customers \$2.50 per 1,000 gallons of water and \$16.00 per month for trash pickup. Which of the following expressions gives a residential customer's total monthly charges, in dollars, for use of  $g$  thousand gallons of water and trash pickup?

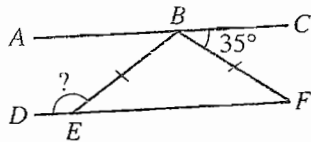
- F.  $2.50g + 16.00$
- G.  $2.50g + 1,016.00$
- H.  $16.00g + 2.50$
- J.  $18.50g$
- K.  $2,500.00g + 16.00$

7. What is the value of  $x$  that satisfies the equation  $2(x + 4) = 5x - 7$ ?

- A. -1
- B.  $\frac{1}{3}$
- C.  $\frac{11}{3}$
- D. 5
- E.  $\frac{43}{3}$

8. In the figure below,  $B$  is on  $\overline{AC}$ ,  $E$  is on  $\overline{DF}$ ,  $\overline{AC}$  is parallel to  $\overline{DF}$ , and  $\overline{BE}$  is congruent to  $\overline{BF}$ . What is the measure of  $\angle DEB$ ?

- F.  $35^\circ$
- G.  $135^\circ$
- H.  $145^\circ$
- J.  $155^\circ$
- K.  $215^\circ$



9. What is the least common denominator when adding the fractions  $\frac{a}{2}$ ,  $\frac{b}{3}$ ,  $\frac{c}{9}$ , and  $\frac{d}{15}$ ?

- A. 45
- B. 90
- C. 135
- D. 270
- E. 810

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.



2



2

10. Which of the following expressions is equivalent to  $3x(x^2y + 2xy^2)$  ?

DO YOUR FIGURING HERE.

- F.  $3x^2y + 6xy^2$
- G.  $3x^3y + 2xy^2$
- H.  $3x^3y + 6x^2y^2$
- J.  $5x^4y^3$
- K.  $9x^4y^3$

11. A certain type of notebook costs \$2.50 before sales tax is added. When you buy 9 of these notebooks you receive 1 additional notebook free. What is the average cost per notebook for the 10 notebooks before sales tax is added?

- A. \$2.78
- B. \$2.50
- C. \$2.30
- D. \$2.25
- E. \$2.15

12. For all  $x$ ,  $(3x + 1)^2 = ?$

- F.  $6x + 2$
- G.  $6x^2 + 2$
- H.  $9x^2 + 1$
- J.  $9x^2 + 3x + 1$
- K.  $9x^2 + 6x + 1$

13. Mark and Juanita own a sandwich shop. They offer 3 kinds of bread, 5 kinds of meat, and 3 kinds of cheese. Each type of sandwich has a combination of exactly 3 ingredients: 1 bread, 1 meat, and 1 cheese. How many types of sandwiches are possible?

- A. 11
- B. 15
- C. 30
- D. 45
- E. 120

14. If  $a^2 = 49$  and  $b^2 = 64$ , which of the following CANNOT be a value of  $a + b$  ?

- F. -15
- G. -1
- H. 1
- J. 15
- K. 113

GO ON TO THE NEXT PAGE.

2



2

5. On the real number line, what is the midpoint of  $-5$  and  $17$ ?

A.  $-11$   
 B.  $6$   
 C.  $11$   
 D.  $12$   
 E.  $22$

DO YOUR FIGURING HERE.

16. If  $3\frac{3}{5} = x + 2\frac{2}{3}$ , then  $x =$ ?

F.  $\frac{4}{5}$   
 G.  $\frac{14}{15}$   
 H.  $1\frac{1}{2}$   
 J.  $1\frac{6}{15}$   
 K.  $6\frac{4}{15}$

17. A system of linear equations is shown below.

$$\begin{aligned} 3y &= -2x + 8 \\ 3y &= 2x + 8 \end{aligned}$$

Which of the following describes the graph of this system of linear equations in the standard  $(x,y)$  coordinate plane?

- A. Two distinct intersecting lines  
 B. Two parallel lines with positive slope  
 C. Two parallel lines with negative slope  
 D. A single line with positive slope  
 E. A single line with negative slope

18. Which real number satisfies  $(2^x)(4) = 8^3$ ?

F.  $2$   
 G.  $3$   
 H.  $4$   
 J.  $4.5$   
 K.  $7$

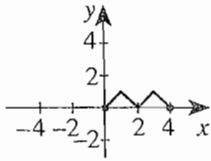
GO ON TO THE NEXT PAGE.

2

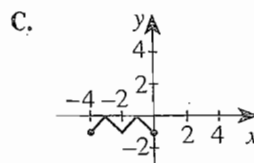
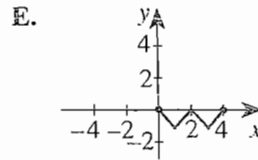
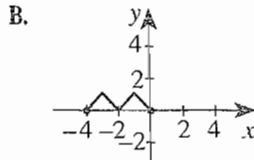
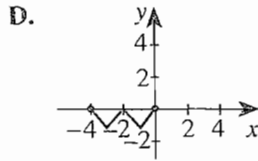
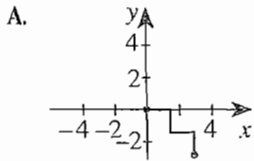


2

19. The graph shown in the standard  $(x,y)$  coordinate plane below is to be rotated in the plane  $180^\circ$  about the origin.



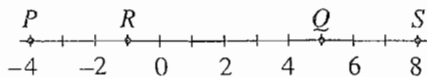
One of the following graphs is the result of this rotation. Which one is it?



20. What are the values for  $x$  that satisfy the equation  $(x + a)(x + b) = 0$ ?

- F.  $-a$  and  $-b$   
 G.  $-a$  and  $b$   
 H.  $-ab$   
 J.  $a$  and  $-b$   
 K.  $a$  and  $b$

21. On the real number line below, with coordinates as labeled, an object moves according to the following set of instructions: From point  $P$  the object moves right to  $Q$ , then left to  $R$ , then right to  $S$ , and finally left until it returns to its original position at  $P$ . What is the closest estimate of the total length, in coordinate units, of the movements this object makes?



- A. 0  
 B. 4  
 C. 12  
 D. 22  
 E. 36

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

2



2

2. By definition, the determinant  $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$  equals  $ad - bc$ .

What is the value of  $\begin{vmatrix} 2x & 3y \\ 5x & 4y \end{vmatrix}$  when  $x = -3$  and  $y = 2$ ?

- F. -138
- G. -42
- H. 12
- J. 42
- K. 138

DO YOUR FIGURING HERE.

13. When Angela was cleaning her refrigerator, she found 2 bottles of catsup. Looking at the labels, she noticed that the capacity of the larger bottle was twice the capacity of the smaller bottle. She estimated that the smaller bottle was about  $\frac{1}{3}$  full of catsup and the larger bottle was about  $\frac{2}{3}$  full of catsup. She poured all the catsup from the smaller bottle into the larger bottle. Then, about how full was the larger bottle?

- A.  $\frac{2}{9}$  full
- B.  $\frac{1}{2}$  full
- C.  $\frac{5}{6}$  full
- D. Completely full
- E. Overflowing

24. When Jeff starts a math assignment, he spends 5 minutes getting out his book and a sheet of paper, sharpening his pencil, looking up the assignment in his assignment notebook, and turning to the correct page in his book. The equation  $t = 10p + 5$  models the time,  $t$  minutes, Jeff budgets for a math assignment with  $p$  problems. Which of the following statements is necessarily true according to Jeff's model?
- F. He budgets 15 minutes per problem.
  - G. He budgets 10 minutes per problem.
  - H. He budgets 5 minutes per problem.
  - J. He budgets 10 minutes per problem for the hard problems and 5 minutes per problem for the easy problems.
  - K. He budgets a 5-minute break after each problem.

GO ON TO THE NEXT PAGE.



2



2

25. Kaya drove 200 miles in 5 hours of actual driving time. By driving an average of 10 miles per hour faster, Kaya could have saved how many hours of actual driving time?

A.  $\frac{1}{6}$   
 B.  $\frac{2}{3}$   
 C.  $\frac{7}{10}$   
 D. 1  
 E. 4

26. What number can you add to the numerator and denominator of  $\frac{7}{9}$  to get  $\frac{1}{2}$ ?

F. -11  
 G. -5  
 H.  $-2\frac{1}{2}$   
 J.  $-1\frac{2}{3}$   
 K. 5

27. If the inequality  $|a| > |b|$  is true, then which of the following *must* be true?

A.  $a = b$   
 B.  $a \neq b$   
 C.  $a < b$   
 D.  $a > b$   
 E.  $a > 0$

28. What is the slope of the line given by the equation  $14x - 11y + 16 = 0$ ?

F. -11  
 G.  $-\frac{14}{11}$   
 H.  $-\frac{11}{14}$   
 J.  $\frac{14}{11}$   
 K. 14

29. Which of the following is a value of  $x$  that satisfies  $\log_x 36 = 2$ ?

A. 4  
 B. 6  
 C. 8  
 D. 16  
 E. 18

DO YOUR FIGURING HERE.

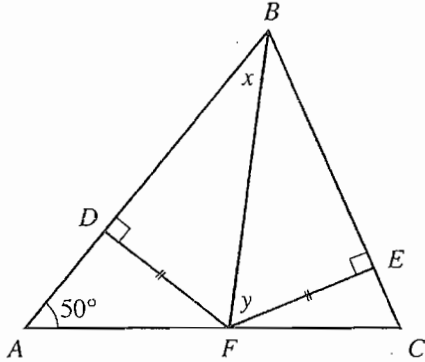
GO ON TO THE NEXT PAGE.

2



2

30. In  $\triangle ABC$  below,  $D$ ,  $E$ , and  $F$  are points on  $\overline{AB}$ ,  $\overline{BC}$ , and  $\overline{AC}$ , respectively, and  $\overline{DF}$  is congruent to  $\overline{EF}$ . What is the *sum* of the measures of the angles marked  $x$  and  $y$ ?



- F.  $40^\circ$   
 G.  $80^\circ$   
 H.  $90^\circ$   
 J.  $100^\circ$   
 K.  $130^\circ$

DO YOUR FIGURING HERE.

31. Which of the following expressions is equivalent to  $(-2x^5y^2)^4$ ?

- A.  $-16x^{20}y^8$   
 B.  $-8x^{20}y^8$   
 C.  $-8x^9y^6$   
 D.  $16x^9y^6$   
 E.  $16x^{20}y^8$

32. A line contains the points  $A$ ,  $B$ ,  $C$ , and  $D$ . Point  $B$  is between points  $A$  and  $C$ . Point  $D$  is between points  $C$  and  $B$ . Which of the following inequalities *must* be true about the lengths of these segments?

- F.  $BC < AB$   
 G.  $BD < AB$   
 H.  $BD < CD$   
 J.  $CD < AB$   
 K.  $CD < BC$

33. Which of the following inequalities defines the solution set for the inequality  $16 - 5x \leq 8$ ?

- A.  $x \geq \frac{8}{5}$   
 B.  $x \geq \frac{5}{8}$   
 C.  $x \geq -\frac{8}{5}$   
 D.  $x \leq -\frac{5}{8}$   
 E.  $x \leq -\frac{8}{5}$

GO ON TO THE NEXT PAGE.

2



2

34. The electrical resistance,  $r$  ohms, of 1,000 ft of solid copper wire at  $77^\circ\text{F}$  can be approximated by the

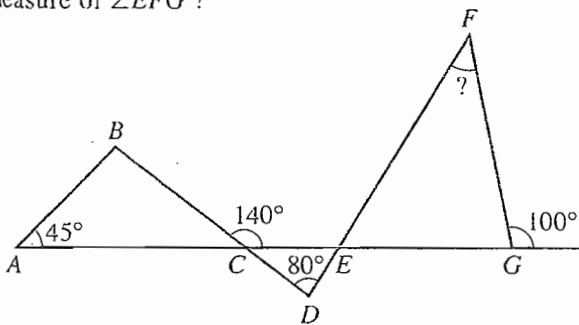
model  $r = \frac{10,770}{d^2} - 0.37$  for any wire diameter,  $d$  mils

(1 mil = 0.001 inch), such that  $5 \leq d \leq 100$ . What is the approximate resistance, in ohms, for such a wire with a diameter of 50 mils?

- F. 1  
G. 4  
H. 17  
J. 215  
K. 430

DO YOUR FIGURING HERE.

35. In the figure below, points  $A$ ,  $C$ ,  $E$ , and  $G$  are collinear;  $B$ ,  $C$ , and  $D$  are collinear; and  $D$ ,  $E$ , and  $F$  are collinear. Angle measures are as marked. What is the measure of  $\angle EFG$ ?



- A.  $40^\circ$   
B.  $45^\circ$   
C.  $60^\circ$   
D.  $80^\circ$   
E. Cannot be determined from the given information
36. The solution set of  $\sqrt{x-1} > 5$  is the set of all real numbers  $x$  such that:
- F.  $x > 4$   
G.  $x > 6$   
H.  $x > 24$   
J.  $x > 25$   
K.  $x > 26$
37. The measure of each interior angle of a regular polygon with  $n$  sides is  $\left[ \frac{(n-2)180}{n} \right]$  degrees. What is the measure of each interior angle of a regular polygon with  $n$  sides, in radians?

- A.  $\frac{(n-2)\pi}{4n}$   
B.  $\frac{(n-2)\pi}{2n}$   
C.  $\frac{(n-2)\pi}{n}$   
D.  $\frac{(n-2)2\pi}{n}$   
E.  $\frac{(n-2)4\pi}{n}$

GO ON TO THE NEXT PAGE.

2



2

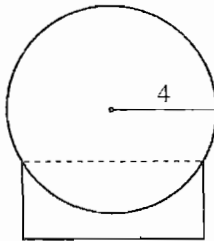
38. What is the distance, in coordinate units, between the points  $(-3,5)$  and  $(4,-1)$  in the standard  $(x,y)$  coordinate plane?

F.  $\sqrt{13}$   
 G.  $\sqrt{17}$   
 H.  $\sqrt{85}$   
 J. 13  
 K. 85

DO YOUR FIGURING HERE.

Use the following information to answer questions 39–41.

The end-on view of a cylindrical milk tank on its support is shown in the figure below. The interior radius of the tank's circular end is 4 feet. The interior length of the tank is 25 feet.



39. Which of the following is closest to the tank's volume, in cubic feet?
- A. 310  
 B. 630  
 C. 1,300  
 D. 2,500  
 E. 5,000
40. The tank currently holds 5,000 gallons of milk. Each gallon of milk weighs about 8 pounds. About how many pounds does this milk weigh?
- F. 625  
 G. 4,000  
 H. 4,992  
 J. 5,008  
 K. 40,000
41. The center of the circular end of the tank is 2 feet above the top level of the support. What is the width, in feet, of the support?
- A.  $2\sqrt{3}$   
 B.  $4\sqrt{3}$   
 C.  $4\sqrt{5}$   
 D. 12  
 E. 24

GO ON TO THE NEXT PAGE.



2

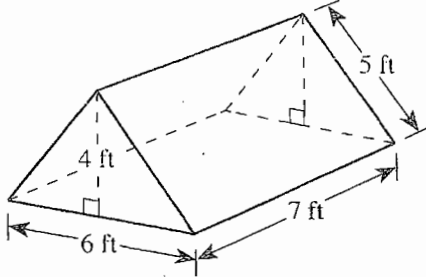


2

42. The tent illustrated below is in the shape of a right triangular prism and is made of nylon. How many square feet of nylon is required for the front, rear, and 2 sides of the tent?

DO YOUR FIGURING HERE.

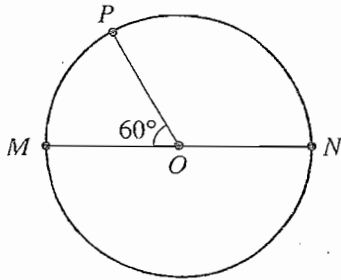
(Note: Please ignore the extra nylon for seams.)



- F. 47  
G. 59  
H. 82  
J. 94  
K. 118

43. Points  $M$  and  $N$  are the endpoints of the diameter of a circle with center at  $O$ , as shown below. Point  $P$  is on the circle, and  $\angle MOP$  measures  $60^\circ$ . The shortest distance along the circle from  $M$  to  $P$  is what percent of the distance along the circle from  $M$  to  $N$ ?

- A. 75%  
B. 60%  
C. 50%  
D.  $33\frac{1}{3}\%$   
E.  $16\frac{2}{3}\%$



44. Traveling at approximately 186,000 miles per second, about how many miles does a beam of light travel in 2 hours?

- F.  $3.72 \times 10^5$   
G.  $2.23 \times 10^6$   
H.  $2.68 \times 10^7$   
J.  $6.70 \times 10^8$   
K.  $1.34 \times 10^9$

45. Barb is going to cover a rectangular area 8 feet by 10 feet with rectangular paving blocks that are 4 inches by 8 inches by 2 inches to make a flat patio. What is the minimum number of paving blocks she will need if all the paving blocks will face the same direction?

(Note: Barb will not cut any of the paving blocks.)

- A. 80  
B. 360  
C. 601  
D. 960  
E. 1,213

GO ON TO THE NEXT PAGE.

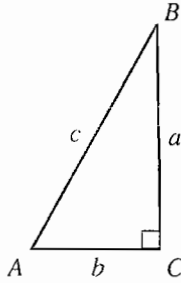
2



2

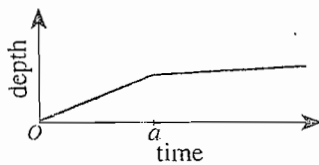
46. A right triangle that has its sides measured in the same unit of length is shown below. For any such triangle,  $(\tan A)(\sin B)$  is equivalent to:

DO YOUR FIGURING HERE.



- F.  $\frac{a}{c}$   
 G.  $\frac{ab}{c^2}$   
 H.  $\frac{a^2}{bc}$   
 J.  $\frac{b^2}{ac}$   
 K.  $\frac{c}{a}$

47. A swimming pool of uniform depth is being filled. When the pool started filling, its drain was closed. The graph below shows the depth of the water in the pool as a function of the length of time that water has been flowing into the pool.



Exactly 1 event occurred at time  $a$  that changed the rate at which the depth was increasing. Which of the following could have been that event?

- I. The flow of water into the pool was increased.  
 II. The flow of water into the pool was decreased.  
 III. The drain was opened.
- A. I only  
 B. II only  
 C. III only  
 D. I or II only  
 E. II or III only

GO ON TO THE NEXT PAGE.

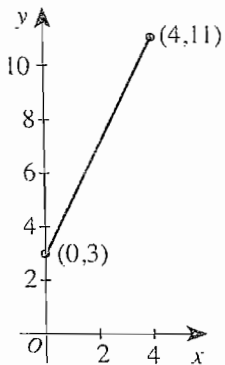
2



2

48. Shown below is the graph of the equation  $y = 2x + 3$  for values of  $x$  such that  $0 \leq x \leq 4$ .

DO YOUR FIGURING HERE.



Which of the following statements is(are) true?

- I. The graph has constant slope 2.
  - II. The range of the graph consists of all values of  $y$  such that  $3 \leq y \leq 11$ .
  - III. The polynomial  $2x + 3$  has a zero of  $x = 3$ .
- F. I only
  - G. I and II only
  - H. I and III only
  - J. I, II, and III
  - K. None of the statements is true.

49. If  $\tan A = \frac{a}{b}$ ,  $a > 0$ ,  $b > 0$ , and  $0 < A < \frac{\pi}{2}$ , then what is  $\cos A$ ?

- A.  $\frac{a}{b}$
- B.  $\frac{b}{a}$
- C.  $\frac{a}{\sqrt{a^2 + b^2}}$
- D.  $\frac{b}{\sqrt{a^2 + b^2}}$
- E.  $\frac{\sqrt{a^2 + b^2}}{b}$

GO ON TO THE NEXT PAGE.

2

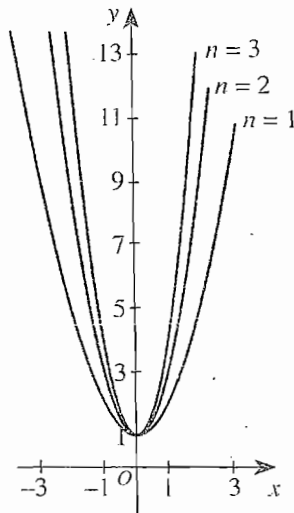


2

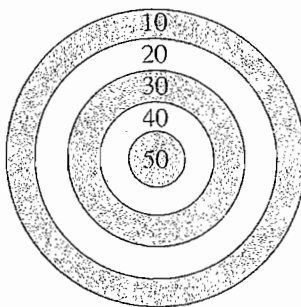
50. The 3 parabolas graphed in the standard  $(x,y)$  coordinate plane below are from a family of parabolas. A general equation that defines this family of parabolas contains the variable  $n$  in addition to  $x$  and  $y$ . For one of the parabolas shown,  $n = 1$ ; for another,  $n = 2$ ; and for the third,  $n = 3$ . Which of the following could be a general equation that defines this family of parabolas for all  $n \geq 1$ ?

DO YOUR FIGURING HERE.

- F.  $y = nx^2 + 1$   
 G.  $y = \frac{1}{n}x^2 + 1$   
 H.  $y = x^2 + n$   
 J.  $y = -nx^2 + 1$   
 K.  $y = -\frac{1}{n}x^2 + 1$



51. Thomas and Jonelle are playing darts in their garage using the board with the point values for each region shown below. The radius of the outside circle is 10 inches, and each of the other circles has a radius 2 inches smaller than the next larger circle. All of the circles have the same center. Thomas has only 1 dart left to throw and needs at least 30 points to win the game. Assuming that his last dart hits at a random point within a single region on the board, what is the percent chance that Thomas will win the game?



- A. 36%  
 B. 30%  
 C. 16%  
 D. 9%  
 E.  $1\frac{1}{2}\%$
52. The ratio of  $a$  to  $b$  is 3 to 4, and the ratio of  $c$  to  $b$  is 1 to 2. What is the ratio of  $a$  to  $c$ ?
- F. 1 to 1  
 G. 3 to 1  
 H. 3 to 2  
 J. 3 to 8  
 K. 6 to 1

GO ON TO THE NEXT PAGE.

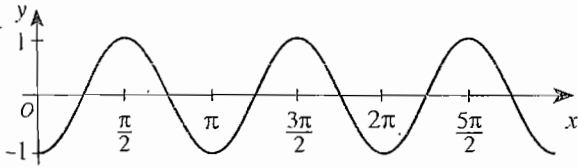
2



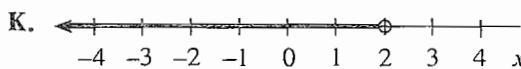
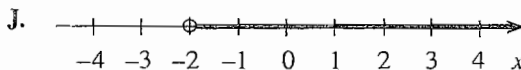
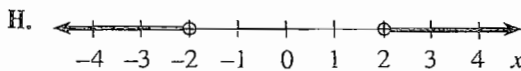
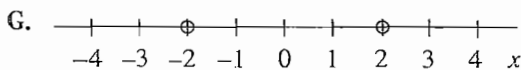
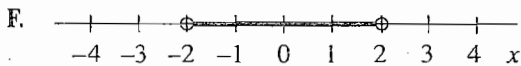
2

53. For the function graphed below, the  $x$ -axis can be partitioned into intervals, each of length  $p$  radians, and the curve over any one interval is a repetition of the curve over each of the other intervals. What is the least possible value for  $p$ , the period of the function?

DO YOUR FIGURING HERE.



- A.  $\frac{\pi}{2}$   
 B.  $\pi$   
 C.  $\frac{3\pi}{2}$   
 D.  $2\pi$   
 E.  $3\pi$
54. Which of the following graphs represents the solution set of the inequality  $|x| < 2$  on the real number line?



55. If  $(x - 7)$  is a factor of  $2x^2 - 11x + k$ , what is the value of  $k$ ?
- A. -21  
 B. -17  
 C. -7  
 D. 7  
 E. 28
56. Let  $a$  equal  $2b + 3c - 5$ . What happens to the value of  $a$  if the value of  $b$  decreases by 1 and the value of  $c$  increases by 2?
- F. It increases by 4.  
 G. It increases by 2.  
 H. It increases by 1.  
 J. It is unchanged.  
 K. It decreases by 2.

GO ON TO THE NEXT PAGE.



2



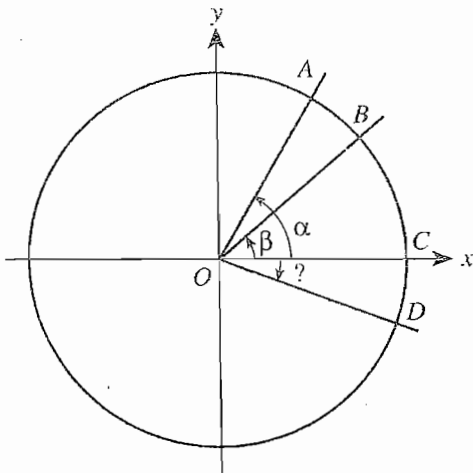
2

57. A large cube has edges that are twice as long as those of a small cube. The volume of the large cube is how many times the volume of the small cube?

A. 2  
B. 4  
C. 6  
D. 8  
E. 16

DO YOUR FIGURING HERE.

58. The center of the unit circle shown below is  $O$ . Points  $A$ ,  $B$ ,  $C$ , and  $D$  are points on the circle. When  $\angle COA$  is measured in the direction of the arrow shown, its measure is  $\alpha$ . Similarly, when  $\angle COB$  is measured in the direction of the arrow shown, its measure is  $\beta$ . Both  $\alpha$  and  $\beta$  are positive. The length of  $\widehat{BA}$  is the same as the length of  $\widehat{DC}$ . What is the measure of  $\angle COD$  measured in the direction of the arrow shown?



- F.  $-\beta$   
G.  $-\beta - \alpha$   
H.  $\beta - \alpha$   
J.  $-\alpha$   
K. Cannot be determined from the given information

59. In a town of 500 people, the 300 males have an average age of 45 and the 200 females have an average age of 35. To the nearest year, what is the average age of the town's entire population?

A. 40  
B. 41  
C. 42  
D. 43  
E. 44

60. On September 1, a dress was priced at \$90. On October 1, the price was reduced by 20%. On November 1, the price was further reduced by 25% of the October 1 price and marked FINAL. What percent of the original price was the FINAL price?

F. 40%  
G. 45%  
H. 55%  
J. 60%  
K. 77.5%

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:** This passage is adapted from the short story "Golden Glass" by Alma Villanueva (©1982 by Bilingual Press).

It was his fourteenth summer. He was thinning out, becoming angular and clumsy, but the cautiousness, the old-man seriousness he'd had as a baby, kept him contained, ageless and safe. His humor, always dry and to the bone since a small child, let you know he was watching everything.

He seemed always to be at the center of his own universe, so it was no surprise to his mother to hear Ted say: "I'm building a fort and sleeping out in it all summer, and I won't come in for anything, not even food. Okay?"

This had been their silent communion, the steady presence of love that flowed regularly, daily—food. The presence of his mother preparing it, his great appetite and obvious enjoyment of it—his nose smelling everything, seeing his mother more vividly than with his eyes.

He watched her now for signs of offense, alarm, and only saw interest. "Where will you put the fort?" Vida asked.

She trusted him to build well and not ruin things, but of course she had to know where.

"I'll build it by the redwoods, in the cypress trees. Okay?"

"Make sure you keep your nails together and don't dig into the trees. I'll be checking. If the trees get damaged, it'll have to come down."

The cypress was right next to the redwoods, making it seem very remote. Redwoods do that—they suck up sound and time and smell like another place. So he counted the footsteps, when no one was looking, from the fort to the house. He couldn't believe it was so close; it seemed so separate, alone—especially in the dark, when the only safe way of travel seemed flight (invisible at best).

Ted had seen his mother walk out to the bridge at night, looking into the water, listening to it. He knew

she loved to see the moon's reflection in the water. She'd pointed it out to him once by a river where they camped, her face full of longing. Then, she swam out into the water, at night, as though trying to touch the moon. He wouldn't look at her. He sat and glared at the fire and roasted another marshmallow the way he liked it: bubbly, soft and brown (maybe six if he could get away with it). Then she'd be back, chilled and bright, and he was glad she went. Maybe I like the moon too, he thought, involuntarily, as though the thought weren't his own—but it was.

He built the ground floor directly on the earth, with a cover of old plywood, then scattered remnant rugs that he'd asked Vida to get for him. He concocted a latch and a door. He brought his sleeping bag, some pillows, a transistor radio, some clothes, and moved in for the summer.

He began to build the top floor now but he had to prune some limbs out of the way. Well, that was okay as long as he was careful. So he stacked them to one side for kindling and began to brace things in place. It felt weird going up into the tree, not as safe as his small, contained place on the ground.

Vida noticed Ted had become cheerful and would stand next to her, to her left side, talking sometimes. But she realized she mustn't face him or he'd become silent and wander away. So she stood listening, in the same even breath and heart beat she kept when she spotted the wild pheasants with their long, lush tails trailing the grape arbor, picking delicately and greedily at the unpicked grapes in the early autumn light. So sharp, so perfect, so rare to see a wild thing at peace.

Ted was taking a makeup course and one in stained glass. There, he talked and acted relaxed; no one expected any more or less. The colors of the stained glass were deep and beautiful, and special—you couldn't waste this glass. The sides were sharp, the cuts were slow and meticulous with a steady pressure. The design's plan had to be absolutely followed or the beautiful glass would go to waste, and he'd curse himself.

The stained glass was finished and he decided to place it in his fort facing the back fields. In fact, it looked like the back fields—trees and the sun in a dark sky. During the day the glass sun shimmered a beautiful

GO ON TO THE NEXT PAGE.

3

3

yellow, the blue a much better color than the sky outside: deeper, like night.

He was so used to sleeping outside now he didn't  
 35 wake up during the night, just like in the house. One  
 night, toward the end when he'd have to move back  
 with everyone (school was starting, frost was coming  
 and the rains), Ted woke up to see the stained glass full  
 of light. The little sun was a golden moon and the  
 40 inside glass sky and the outside sky matched.

In a few days he'd be inside, and he wouldn't  
 mind at all.

- The passage establishes that Vida and Ted have all of the following traits in common EXCEPT:
  - a willingness to accommodate the requests each makes of the other.
  - a response to elements of nature.
  - a perception of others that surfaces in humor.
  - an awareness of what delights the other.
- Which of the following is NOT an accurate description of the passage?
  - A story about a teenager whose summer experiences building and occupying a fort near his house have a positive effect on his relationship with his mother
  - A glimpse at what connects a mother and son and what separates them as the boy tests his own limits with a summer project
  - A look at how two characters—one grown, one young—behave when each perceives the fragility of someone or something he or she holds dear
  - A portrait of two family members whose painful disagreements force one to seek shelter outside the home until they reach an understanding
- In both the twelfth paragraph (lines 61–69) and the thirteenth paragraph (lines 70–77) the author is portraying characters who:
  - feel compelled to act carefully in order to avoid shattering something precious.
  - are frustrated to the point of indignation that success seems always slightly out of reach.
  - are at first excited by a project but later lose interest as others get involved.
  - discover that a personal weakness in some situations can be a personal strength in others.
- It can most reasonably be inferred that as it is used in line 69 the term *wild thing* refers not only to a pheasant but also to:
  - Ted as Vida somewhat reverently sees him.
  - Vida as seen by Ted when she visits the fort.
  - Ted as he imagines himself to be.
  - what Vida wishes Ted would cease to be.
- Which of the following best describes the difference between Ted as a little boy and Ted at the time he builds and occupies the fort?
  - By the time Ted builds the fort he has lost the lighthearted manner he had as a child and has become more of a brooder who avoids the company of others.
  - As a teenager Ted is physically clumsier and more angular than he was as a child, but he retains the humor, cautiousness, and seriousness that distinguished him at an early age.
  - As a child Ted was constantly observing others for indications of how he should behave, but as a teenager he looks more to nature for guidance.
  - As a child Ted was outgoing in a way that appealed to adults, but as a teenager he was introspective in a way that alarmed them.
- The passage indicates that Vida was not surprised by Ted's decision to build a fort because she:
  - knew that more often than not he was inclined to take projects she had started a step farther.
  - sensed that it fit with his tendency to approach life as if he were self-contained.
  - had noticed that ever since their camping trip he had been putting more and more distance between himself and her.
  - had noticed that he no longer worried that his fascination with nature would interfere with his long-standing craving for the company of others.
- As it is used in the passage, the term *silent communion* (line 12) refers to the:
  - way that without using words Ted communicates his disappointments to Vida.
  - promise Ted made to himself that he would not return to the house all summer, even for food.
  - way a thought shifted in Ted's mind from feeling like someone else's to feeling like his own.
  - exchange of warm emotions between Ted and Vida during the preparation and sharing of food.
- Which of the following best describes the way the seventh paragraph (lines 25–27) functions in the passage?
  - It reinforces the image of Vida established elsewhere in the passage as someone whose skeptical nature disheartens Ted on the brink of new projects.
  - It foreshadows events described later in the passage that lead to the dismantling of the tree house once Ted is back in school.
  - It reveals that Vida takes an interest in Ted's project to the extent that she determines ways in which he needs to carry it out to avoid problems.
  - It reveals that Vida's willingness to shift responsibility to her son for his actions is greater than his willingness to accept such responsibility.

GO ON TO THE NEXT PAGE.



9. According to the passage, Ted attributes which of the following characteristics to the redwoods?
- A. They make ideal supports for a fort because they are strong and tall.
  - B. They create a sense of remoteness by absorbing time and sound and by smelling like another place.
  - C. They lend a feeling of danger to whatever surrounds them because they themselves are endangered.
  - D. They grace their surroundings with a serenity that softens disturbing emotions like fear of the dark.
10. Ted felt that in comparison to the ground floor of the fort, going up into the tree to build the top floor seemed:
- F. safer because the top floor was less accessible to intruders.
  - G. safer because the branches provided him with a sense of privacy.
  - H. less safe because the place felt bigger and more exposed.
  - J. less safe because the top floor was made of cypress instead of redwood.

### Passage II

**SOCIAL SCIENCE:** This passage is adapted from *Biomimicry: Innovation Inspired by Nature* by Janine M. Benyus (©1997 by Janine M. Benyus).

If anybody's growing biomass, it's us. To keep our system from collapsing on itself, industrial ecologists are attempting to build a "no-waste economy." Instead of a linear production system, which binges on virgin raw materials and spews out unusable waste, they envision a web of closed loops in which a minimum of raw materials comes in the door, and very little waste escapes. The first examples of this no-waste economy are collections of companies clustered in an ecopark and connected in a food chain, with each firm's waste going next door to become the other firm's raw material or fuel.

In Denmark, the town of Kalundborg has the world's most elaborate prototype of an ecopark. Four companies are co-located, and all of them are linked, dependent on one another for resources or energy. The Asnaesverket Power Company pipes some of its waste steam to power the engines of two companies: the Statoil Refinery and Novo Nordisk (a pharmaceutical plant). Another pipeline delivers the remaining waste steam to heat thirty-five hundred homes in the town, eliminating the need for oil furnaces. The power plant also delivers its cooling water, now toasty warm, to fifty-seven ponds' worth of fish. The fish revel in the warm water, and the fish farm produces 250 tons of sea trout and turbot each year.

Waste steam from the power company is used by Novo Nordisk to heat the fermentation tanks that produce insulin and enzymes. This process in turn creates 700,000 tons of nitrogen-rich slurry a year, which used

to be dumped into the fjord. Now, Novo bequeaths it free to nearby farmers—a pipeline delivers the fertilizer to the growing plants, which are in turn harvested to feed the bacteria in the fermentation tanks.

- 35 Meanwhile, back at the Statoil Refinery, waste gas that used to go up a smokestack is now purified. Some is used internally as fuel, some is piped to the power company, and the rest goes to Gyproc, the wallboard maker next door. The sulfur squeezed from the gas during purification is loaded onto trucks and sent to Kemira, a company that produces sulfuric acid. The power company also squeezes sulfur from its emissions, but converts most of it to calcium sulfate (industrial gypsum), which it sells to Gyproc for wallboard.
- 45 Although Kalundborg is a cozy co-location, industries need not be geographically close to operate in a food web as long as they are connected by a mutual desire to use waste. Already, some companies are designing their processes so that any waste that falls on the production-room floor is valuable and can be used by someone else. In this game of "designed offal," a process with lots of waste, as long as it's "wanted waste," may be better than one with a small amount of waste that must be landfilled or burned. As author Daniel Chiras says, more companies are recognizing that "technologies that produce by-products society cannot absorb are essentially failed technologies."

So far, we've talked about recycling within a circle of companies. But what happens when a product leaves the manufacturer and passes to the consumer and finally to the trash can? Right now, a product visits one of two fates at the end of its useful life. It can be buried in a landfill or incinerated, or it can be recaptured through recycling or reuse.

- 65 Traditionally, manufacturers haven't had to worry about what happens to a product after it leaves their gates. But that is starting to change, thanks to laws now in the wings in Europe (and headed for the United States) that will require companies to take back their durable goods such as refrigerators, washers, and cars at the end of their useful lives. In Germany, the take-back laws start with the initial sale. Companies must take back all their packaging or hire middlemen to do the recycling. Take-back laws mean that manufacturers who have been saying, "This product can be recycled," must now say, "We recycle our products and packaging."

- When the onus shifts in this way, it's suddenly in the company's best interest to design a product that will either last a long time or come apart easily for recycling or reuse. Refrigerators and cars will be assembled using easy-open snaps instead of glued-together joints, and for recyclability, each part will be made of one material instead of twenty. Even simple things, like the snack bags for potato chips, will be streamlined. Today's bags, which have nine thin layers made of seven different materials, will no doubt be replaced by one material that can preserve freshness and can easily be remade into a new bag.

**GO ON TO THE NEXT PAGE.**

11. According to the passage, waste emissions from the Asnaesverket Power Company are used to help produce all of following EXCEPT:
- A. insulin.
  - B. heating oil.
  - C. plant fertilizer.
  - D. industrial gypsum.
12. When the author says “our system” (lines 1–2), she is most likely referring to a production system in:
- F. Denmark in which four companies are co-located in one small town and are linked by their dependence on energy resources.
  - G. the United States that produces recyclable durable goods such as refrigerators, washers, and cars.
  - H. the United States and Europe in which products are developed with few virgin raw materials and leave little or no waste.
  - J. the United States and Europe that uses too many virgin raw materials and produces too much unused waste.
13. The main purpose of the second, third, and fourth paragraphs (lines 13–44) is to show:
- A. how four companies depend on each other for resources and the recycling of waste.
  - B. that Denmark is one of the world’s leaders in developing new sources of energy.
  - C. that one town’s need for energy can be eliminated through recycling.
  - D. that a no-waste economy saves money.
14. It is reasonable to infer that the author’s proposed solution to what she sees as the problem of an increasing amount of biomass is to:
- F. change the process by which manufacturers produce their products.
  - G. make consumers responsible for recycling the products they buy.
  - H. encourage traditional businesses to compete with new, innovative businesses.
  - J. encourage companies that produce similar products to cluster together in ecoparks.
15. Based on the passage, which of the following pairs of industries is shown to depend directly on one another for the production of their products?
- A. Statoil and Gyproc
  - B. Asnaesverket and fish farmers
  - C. Novo Nordisk and plant farmers
  - D. Statoil and Novo Nordisk
16. The main function of the sixth paragraph (lines 58–64) in relation to the passage as a whole is most likely to provide:
- F. evidence to support Daniel Chiras’s statement in lines 54–57.
  - G. a transition between the two main points discussed in the passage.
  - H. a conclusion to the author’s discussion about a no-waste economy.
  - J. a summary of the author’s main argument.
17. According to the passage, take-back laws in Germany shift the responsibility for recycling from the:
- A. local government to the manufacturer.
  - B. manufacturer to the local government.
  - C. manufacturer to the consumer.
  - D. consumer to the manufacturer.
18. According to the passage, the common element for companies that want to be part of a food web is their mutual interest in:
- F. relocating their operations to a common geographic area in Europe.
  - G. providing industrial waste to private homes and farming operations.
  - H. eliminating the need for raw materials.
  - J. using industrial waste as raw materials.
19. The author uses the term “designed offal” (line 51) to indicate that:
- A. companies can design ways in which their waste products can be used.
  - B. industrial ecologists have designed ways to reduce waste products.
  - C. technology has not kept pace with how to dispose of waste products.
  - D. companies can learn to design more efficient land-fill spaces.
20. According to Daniel Chiras, a failed technology is one that:
- F. cannot reuse its own waste.
  - G. produces more waste than it uses.
  - H. produces waste that is unusable.
  - J. makes durable goods such as refrigerators.



## Passage III

**HUMANITIES:** This passage is adapted from the article "What Light Through Yonder Windows Breaks?" by Stephen Greenblatt, which appeared in *Civilization* (©1995 by L.O.C. Associates, L.P.). The CD-ROMs referred to in this passage are discs that, when inserted into a computer, provide the user with multimedia information on a given subject.

Shakespeare on CD-ROM is potentially the most important thing to happen to the texts of Shakespeare's plays since the 18th century, when they were first given the serious scholarly attention reserved for cultural treasures. It is important to understand why the innovations represented by these CDs—the BBC Shakespeare Series' *Romeo and Juliet* and Voyager's *Macbeth*—are so significant.

What exactly is a printed play by Shakespeare? Where it was once thought that Shakespeare's plays sprang from his noble brow in definitive and final form, it is now widely recognized that many of them were repeatedly revised. Some of these early alterations were likely made by the theater company to adapt a play to a particular occasion, others by a collaborator, others for the government censors, still others by the printer, but many of the most significant changes seem to bear the mark of Shakespeare himself. For example, there are two strikingly distinct versions of *King Lear*, three of *Hamlet* and two of *Romeo and Juliet*. The point is not simply that Shakespeare had second or third thoughts but rather that he apparently regarded his plays as open and unfinished; he intended them to be repeatedly performed, and this meant that they would be continually cut, revised or even radically reconceived according to the ideas of the players and the demands of the public. The words were not meant to remain on the page. They were destined for the beauty and mutability of the human voice.

Nevertheless, even today most editors silently stitch together the different versions of *Hamlet* or *King Lear* in an attempt to present the "final" version Shakespeare supposedly meant to leave behind. These printed editions also hide or at least de-emphasize the presentation of the play on stage.

The CD-ROM is a radical departure. The words of the play appear on the screen, synchronized with a complete audio performance. It has long been possible to read the text of the play while listening to a recorded version, but now it is wonderfully easy to locate particular scenes and instantly hear them, to go back and listen again, and to stop and look at the glosses keyed to difficult words and phrases. Each CD includes video clips of some of the most famous scenes, so that the pleasure of listening and reading can be supplemented with glimpses of a full production.

These video clips are at once among the most promising and the most frustrating aspects of the current technology. The quality of both the sound and the visual effects is mediocre, and, to make matters worse, in the BBC's *Romeo and Juliet* the actors on the video

are not the same as the actors reading the words. The dubbing is inevitably imperfect, and it is disconcerting to hear Albert Finney's unmistakable voice as Romeo coming from Patrick Rycart's mouth. Still, there is considerable pleasure in the brief glimpses of performance, a pleasure quite distinct from watching the play on stage or film, since it is here linked so intimately and effortlessly with the words on the screen.

Let me be clear: These Shakespeare CDs are not principally interesting as performances. Rather, they are remarkable because they change our experience of what it is to read a play, insistently recalling for us that the words were meant for our ears as well as our eyes. Texts on CD-ROM have, in effect, recovered something of the magic that books possessed in the late Middle Ages, when they were still rare enough to seem slightly eerie, as if they were haunted by spirits.

One stunning moment on the *Romeo and Juliet* CD-ROM is a brief audio clip of an interview with the actress Gwen Ffrangcon-Davies, who had played Juliet in 1924. The interviewer asks her to recite some lines from the balcony scene, and after a brief demurral, she begins to speak the enchanting lines in a lush style completely different from Claire Bloom's quietly restrained rendition. For a minute or so we get a glimpse of what the technology can do. If a stage performance at its best makes us experience a certain inevitability, leading us to think of the actors' interpretation of the play, "This *must* be so," then a CD-ROM has the power to make us think, "It could be so different." We could compare three or four radically different performances of the same scene, just as we could for the first time easily compare differences in the text. In one version of Juliet's death scene, for example, she stabs herself with a dagger and says, "There rest." In another version she says, "There rust."

21. Which of the following statements best characterizes the author's attitude toward the CD-ROMs he reviews in the passage?

- A. He welcomes them as a means of experiencing the works of Shakespeare in a way that is closer to the playwright's original intent.
- B. He applauds them as the first technology to verify that Shakespeare's plays were revised by countless individuals.
- C. He bemoans their arrival as further evidence that the magic of books has been lost in the feverish pursuit of technological advances.
- D. He is skeptical of their potential to reach the audience for whom they are intended: those who are intimidated by Shakespeare in the first place.

GO ON TO THE NEXT PAGE.

22. Without the last paragraph, the passage would contain no specific examples of:
- F. how CD-ROM technology enhances appreciation for Shakespeare centuries after his death.
  - G. actors and actresses who have performed roles in Shakespeare plays.
  - H. what caused scholars to view Shakespeare's plays as cultural treasures.
  - J. inconsistencies in the text of Shakespeare plays as well known as *Romeo and Juliet*.
23. In the first paragraph, the author compares the dawning of the age of CD-ROM Shakespeare to the dawning of scholarly attention to Shakespeare's work in the eighteenth century. This comparison supports the author's point that:
- A. since books became widely available, the magic of the theater has diminished.
  - B. academics have long regarded Shakespeare as too sophisticated for the general public.
  - C. each generation identifies with a different one of Shakespeare's plays.
  - D. CD-ROMs of Shakespeare plays represent a profound shift in the treatment of his work.
24. According to the passage, the CD-ROMs offer a combination of:
- F. complete text and full-length video of a production.
  - G. selections from the text and selected scenes on video from a production.
  - H. selections from the text and a full-length video of a production.
  - J. complete audio and written text and selected scenes on video from a production.
25. It can be reasonably inferred that one of the author's concerns is that his praise for the Shakespeare CD-ROMs will be misunderstood as:
- A. support of CD-ROMs in general.
  - B. praise of well-meaning but mediocre actors.
  - C. a suggestion that they are a substitute for live performances.
  - D. support for more than one interpretation of a Shakespeare play.
26. It is most reasonable to infer that in line 77 the phrase "what the technology can do" refers to the capacity of CD-ROMs to:
- F. interfere with the playwright's original intent.
  - G. reduce a play to the level of a television program.
  - H. invite an appreciation for the immense possibilities contained in a Shakespeare play.
  - J. simplify Shakespeare's complex messages by conveying them in modern English.
27. The passage refers to efforts today by editors to assemble a final version of one Shakespeare play or another. These efforts are most closely aligned in spirit with which of the following?
- A. Shakespeare's concept of the adaptable nature of his plays
  - B. Previously held beliefs "that Shakespeare's plays sprang from his noble brow in definitive and final form" (lines 10–11)
  - C. The form and spirit of the new versions of Shakespeare's plays on CD-ROM
  - D. The view expressed in the passage of how Shakespeare's plays should be treated
28. The author is bothered by Albert Finney's voice on the BBC's *Romeo and Juliet* CD-ROM because the actor's words:
- F. don't match the original script.
  - G. are muddled by static interference.
  - H. accompany the performance of another actor.
  - J. conjure up the tragic fate of Romeo.
29. It is the author's opinion that CD-ROMs' primary advantage over printed versions of Shakespeare's plays is that a CD-ROM appeals to more senses in making the connection between:
- A. original and contemporary set designs.
  - B. the themes of *Hamlet* and *King Lear*.
  - C. the eighteenth century and today.
  - D. the written and the spoken word.
30. In line 80, the statement "This *must* be so" is intended as an example of:
- F. an audience member's response to a high quality theater performance.
  - G. a line from a Shakespeare play that appears slightly altered in another version of the same play.
  - H. the author quoting a director who sees only one possible interpretation of a Shakespeare play.
  - J. an audio clip from the CD-ROM version of Shakespeare's *Romeo and Juliet*.



## Passage IV

**NATURAL SCIENCE:** This passage is adapted from the article "The Mars Model" by Bridget Mintz Testa, which appears in *Discover Magazine* (©1995 by The Walt Disney Company).

The first close-up images of Mars, captured in 1972 by the probe *Mariner 9*, were a planetary scientist's dream: they revealed networks of valleys that looked uncannily like drainage basins and streambeds back here on Earth and thus implied that there had once been water freely flowing over the surface of Mars. The images also implied that Mars had once had a thick atmosphere. Our planet is blessed with liquid water on its surface only because it has a thick atmosphere to maintain a high pressure and trap the sun's heat. So planetary scientists proposed that when Mars formed 4.6 billion years ago, it too had a dowry of a heat-trapping atmosphere, composed of carbon dioxide and water vapor. With warmth, water, and air, they speculated, Mars might once have been a garden world, a paradise among planets.

But, as they also discovered, the garden didn't last long. None of the streambeds were younger than 3.7 billion years. Something happened to Mars, something that stripped nearly all of its atmosphere, killed its streams, and froze the garden forever.

Researchers have suggested many scenarios for the Martian apocalypse. Some have proposed that the sun gradually whittled away Mars' atmosphere with its wind of charged particles. Others have hypothesized that the planet itself absorbed most of its atmosphere, turning carbon dioxide into carbonate rocks. For the past seven years, however, Ann Vickery and Jay Melosh, two planetary scientists from the University of Arizona, have been exploring a far more spectacular ending: most of Mars' atmosphere, they suggest, was blasted away by a succession of asteroids and comets.

"The basic idea," Melosh says, "is that an impact doesn't just open a crater. With high velocities, the projectile vaporizes and expands into the atmosphere." This superheated expanding plume shoves the atmosphere above it like a snowplow pushing snow to the heavens. How high a vapor plume goes depends on the mass and velocity of the object that crashed into the planet. If it is big enough and fast enough, it can drive its plume straight back up into space. The portion of the atmosphere it plows away is then stripped from the planet forever.

To see if this process could account for Mars' missing atmosphere, Vickery and Melosh essentially ran a film of the Red Planet in reverse, starting with today's wispy atmosphere and adding back the air that might have been removed by impacts over the eons. First they derived a mathematical expression relating time to the rates of both impacts and atmosphere loss. Using this expression, they then ran the clock backward to find out how long it would take to "grow" an ancient, Earth-like atmosphere from Mars' current tiny one. If

their model was right, it would produce the original, early Mars. And the time it took to "grow" a thick atmosphere by going backward would be the same as the time it took to lose a thick atmosphere, traveling forward. Using an impact rate that prevailed 3.7 billion years ago—one impact every 10,000 years—Vickery and Melosh were able to start with a virtually dead planet and grow a thick atmosphere in only 600 or 700 million years.

However, now that an attractive explanation finally exists for how the young paradise of Mars was destroyed, some researchers are questioning whether that paradise ever existed in the first place. Studies of other stars suggest that the young sun was 25 to 30 percent dimmer than it is today. Mars, which is 49 million miles farther from the sun than is Earth, would have been receiving less than a third of the sunlight we now enjoy. Some scientists have calculated that given so little sunlight, Mars' atmosphere wouldn't be able to trap enough heat to keep water from freezing and that under such conditions, carbon dioxide would form frozen clouds. What little sunlight Mars received would bounce off the clouds, and the planet would cool even further. As to how the Martian valleys we see today might have formed without a warm atmosphere, it is suggested that the planet might have been covered by large expanses of ice and that the heat from Mars' interior could have thawed out hidden channels.

Vickery, however, is sticking by her original assumptions. "There exist on Mars valley networks that look like terrestrial river valley networks and don't look like any other kind of feature found anywhere else in the solar system," she points out. "The first, obvious interpretation is that these networks were formed more or less the same way as similar terrestrial networks."

31. The author's purpose in writing this passage is most likely to:
  - A. point out irreconcilable differences between contending theories concerning the early history of Mars.
  - B. examine why the early history of Mars is important in understanding other aspects of planetary science.
  - C. illustrate the differences in atmospheric pressure between Mars and Earth.
  - D. report on recent theories and controversies in research concerning the early history of Mars.
32. The last paragraph supports the general hypothesis provided earlier in the passage that:
  - F. a series of comets and asteroids repeatedly struck Mars.
  - G. Mars formed about 4.6 billion years ago.
  - H. Mars once had warmth, water, and air.
  - J. large expanses of ice once covered Mars.

GO ON TO THE NEXT PAGE.

3

3

33. Which of the following findings, if true, would best support the idea that Mars once was “a garden world, a paradise among planets” (lines 15–16)?
- A. Images of Mars revealed networks of drainage basins and streambeds.
  - B. When the sun was young, it was 25 to 30 percent dimmer than it is today.
  - C. A succession of asteroids and comets struck Mars about every 10,000 years.
  - D. Large expanses of ice on Mars were thawed by a heat source deep within the planet.
34. It is reasonable to conclude from the passage that the amount of solar heat a planet retains is most directly related to its distance from the sun and to:
- F. the amount of liquid water it has.
  - G. its distance from other planets.
  - H. the thickness of its atmosphere.
  - J. the volume and mass of its underground ice.
35. The main purpose of the third paragraph (lines 22–32) is to point out that there are several theories about:
- A. why Mars now has a thin atmosphere.
  - B. how carbon dioxide turns into rock.
  - C. how the wind on Mars became charged with particles.
  - D. why the sun gradually took away the atmosphere of Mars.
36. The central idea of the hypothesis proposed by Vickery and Melosh is that:
- F. a series of asteroid and comet impacts pushed away the atmosphere of Mars.
  - G. the atmosphere of Mars trapped too much heat and burned away a layer of carbon dioxide.
  - H. the water vapor once prevalent on Mars was blown away by a wind of charged particles.
  - J. carbon dioxide on Mars was absorbed into the atmosphere and changed into carbonate rocks.
37. Based on the passage, which of the following statements, if true, would most WEAKEN the hypothesis made by Vickery and Melosh?
- A. The network of valleys on Mars was made up of drainage basins and streambeds.
  - B. Asteroids collided with Mars at a much higher frequency than was previously thought.
  - C. Most of the comets and asteroids that struck Mars were very small.
  - D. The atmosphere around Mars was once as thick as Earth’s atmosphere.
38. If it could be proved “that the young sun was 25 to 30 percent dimmer than it is today” (lines 67–68), then, according to the passage, it might also be shown that Mars:
- F. has always had an Earth-like atmosphere.
  - G. has never had an Earth-like atmosphere.
  - H. once had liquid water.
  - J. has been routinely hit by large asteroids.
39. The word *projectile* in line 35 refers to:
- A. a large mass of charged particles carried by the wind.
  - B. a large mass of carbonate rock.
  - C. a plume of water vapor.
  - D. an asteroid or comet.
40. According to Vickery and Melosh, about how long did it take Mars to go from a planet with an Earth-like atmosphere to a planet with the atmosphere it has today?
- F. 10,000 years
  - G. 600–700 million years
  - H. 3.7 billion years
  - J. 4.6 billion years

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.

## Passage 1

Students used 2 methods to calculate  $D$ , a car's *total stopping distance*;  $D$  is the distance a car travels from the time a driver first reacts to an emergency until the car comes to a complete stop.

In Method 1,  $R$  is the distance a car travels during a driver's assumed reaction time of 0.75 sec, and  $B$  is the average distance traveled once the brakes are applied. Method 2 assumes that  $D = \text{initial speed in ft/sec} \times 2 \text{ sec}$ . Table 1 lists  $R$ ,  $B$ , and  $D$  for various initial speeds, where  $D$  was computed using both methods. Figure 1 contains graphs of  $D$  versus initial speed for Method 1 and Method 2.

Table 1

Initial speed (mi/hr)	Initial speed (ft/sec)	Method 1			Method 2
		$R$ (ft)	$B$ (ft)	$D$ (ft)	$D$ (ft)
20	29	22	20	42	58
40	59	44	80	124	118
60	88	66	180	246	176
80	118	88	320	408	236

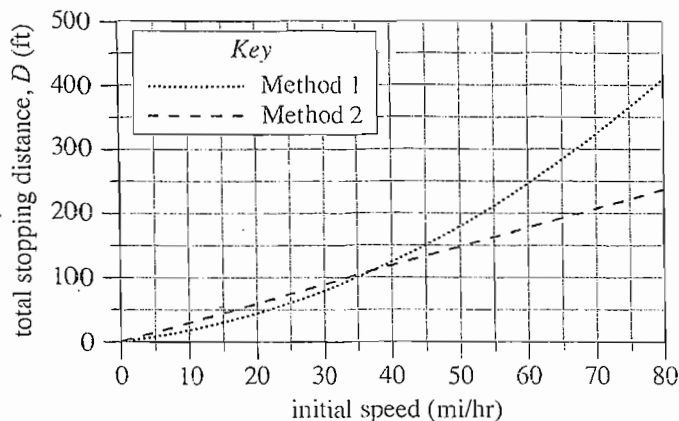


Figure 1

Table 1 and Figure 1 adapted from Edwin F. Meyer III, *Multiple-Car Pileups and the Two-Second Rule*. ©1994 by The American Association of Physics Teachers.

- Compared to  $R$  at an initial speed of 20 mi/hr,  $R$  at an initial speed of 80 mi/hr is:
  - $\frac{1}{4}$  as great.
  - $\frac{1}{2}$  as great.
  - 2 times as great.
  - 4 times as great.
- In Method 1,  $D$  equals:
  - $R + B$ .
  - $R - B$ .
  - $R \times B$ .
  - $R \div B$ .
- According to Figure 1, the 2 methods yield the same value for  $D$  when the initial speed is closest to:
  - 20 mi/hr.
  - 40 mi/hr.
  - 60 mi/hr.
  - 80 mi/hr.
- A driver was traveling 60 mi/hr when she spotted an accident and immediately applied her brakes. It took her 2 sec from the time she spotted the accident until she brought her car to a complete stop. According to Method 2, how far did her car travel during the 2 sec interval?
  - 58 ft
  - 118 ft
  - 176 ft
  - 234 ft
- Based on Table 1 or Figure 1, if the initial speed of a car is 90 mi/hr,  $D$ , according to Method 2, will be:
  - less than 90 ft.
  - between 95 ft and 150 ft.
  - between 150 ft and 250 ft.
  - greater than 250 ft.

GO ON TO THE NEXT PAGE.



## Passage II

Urine samples were collected from 4 students on 1 day at 8:00 A.M. and 8:00 P.M. The samples were then analyzed. Tables 1 and 2 show the volume, color, specific gravity, and the concentration of suspended solids of the 8:00 A.M. and 8:00 P.M. urine samples, respectively. *Specific gravity* was calculated as follows:

$$\text{specific gravity} = \frac{\text{density of sample}}{\text{density of water}}$$

The normal range for the specific gravity of urine is 1.0001–1.0350.

Table 1

8:00 A.M. urine samples

Student	Volume (mL)	Color*	Specific gravity	Suspended solids (g/L)
A	100	8	1.028	74.48
B	260	5	1.016	42.56
C	270	4	1.027	71.82
D	385	2	1.006	15.96

\*Note: Color was assigned using the following scale: 0 = very pale; 10 = very dark.

Table 2

8:00 P.M. urine samples

Student	Volume (mL)	Color*	Specific gravity	Suspended solids (g/L)
A	150	7	1.024	63.84
B	300	4	1.015	39.90
C	305	3	1.020	53.20
D	400	0	1.001	2.66

\*Note: Color was assigned using the following scale: 0 = very pale; 10 = very dark.

6. Based on the information presented, which of the following urine samples most likely had the highest water content per milliliter?

F. The 8:00 A.M. urine sample from Student A  
 G. The 8:00 A.M. urine sample from Student B  
 H. The 8:00 P.M. urine sample from Student C  
 J. The 8:00 P.M. urine sample from Student D

7. Do the data in Tables 1 and 2 support the conclusion that as urine volume increases, urine color darkens?

A. Yes, because urine samples with the greatest volumes had the highest color values.  
 B. Yes, because urine samples with the greatest volumes had the lowest color values.  
 C. No, because urine samples with the greatest volumes had the highest color values.  
 D. No, because urine samples with the greatest volumes had the lowest color values.

8. Based on the results provided, as the concentration of suspended solids in urine increase, the specific gravity of the urine:

F. increases only.  
 G. decreases only.  
 H. increases, then decreases.  
 J. decreases, then increases.

9. One of the 4 students had the flu on the 2 days preceding the collection of the urine samples. During these 2 days, the student experienced a net fluid loss due to vomiting and diarrhea. Based on the information provided, the student with the flu was most likely:

A. Student A.  
 B. Student B.  
 C. Student C.  
 D. Student D.

10. A volume of 1 mL from which of the following urine samples would weigh the most?

F. The 8:00 A.M. urine sample from Student B  
 G. The 8:00 A.M. urine sample from Student D  
 H. The 8:00 P.M. urine sample from Student A  
 J. The 8:00 P.M. urine sample from Student C

GO ON TO THE NEXT PAGE.

## Passage III

The following experiments were performed to investigate the effects of adding various *solutes* (substances that are dissolved in a solution), in varying amounts, on the boiling points and freezing points of  $\text{H}_2\text{O}$  solutions. Pure  $\text{H}_2\text{O}$  freezes at  $0^\circ\text{C}$  and boils at  $100^\circ\text{C}$  at standard atmospheric pressure.

## Experiment 1

A student dissolved 0.01 mole of sodium chloride ( $\text{NaCl}$ ) in 100 g of  $\text{H}_2\text{O}$ . Each mole of  $\text{NaCl}$  produces 2 moles of solute particles (1 mole of sodium ions and 1 mole of chloride ions in solution). After the  $\text{NaCl}$  dissolved, the freezing point of the solution was determined. This procedure was repeated using different amounts of  $\text{NaCl}$  and table sugar (sucrose). Each mole of sucrose produces 1 mole of solute particles (sucrose molecules). The results are shown in Table 1.

Table 1			
Solution	Substance added to $\text{H}_2\text{O}$	Amount added (mole)	Freezing point ( $^\circ\text{C}$ )
1	$\text{NaCl}$	0.01	-0.3
2	$\text{NaCl}$	0.05	-1.7
3	$\text{NaCl}$	0.1	-3.4
4	$\text{NaCl}$	0.2	-6.9
5	sucrose	0.01	-0.2
6	sucrose	0.05	-1.0
7	sucrose	0.1	-2.1
8	sucrose	0.2	-4.6

Note: Freezing points were measured at standard atmospheric pressure.

## Experiment 2

A student dissolved 0.01 mole of  $\text{NaCl}$  in 100 g of  $\text{H}_2\text{O}$ . After the  $\text{NaCl}$  dissolved, the boiling point of the solution was determined. The procedure was repeated using various amounts of  $\text{NaCl}$ . The results are shown in Table 2.

Table 2		
Solution	Amount of $\text{NaCl}$ added (mole)	Boiling point ( $^\circ\text{C}$ )
9	0.01	100.1
10	0.05	100.5
11	0.1	101.0
12	0.2	102.0

Note: Boiling points were measured at standard atmospheric pressure.

11. A solution containing 100 g of  $\text{H}_2\text{O}$  and an unknown amount of  $\text{NaCl}$  boils at  $104^\circ\text{C}$ . Based on the results of Experiment 2, the number of moles of  $\text{NaCl}$  dissolved in the solution is closest to:

A. 0.2.  
B. 0.3.  
C. 0.4.  
D. 0.5.

12. Which of the following factors was NOT directly controlled by the student in Experiment 2?

F. The substance added to the  $\text{H}_2\text{O}$   
G. The amount of  $\text{H}_2\text{O}$  used  
H. The amount of solute added to the  $\text{H}_2\text{O}$   
J. The boiling points of the  $\text{H}_2\text{O}$  solutions

13. From the results of Experiment 2, what would one hypothesize, if anything, about the effect of the number of solute particles dissolved in  $\text{H}_2\text{O}$  on the boiling point of a solution?

A. The more solute particles that are present, the higher the boiling point.  
B. The more solute particles that are present, the lower the boiling point.  
C. No hypothesis can be made because only 1 solute was tested.  
D. The number of solute particles produced does not affect the boiling point.

14. According to the results of Experiments 1 and 2, which of the following conclusions can be made about the magnitudes of the changes in the boiling point and freezing point of  $\text{H}_2\text{O}$  solutions when 0.2 mole of  $\text{NaCl}$  is added to 100 g of  $\text{H}_2\text{O}$ ? The freezing point is:

F. raised less than the boiling point is lowered.  
G. raised more than the boiling point is raised.  
H. lowered less than the boiling point is lowered.  
J. lowered more than the boiling point is raised.

GO ON TO THE NEXT PAGE.

4



4

15. Based on the results of Experiment 1, as the number of sodium particles and chloride particles in 100 g of  $\text{H}_2\text{O}$  increased, the freezing point of the solution:
- A. increased only.
  - B. decreased only.
  - C. decreased, then increased.
  - D. remained the same.
16.  $\text{CaCl}_2$  produces 3 moles of solute particles per mole when dissolved. Experiment 1 was repeated using a solution containing 100 g of  $\text{H}_2\text{O}$  and 0.1 mole  $\text{CaCl}_2$ . Assuming that  $\text{CaCl}_2$  has the same effect on the freezing point of  $\text{H}_2\text{O}$  as does  $\text{NaCl}$  per particle produced when dissolved, the freezing point of the solution would most likely be:
- F. between  $0^\circ\text{C}$  and  $-2.1^\circ\text{C}$ .
  - G. between  $-2.1^\circ\text{C}$  and  $-3.4^\circ\text{C}$ .
  - H. between  $-3.4^\circ\text{C}$  and  $-6.9^\circ\text{C}$ .
  - J. below  $-6.9^\circ\text{C}$ .

GO ON TO THE NEXT PAGE.

## Passage IV

The study of oxygen isotopes present in water can give us clues to the climate of a certain location. The ratio of the isotopes  $^{18}\text{O}$  and  $^{16}\text{O}$  in a sample of rain, snow, or ice is compared to the  $^{18}\text{O}/^{16}\text{O}$  ratio in a *standard sample*. A standard sample has a known value for the parameter being measured. The comparison of a sample's ratio to that of the standard is called the *O-18 index* ( $\delta^{18}\text{O}$ ). The  $\delta^{18}\text{O}$  is calculated using the following formula:

$$\delta^{18}\text{O} = \frac{(^{18}\text{O}/^{16}\text{O})_{\text{sample}} - (^{18}\text{O}/^{16}\text{O})_{\text{standard}}}{(^{18}\text{O}/^{16}\text{O})_{\text{standard}}} \times 1,000$$

Scientists conducted 3 studies to examine the  $\delta^{18}\text{O}$  of glacial ice in Arctic and Antarctic locations and learn about the past climates there.

## Study 1

Containers were placed on glaciers at 25 locations in the Arctic to collect snowfall. The containers' contents were collected every 2 weeks during a 1-year period and analyzed for  $^{16}\text{O}$  and  $^{18}\text{O}$ . Figure 1 shows the calculated monthly  $\delta^{18}\text{O}$  and air temperature averages.

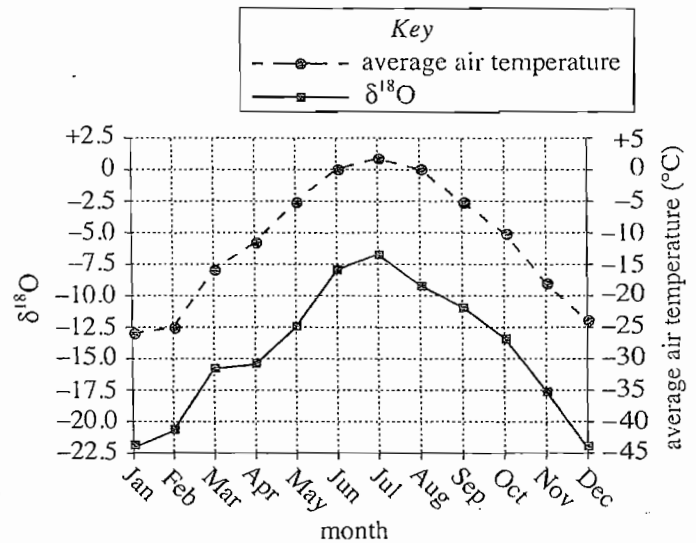


Figure 1

## Study 2

At the 25 Arctic locations from Study 1, a 500 m deep vertical ice core was drilled. Each core represented the past 100,000 years of glacial ice accumulation at the site. Starting at the surface, samples were taken every 10 m along the length of the cores. These samples were analyzed for  $^{18}\text{O}$  and  $^{16}\text{O}$ . Larger  $\delta^{18}\text{O}$  values indicate that a relatively warmer climate existed at the time the ice was formed than do smaller  $\delta^{18}\text{O}$  values. The calculated average  $\delta^{18}\text{O}$  values for the samples are shown in Figure 2.

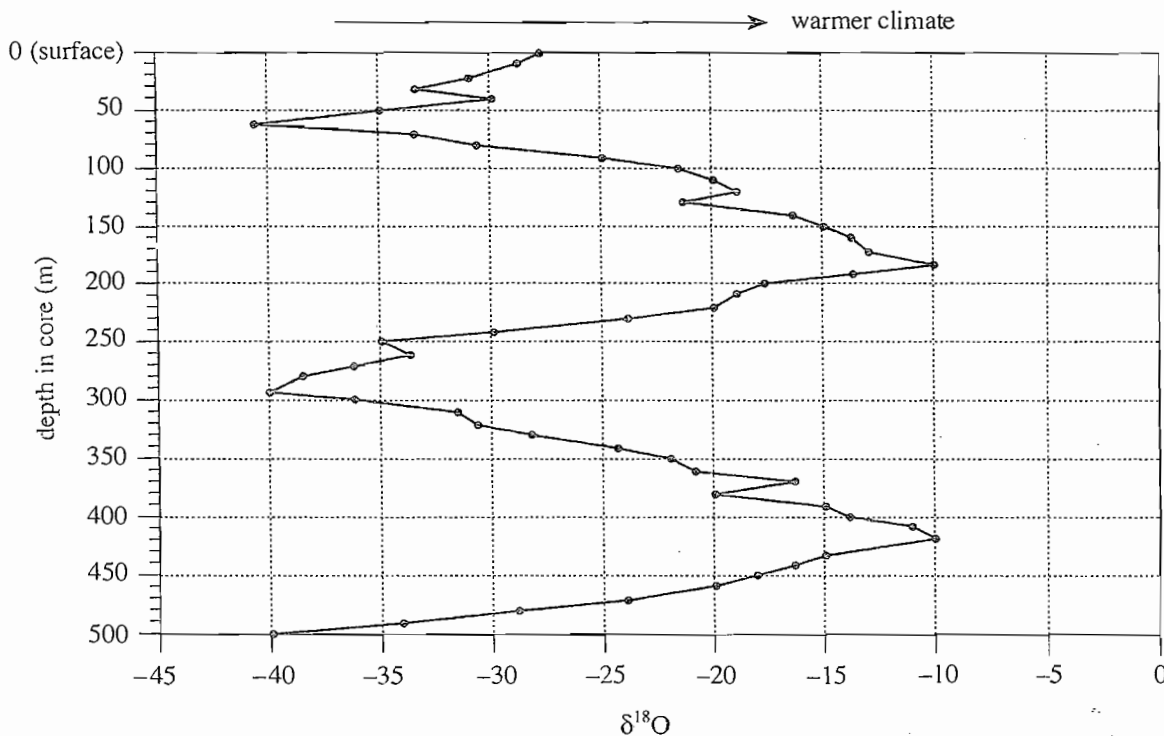


Figure 2

GO ON TO THE NEXT PAGE.



Study 3

The procedures of Study 2 were repeated at 5 Antarctic locations. The past 100,000 years of glacial ice accumulation at the site was represented by a 300 m ice core. The calculated average  $\delta^{18}\text{O}$  values for the samples are shown in Figure 3.

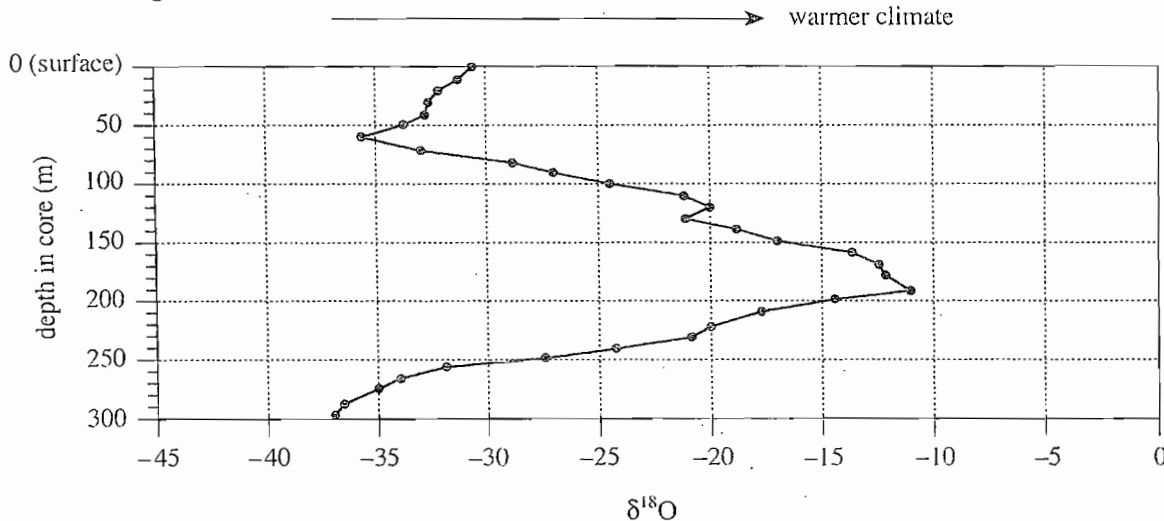
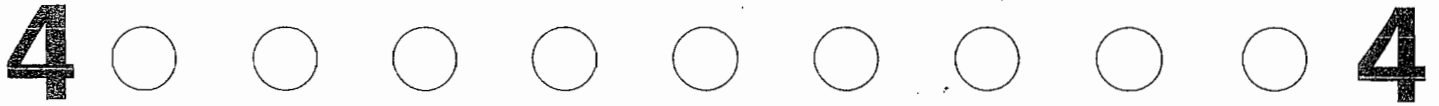


Figure 3

17. According to Study 1, average air temperatures in the Arctic were closest for which of the following pairs of months?
- January and March
  - March and September
  - May and September
  - October and December
18. According to Study 1, which of the following best describes the relationship between the  $\delta^{18}\text{O}$  of the Arctic snow samples and the average monthly air temperatures? As the average monthly air temperatures increased, then decreased, the  $\delta^{18}\text{O}$ :
- increased only.
  - increased, then decreased.
  - decreased only.
  - decreased, then increased.
19. Which of the following statements best describes why sites in the Arctic and Antarctic were chosen for these studies? These sites had to have:
- average air temperatures below  $-25^{\circ}\text{C}$  year-round.
  - glaciers present at many different locations.
  - several months during the year in which no precipitation fell.
  - large areas of bare soil and rock present.
20. According to Study 2, the ice found in the Arctic core at depths between 150 m and 200 m was formed during a period when the climate in the Arctic was most likely:
- somewhat cooler than the present climate in the Arctic.
  - the same as the present climate in the Arctic.
  - the same as the present climate in the Antarctic.
  - somewhat warmer than the present climate in the Arctic.
21. According to Studies 2 and 3, 100,000 years of ice accumulation was represented by a 500 m core in the Arctic and a 300 m core in the Antarctic. Which of the following statements best explains why the ice cores were different lengths? The average rate of glacial ice accumulation over that time period in the Arctic:
- was greater than the rate in the Antarctic.
  - was the same as the rate in the Antarctic.
  - was less than the rate in the Antarctic.
  - could not be determined with any accuracy.
22. According to the information provided, a sample that had a calculated  $\delta^{18}\text{O}$  of zero had a  $^{18}\text{O}/^{16}\text{O}$  value that compared in which of the following ways to the  $^{18}\text{O}/^{16}\text{O}$  value of the standard sample? The sample's  $^{18}\text{O}/^{16}\text{O}$  ratio was:
- $\frac{1}{2}$  of the  $^{18}\text{O}/^{16}\text{O}$  ratio of the standard.
  - the same as the  $^{18}\text{O}/^{16}\text{O}$  ratio of the standard.
  - $1\frac{1}{2}$  times larger than the  $^{18}\text{O}/^{16}\text{O}$  ratio of the standard.
  - twice as large as the  $^{18}\text{O}/^{16}\text{O}$  ratio of the standard.

GO ON TO THE NEXT PAGE.



### Passage V

Scientists discuss 2 possible causes of an event 250 million years ago (Ma) in which 90% of all marine species became extinct.

#### Scientist 1

The extinctions were caused by *continental flood volcanism*, a massive volcanic eruption lasting 1 million years that produced 2 million km<sup>3</sup> of lava. The eruption sent large amounts of sulfate-containing (SO<sub>4</sub>) aerosols into the air. The aerosols combined with water vapor in the air to produce acid rain that fell worldwide and poisoned many bodies of water. SO<sub>4</sub>-containing aerosols also helped break down ozone in the atmosphere, permitting high levels of ultraviolet light to reach the surface.

The eruption also released large amounts of carbon dioxide (CO<sub>2</sub>) into the air. The higher-than-typical CO<sub>2</sub> levels in the air raised the CO<sub>2</sub> content of ocean surface waters to levels that were toxic to many marine organisms. The increased levels of CO<sub>2</sub> also caused climatic warming that decreased the temperature difference between the poles and the equator, thus slowing ocean circulation and causing ocean water to become oxygen-poor.

#### Scientist 2

The extinctions were caused by an overturning of deep, CO<sub>2</sub>-rich ocean waters.

No continental ice sheets were present on Earth just prior to 250 Ma. Today, continental ice sheets help cool ocean surface waters, which then sink and drive the ocean's vertical circulation. Since this circulation was absent 250 Ma, the ocean water was stagnant and oxygen-poor.

Photosynthetic organisms living in ocean surface waters removed CO<sub>2</sub> from the atmosphere, converting it to organic matter. This organic matter sank to the ocean bottom, where it was oxidized to CO<sub>2</sub>. As a result, the CO<sub>2</sub> levels in the deep ocean waters rose dramatically, while atmospheric CO<sub>2</sub> levels continued to drop, causing climatic cooling. Glaciers and ice sheets grew rapidly, cooling the ocean surface waters such that vertical circulation of the ocean began. Deep ocean water was brought to the surface, where it released the accumulated CO<sub>2</sub>, dramatically increasing atmospheric and surface water concentrations of CO<sub>2</sub>. This excess CO<sub>2</sub> was toxic to many marine organisms.

23. Which of the following statements best explains why Scientist 1 mentioned ultraviolet light?
  - A. High levels of ultraviolet light are beneficial to many living things.
  - B. High levels of ultraviolet light are harmful to many living things.
  - C. Ultraviolet light helps create ozone in the atmosphere.
  - D. Ultraviolet light helps create CO<sub>2</sub> in the atmosphere.
  
24. Large amounts of SO<sub>4</sub>-containing aerosols in the atmosphere are known to reflect some of the incoming solar radiation back into space, which results in a lowering of the surface temperature. Based on the information provided, this finding would most likely *weaken* the viewpoint(s) of:
  - F. Scientist 1 only.
  - G. Scientist 2 only.
  - H. both Scientist 1 and Scientist 2.
  - J. neither Scientist 1 nor Scientist 2.
  
25. Scientist 2 would most likely state that the vertical circulation that is present in most of the oceans today is maintained, at least in part, by the presence of:
  - A. high levels of CO<sub>2</sub> in the air.
  - B. active volcanoes around the Pacific Ocean rim.
  - C. ice sheets in Earth's polar regions.
  - D. marine organisms in deep ocean waters.
  
26. Both scientists would most likely agree that the ocean water was, or became, oxygen-poor when which of the following events occurred?
  - F. Ocean water circulation reversed its usual direction.
  - G. Ocean water circulation slowed, stopped, or was absent.
  - H. Oceanic organisms dramatically increased the available oxygen in the ocean water.
  - J. Oceanic organisms used up all the available CO<sub>2</sub> in the ocean water.
  
27. According to the information provided, radioactive dating of volcanic rocks created during the continental flood volcanism described by Scientist 1 would show the rocks to be about how many million years old?
  - A. 1
  - B. 50
  - C. 100
  - D. 250

GO ON TO THE NEXT PAGE.



4



4

28.  $\text{SO}_4$ -containing aerosols are produced today in large quantities by human activity. Scientist 1 would most likely predict that the climatic effect in an area where large amounts of  $\text{SO}_4$ -containing aerosols are put into the atmosphere would be a *decrease* in the:

- F. amount of ultraviolet light reaching Earth's surface in that area.
- G. average pH of rainfall in that area.
- H. amount of rainfall in that area.
- J. average wind speed in that area.

29. *Inorganic carbonates* are rocks formed from calcium carbonate ( $\text{CaCO}_3$ ) that precipitate out of ocean surface waters which have much higher than normal levels of dissolved  $\text{CO}_2$ . If scientists found large deposits of inorganic carbonates that had formed around 250 Ma, this discovery would most likely support the viewpoint(s) of:

- A. Scientist 1 only.
- B. Scientist 2 only.
- C. both Scientist 1 and Scientist 2.
- D. neither Scientist 1 nor Scientist 2.

## Passage VI

When hydrogen and oxygen are mixed under certain conditions,  $\text{H}_2\text{O}$  will form. Students did the following experiments to study how  $\text{H}_2\text{O}$  forms.

## Experiment 1

A thick-walled gas syringe fitted with a sparking device was filled with 20 mL of hydrogen gas ( $\text{H}_2$ ) and 10 mL of oxygen gas ( $\text{O}_2$ ), as shown in Figure 1.

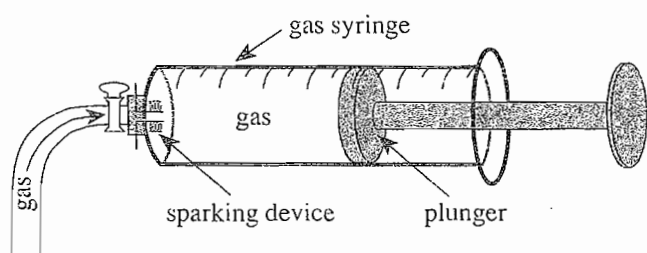


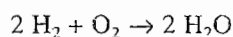
Figure 1

The syringe plunger was then locked in place and the gases were sparked. A reaction took place, forming droplets of water. The plunger was then released. The gas in the syringe was allowed to adjust to room temperature and pressure, and the final volume of gas was recorded. The remaining gas, if any, was then analyzed to determine its composition. The procedure was repeated with different volumes of gases, and the results were recorded in Table 1.

Table 1

Trial	Volume (mL)			
	Initial $\text{H}_2$	Initial $\text{O}_2$	Final $\text{H}_2$	Final $\text{O}_2$
1	20	10	0	0
2	20	20	0	10
3	20	30	0	20
4	10	20	0	15
5	40	20	0	0
6	50	20	10	0

Since it is known that equal numbers of molecules of different gases occupy equal volumes at the same pressure and temperature, the following equation was suggested:



## Experiment 2

In the apparatus shown in Figure 2, a stream of  $\text{H}_2$  was passed over hot copper oxide ( $\text{CuO}$ ), producing  $\text{H}_2\text{O}$  vapor. The vapor was then absorbed by calcium chloride ( $\text{CaCl}_2$ ).

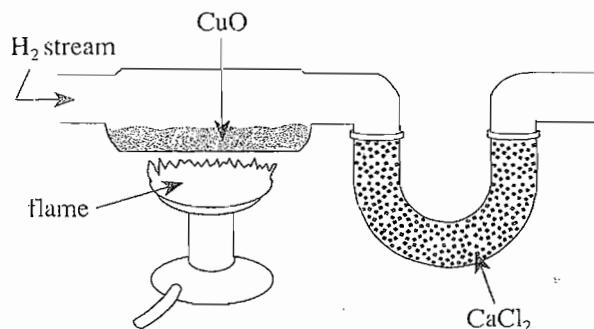
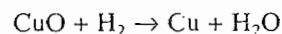
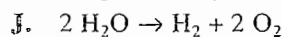
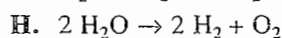
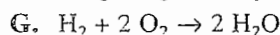
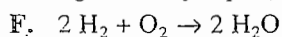


Figure 2

The changes in the masses of the tube sections containing the  $\text{CuO}$  and  $\text{CaCl}_2$  were used to calculate the mass of  $\text{CuO}$  reacted and the mass of  $\text{H}_2\text{O}$  formed. It was determined that 1 molecule of  $\text{H}_2\text{O}$  was produced for every  $\text{CuO}$  reacted:



30. When an electric current is passed through  $\text{H}_2\text{O}$ , the  $\text{H}_2\text{O}$  decomposes to form  $\text{H}_2$  and  $\text{O}_2$ . Which of the following correctly represents this reaction?



31. In Trial 1 of Experiment 1, after the reaction had taken place, but before the syringe plunger was unlocked, one would predict that, compared to the pressure in the syringe before the spark, the pressure in the syringe after the spark was:

A. lower, because the overall amount of gas decreased.

B. lower, because the overall amount of gas increased.

C. higher, because the overall amount of gas decreased.

D. higher, because the overall amount of gas increased.

GO ON TO THE NEXT PAGE.

4



4

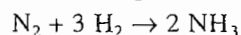
32. If 50 mL of  $H_2$  and 50 mL of  $O_2$  were reacted using the procedure from Experiment 1, the final volume of  $O_2$  would most likely be:

F. 0 mL.  
G. 10 mL.  
H. 15 mL.  
J. 25 mL.

33. Which of the following assumptions about the chemical reactions in Experiment 1 were made before the final measurements were taken?

A. Excess  $O_2$  must be present for water to form.  
B. Only hot  $CuO$  will react with  $H_2$ .  
C.  $H_2$  is not absorbed by  $CaCl_2$ .  
D. Each reaction had run to completion.

34. When nitrogen gas ( $N_2$ ) is reacted with  $H_2$  under certain conditions, the following reaction occurs:



Based on the results of Experiment 1, if 10 mL of  $N_2$  were completely reacted with 40 mL of  $H_2$  at the same pressure and temperature, what volume of  $H_2$  would remain unreacted?

F. 0 mL  
G. 10 mL  
H. 20 mL  
J. 30 mL

35. Which of the following, if it had occurred, would probably NOT have caused an error in interpreting the results of Experiment 2?

A. Using  $H_2$  contaminated with nonreactive impurities  
B. Using  $CuO$  contaminated with reactive impurities  
C.  $H_2O$  escaping without being absorbed by the  $CaCl_2$   
D. Other reactions occurring between  $CuO$  and  $H_2$  that produced different products

GO ON TO THE NEXT PAGE.

## Passage VII

A heavy chain was positioned on a frictionless tabletop with a length of the chain,  $Y_0$ , hanging over the edge of the table, as shown in Figure 1.

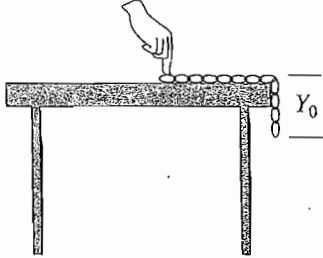


Figure 1

The total length of the chain was  $L$ . When the chain was released it slid off the table, as shown in Figure 2.

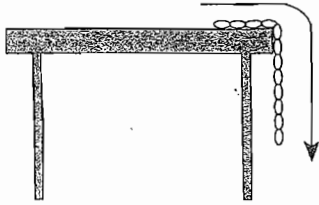


Figure 2

The *fall time* was the time required for the chain to slide completely off the table. The fall time is graphed in Figure 3 for a fixed  $L$  and various  $Y_0$  on the surfaces of Jupiter, Earth, and the Moon. The fall time is graphed in Figure 4 for  $Y_0 = 20$  cm and various  $L$  on the same 3 surfaces. The acceleration due to gravity at these surfaces is shown in Table 1.

Table 1	
Planet or moon	Acceleration due to gravity at surface of planet or moon ( $\text{m/sec}^2$ )
Jupiter	24.9
Earth	9.8
Moon	1.6

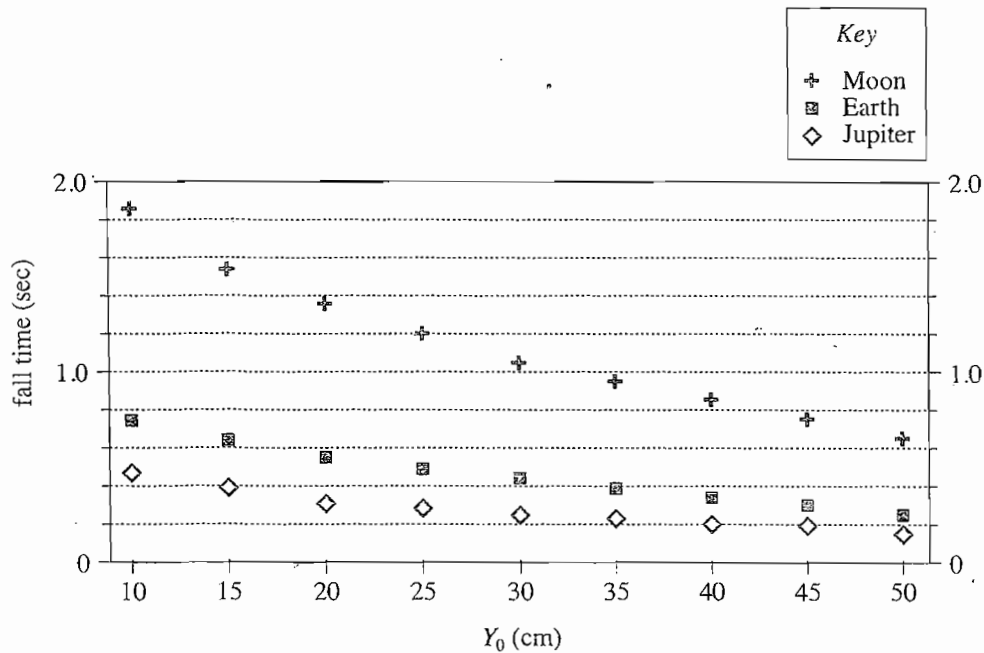


Figure 3

GO ON TO THE NEXT PAGE.

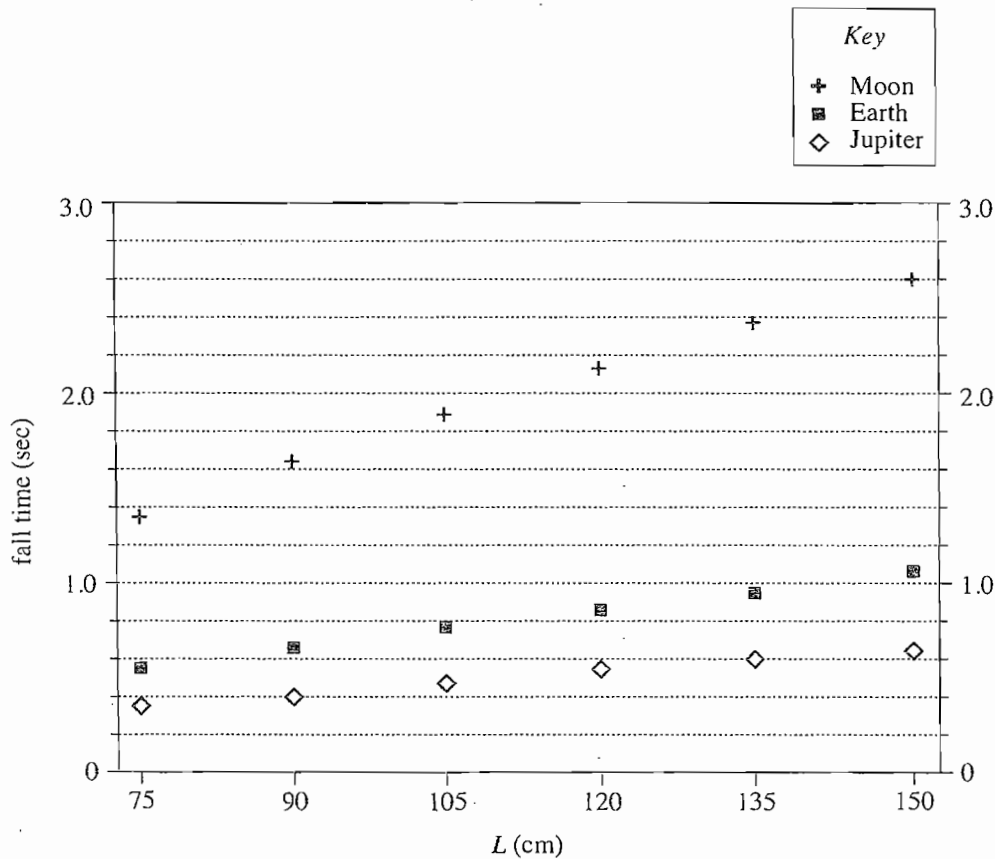


Figure 4

36. Based on Figure 3, if  $Y_0$  were 5 cm, the fall time on the Moon would be closest to:
- F. 0.4 sec.
  - G. 0.8 sec.
  - H. 1.9 sec.
  - J. 2.3 sec.
37. According to Figure 4, the chain with  $Y_0 = 20$  cm will have a fall time on the Moon of 2.0 sec if  $L$  is approximately:
- A. 75 cm.
  - B. 94 cm.
  - C. 113 cm.
  - D. 135 cm.
38. Before the chain was released, the horizontal length of the chain on the tabletop equaled:
- F.  $L + Y_0$ .
  - G.  $L - Y_0$ .
  - H.  $Y_0$ .
  - J.  $L$ .
39. Suppose the chain represented in Figure 3 has a 0.7 sec fall time at Earth's surface. For the same chain to have a 0.7 sec fall time at the Moon's surface,  $Y_0$  at the Moon's surface would have to be approximately:
- A. 35 cm greater than at Earth's surface.
  - B. 35 cm less than at Earth's surface.
  - C. 47 cm greater than at Earth's surface.
  - D. 47 cm less than at Earth's surface.
40. The acceleration due to gravity on the surface at the planet Neptune is approximately  $11.7 \text{ m/sec}^2$ . Based on Figure 3, a chain's fall time, calculated for Neptune's surface and a given  $Y_0$ , would be:
- F. less than its fall time at Jupiter's surface.
  - G. greater than its fall time at Jupiter's surface, and less than its fall time at Earth's surface.
  - H. greater than its fall time at Earth's surface, and less than its fall time at the Moon's surface.
  - J. greater than its fall time at the Moon's surface.

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.





072952

## Practice Writing Test Prompt 3

Your Signature (do not print): \_\_\_\_\_

Print Your Name Here: \_\_\_\_\_

Your Date of Birth:									
<input type="text"/>	<input type="text"/>	-	<input type="text"/>	<input type="text"/>	-	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Month		Day		Year					

Form 3WT

# The ACT® Writing Test Booklet

You must take the multiple-choice tests before you take the Writing Test.

## 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 the unlined pages in this test booklet to plan your essay. These pages will not be scored. *You must write your essay in pencil on the lined pages in the answer folder.* Your writing on those lined pages will be scored. You may not need all 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 OPEN THIS BOOKLET UNTIL TOLD TO DO SO.**

©2008 by ACT, Inc. All rights reserved.

NOTE: This booklet is covered by Federal copyright laws that prohibit the reproduction of the test questions without the express, written permission of ACT, Inc.

P.O. BOX 168  
IOWA CITY, IA 52243-0168

ACT®

### Practice Writing Test Prompt 3

Some high schools in the United States have considered creating separate classrooms for male and female students in subjects such as mathematics and science. Some educators think separate classes will be beneficial because students will be less distracted from learning. Other educators think having separate classes for females and males will not be beneficial because it seems to support false stereotypes about differences in ability between males and females. In your opinion, should high schools create separate classes for male and female students?

In your essay, take a position on this question. You may write about either one of the two points of view given, or you may present a different point of view on this question. Use specific reasons and examples to support your position.

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

If you need more space to plan,  
please continue on the back of this page.

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

You may wish to photocopy these sample answer document pages to respond to the practice ACT Writing Test.

Please enter the information at the right before beginning the Writing Test.

Use a soft lead pencil only. Do not use ink.

## WRITING BOOKLET NUMBER

Print your 6-digit  
**Booklet Number**  
in the boxes at the  
right.

--	--	--	--	--	--

**WRITING TEST FORM**

☐ 1WT    ☐ 2WT    ☐ 3WT

--	--	--

Print your  
3-character  
**Test Form** in  
the boxes above  
and fill in the  
corresponding  
oval at the right.

**Begin WRITING TEST here.**

**If you need more space, please continue on the back of this page.**



## WRITING TEST

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

**If you need more space, please continue on the next page.**

## WRITING TEST

**If you need more space, please continue on the back of this page.**



0876008

WRITING TEST

STOP here with the Writing Test.

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



## Chapter 5

## Scale Score Conversion Table

### Practice Test 3

Scale Score	Raw Score				Scale Score
	English	Mathematics	Reading	Science	
36	75	60	38-40	39-40	36
35	74	59	37	38	35
34	72-73	58	36	37	34
33	71	57	35	36	33
32	70	56	34	35	32
31	69	55	33	—	31
30	67-68	53-54	32	34	30
29	65-66	51-52	31	33	29
28	63-64	48-50	29-30	31-32	28
27	61-62	45-47	28	30	27
26	58-60	42-44	27	29	26
25	55-57	40-41	26	28	25
24	53-54	37-39	24-25	26-27	24
23	50-52	36	23	25	23
22	48-49	34-35	22	23-24	22
21	45-47	33	21	22	21
20	42-44	31-32	20	20-21	20
19	40-41	29-30	19	18-19	19
18	37-39	26-28	18	17	18
17	35-36	23-25	17	15-16	17
16	33-34	20-22	16	14	16
15	30-32	16-19	14-15	13	15
14	28-29	13-15	13	11-12	14
13	26-27	11-12	11-12	10	13
12	24-25	9-10	9-10	9	12
11	22-23	7-8	7-8	8	11
10	20-21	6	6	7	10
9	18-19	5	5	5-6	9
8	15-17	4	—	4	8
7	13-14	3	4	—	7
6	10-12	—	3	3	6
5	8-9	2	—	2	5
4	6-7	—	2	—	4
3	4-5	1	—	1	3
2	2-3	—	1	—	2
1	0-1	0	0	0	1

