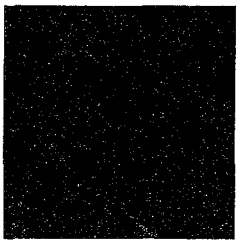
Form 73E

(April 2016)



The ACT®

2015 | 2016

In response to your request for Test Information Release materials, this booklet contains the test questions and conversion tables used in determining your ACT scores. Enclosed with this booklet is a report that lists each of your answers, shows whether your answer was correct, and, if your answer was not correct, gives the correct answer.

If you wish to order a photocopy of your answer document—including, if you took the writing test, a copy of your written essay—please use the order form on the inside back cover of this booklet.

ACT®

PO BOX 168
IOWA CITY, IA 52243-0168

CrackACT.com

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

The *Min*: A Ship from the Desert

[1]

In 2004, a team of archaeologists discovered the remains of an ancient shipyard. In a series of caves at (1)

a site named Wadi Gawasis in the Egypt's desert. The (2)
team found a wealth of well-preserved planks, anchors, oars, and other sailing equipment. [A] These objects were determined to be approximately four thousand years old.

[2]

We have long known that ancient Egyptians sailed the freshwater Nile River. However, until Wadi Gawasis was excavated, there had been little evidence that we (3)
had also sailed the ocean. [B] Hieroglyphic inscriptions suggested that some of the excavated objects had been used in an expedition to the ancient Red Sea port of Punt, about one thousand miles from Wadi Gawasis.

1. **A.** NO CHANGE
   B. shipyard: in
   C. shipyard; in
   D. shipyard in

2. **F.** NO CHANGE
   G. Egyptian's
   H. Egyptians
   J. Egyptian

3. **A.** NO CHANGE
   B. they
   C. she
   D. it

Planks pocked with holes bored by shipworms, creatures that live only in salt water, (4) supported the hypothesis that ancient Egyptians had ventured into the ocean.

[3]

Florida State University professor (5) Cheryl Ward, a maritime archaeologist, drew up plans for building a ship like those the ancient Egyptians had sailed. The completed ship, sixty-six feet long and sixteen feet wide, would be named *Min of the Desert* in honor of the Egyptian god who's likeness (6) adorned many Wadi Gawasis artifacts. (7)

[4]

Four shipbuilders constructed the *Min* by using many of the same tools, materials, and techniques, (8) that the shipbuilders of Wadi Gawasis had used. [C] Like the ancient Egyptians, the modern builders used mortise-and-tenon joints, when (9) the end of one plank is fitted into a slot in the adjoining plank. Ward compared building the *Min* to (10) putting together a jigsaw puzzle because the two processes are analogous. (11)

[5]

In December 2008, an international crew of twenty-four people made a weeklong ocean voyage in the *Min* to test: (12) the ship's seaworthiness. [D] During the voyage, the *Min* was able to sail roughly seven miles per hour, about twice as fast as Ward had expected.

4. If the writer were to delete the underlined portion (adjusting the punctuation as needed), the paragraph would primarily lose an explanation of why:

F. evidence of shipworms could indicate that the Wadi Gawasis ships had sailed the ocean.
G. archaeologists thought Punt was the destination of the Wadi Gawasis expedition.
H. shipworms may have bored holes in the planks of the Wadi Gawasis ships.
J. there was evidence of shipworms at Wadi Gawasis.

5. Which choice most effectively ties the information in the preceding paragraph to the topic of this paragraph?

A. NO CHANGE
B. Drawing on her doctoral research on ancient Egyptian hull design,
C. Guided by these discoveries,
D. With the best of intentions,

6. **F.** NO CHANGE
G. who's liked and
H. whose likeness
J. whose likely

7. **A.** NO CHANGE
B. remainders.
C. parts.
D. things.

8. **F.** NO CHANGE
G. tools, materials, and, techniques
H. tools, materials, and techniques
J. tools materials and techniques

9. **A.** NO CHANGE
B. for whom
C. in which
D. DELETE the underlined portion.

10. **F.** NO CHANGE
G. as
H. or
J. by

11. **A.** NO CHANGE
B. because of the construction methods.
C. to make a comparison.
D. DELETE the underlined portion and end the sentence with a period.

12. **F.** NO CHANGE
G. *Min*, to test,
H. *Min*; to test
J. *Min* to test

Though it was not always smooth sailing, Ward recalls
13
almost colliding with a reef the *Min* was found to be
13
more than adequate for a voyage to Punt.

13. **A.** NO CHANGE
B. sailing—Ward recalls almost colliding with a reef—the
C. sailing, Ward recalls almost colliding with a reef. The
D. sailing, Ward recalls, almost colliding with a reef, the

Questions 14 and 15 ask about the preceding passage as a whole.

14. The writer wants to add the following sentence to the essay:

> The crew occasionally used the oars, but a single sail was generally sufficient to propel the ship.

This sentence would most logically be placed at:

F. Point A in Paragraph 1.
G. Point B in Paragraph 2.
H. Point C in Paragraph 4.
J. Point D in Paragraph 5.

15. Suppose the writer's primary purpose had been to instruct the reader how to build a replica of an ancient ship. Would this essay accomplish that purpose?

A. Yes; the writer describes the use of mortise-and-tenon joints in detail.
B. Yes; the writer provides the measurements of the *Min*.
C. No; the writer instead emphasizes the inspiration for and significance of a particular replica.
D. No; the writer instead focuses on providing details about how and why Wadi Gawasis was excavated.

PASSAGE II

An Italian Garden in California

[1]

When I was young, my grandparents' sprawling Southern California yard intimidated me. [A] Whereas
16
the small, carefully mowed lawn surrounding my own nearby house, their yard was a huge, unruly
17
garden, like a neighborhood park that had been taken over by wildflowers and weeds. Grandpa worked in his garden every day—planting, and pruning,
18
mixing and staking, weeding and mulching—so I wondered why it looked so wild and overgrown. [19]

16. **F.** NO CHANGE
G. Nevertheless,
H. Instead,
J. Unlike

17. Which of the following choices best indicates the disorder of the garden?

A. NO CHANGE
B. contradictory
C. stormy
D. blatant

18. **F.** NO CHANGE
G. day—planting and pruning,
H. day, planting, and pruning
J. day, planting and pruning

19. If the writer were to delete the preceding sentence, this paragraph would primarily lose a statement that:

A. explains why the appearance of the garden puzzled the narrator.
B. illustrates why the garden appeared wild and overgrown.
C. establishes that the grandfather resented the amount of work that the garden required.
D. describes the varieties of plants and flowers that grew in the garden.

[2]

Certainly, Grandpa told
20

myself that the way he grew fruits, vegetables,
21
and herbs conserved space and water. [B] His

plantings are complementing each other and were
22

in harmony with the seasons, the sun, and the acidity
23
and moisture of the soil. Because of those benefits,
he didn't care how his garden looked.

[3]

The citrus trees grew in the sunniest part of the yard,
24
they flourished there while providing shade for garlic and
mint plants below. [C] Almond, peach, and cherry trees
near the citrus, due to the fact that they were needing as
25
much sun but more nutrients, were mulched with mounds
of compost that Grandpa would mix himself. Fig, pear, and
persimmon trees were scattered easy-growing throughout
26
the yard. There were weathered trellises that supported
raspberry, blueberry, and boysenberry bushes crowded

together to block out weeds. Muddy, rutted paths led to
27
tangled vines of endless varieties of tomatoes—some
heavy and misshapen, others small and smooth, some
even streaked purple, green, and red—with basil planted
in between the vines to repel insects. Salad greens and
herbs, such as arugula, Swiss chard, black kale, rapini,
28
sage, and oregano, shared one large plot, given their
28
similar moisture requirements.

20. **F.** NO CHANGE
G. For the time being,
H. Eventually,
J. At first,

21. **A.** NO CHANGE
B. myself about
C. me about
D. me that

22. **F.** NO CHANGE
G. have complemented each other and are
H. complemented each other and were
J. complement each other and were

23. **A.** NO CHANGE
B. not only the seasons, the sun, but also
C. either the seasons, the sun, and
D. both the seasons, the sun, and

24. **F.** NO CHANGE
G. yard, I noticed that
H. yard;
J. yard

25. **A.** NO CHANGE
B. requiring the need for
C. necessarily needing
D. needing

26. The best placement for the underlined portion would be:
F. where it is now.
G. before the word *fig* (adjusting the capitalization as needed).
H. after the word *persimmon*.
J. after the word *were*.

27. **A.** NO CHANGE
B. rutted, paths,
C. rutted, paths
D. rutted paths,

28. **F.** NO CHANGE
G. herbs—such as arugula, Swiss chard, black kale, rapini, sage, and oregano
H. herbs, such as arugula, Swiss chard, black kale, rapini, sage, and oregano
J. herbs; such as arugula, Swiss chard, black kale, rapini, sage, and oregano

[4]

Meanwhile, I learned that my grandpa's garden, his *orto*, was much like the orto his own grandfather had cultivated in southern Italy. [D] When I plant a garden, I might start with my favorite tomato, the sweet *Datterini*, a classic cherry tomato variety from southern Italy that my grandfather grew so well.

29. Which choice most effectively suggests that as an adult the narrator continued to discover new information about the grandfather's garden?

A. NO CHANGE
B. Years later,
C. However,
D. In short,

Question 30 asks about the preceding passage as a whole.

30. The writer wants to add the following sentence to the essay:

> My parents' tidy rows of flowers required more watering and chemicals than his garden did, he said.

This sentence would most logically be placed at:

F. Point A in Paragraph 1.
G. Point B in Paragraph 2.
H. Point C in Paragraph 3.
J. Point D in Paragraph 4.

PASSAGE III

Wave Riding on Lake Michigan

By the time cool autumn winds rush in, kicking up waves that rock the pier: the sunbathers and swimmers have already left our beach in Grand Haven, Michigan. The empty beach, with waves pushing so far onto shore that they would have knocked down sand castles in July, is our favorite sight. It's September, and for my friends and me, it's finally time to surf our stretch of the "Third Coast": the eastern shore of Lake Michigan.

31. **A.** NO CHANGE
B. cool, autumn, winds,
C. cool, autumn, winds
D. cool, autumn winds,

32. **F.** NO CHANGE
G. pier; the
H. pier, the
J. pier. The

33. **A.** NO CHANGE
B. were my
C. was my
D. are our

Although on rare occasions we do surf twelve-foot waves here—as we've done at Malibu Beach on the West Coast, lake surfing is different from ocean surfing. [35] The six- to ten-foot waves we can realistically hope for on Lake Michigan mainly happen in fall and winter, when winds often reach twenty-five miles per hour. Our waves, created by local weather systems, are choppy and quick-moving. This makes them more fun and more challenging to surf. Ocean waves, on the other hand, are created by tides and storms a thousand miles offshore. [36] They are usually bigger than lake waves and smoother and more predictable.

The Great Lakes region is also referred to as the "Fresh Coast" because of its fresh water. It doesn't feel like an ocean when we surf it, though. The fresh water of Lake Michigan makes us slow and heavy on our boards; it doesn't have the salt that creates the buoyancy we get when surfing an ocean.

34. **F.** NO CHANGE
G. here—as we've done at Malibu Beach on the West Coast—
H. here, as we've done at Malibu Beach on the West Coast—
J. here as we've done at Malibu Beach on the West Coast

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

I have heard about occasional shark attacks on surfers in the ocean.

Should the writer make this addition here?

A. Yes, because it expresses the essay's main argument about why people prefer lake surfing to ocean surfing.
B. Yes, because it provides support for the author's claim that lake surfing isn't dangerous.
C. No, because it interrupts the description of the different heights of ocean and lake waves.
D. No, because it identifies an advantage of lake surfing that is discussed in detail later in the essay.

36. If the writer were to delete the preceding sentence, this paragraph would primarily lose a statement that:

F. explains the effects of weather on the formation of both lake and ocean waves.
G. contrasts with the earlier description of how lake waves are formed.
H. clarifies why ocean waves are choppy and quick-moving.
J. reiterates the main idea of the paragraph.

37. Given that all the choices are true, which one most effectively introduces the paragraph and provides a transition into the rest of the essay?

A. NO CHANGE
B. Unlike the Pacific Ocean, with 63.8 million square surface miles, Lake Michigan has only 22,400 square surface miles.
C. Michigan has 3,288 miles of Great Lakes coastline, more coastline than any state other than Alaska.
D. With 22,400 square surface miles, Lake Michigan looks like an ocean.

38. **F.** NO CHANGE
G. travel at low velocity with substantial weight
H. leaden like a rock and ponderous
J. stagnant and weigh a ton

It's hard to paddle—and to do sharp, carving turns—on Lake Michigan. [39] We add stability and reduce density by using surfboards that are longer and made with more foam than our ocean boards.

By late November, if we wear thick wet
40

suits—completely with hood, mitts, and booties—so
41
we can surf in slushy, freezing water while snow flies around us. Likewise, ice on our beach shuts us out from
42
the waves. By January, our season is over. We watch most of Lake Michigan freeze in winter, thaw in spring, and fill up with boats and water skis all summer. We wait
43

for the crisp September wind to celebrate the start of the
44
school year and the chance to reunite with our friends.
44

39. If the writer were to delete the preceding sentence, the paragraph would primarily lose a statement that:

- **A.** explains how lake surfers counteract the difficulties of surfing in fresh water.
- **B.** provides examples of the challenges lake surfers face as a result of Lake Michigan's fresh water.
- **C.** identifies a similarity between surfing in Lake Michigan and ocean surfing.
- **D.** illustrates the advantages created by the decreased buoyancy of fresh water compared to salt water.

40.

- **F.** NO CHANGE
- **G.** we wore
- **H.** we wear
- **J.** if we wore

41.

- **A.** NO CHANGE
- **B.** completely accompanied
- **C.** in completion
- **D.** complete

42.

- **F.** NO CHANGE
- **G.** Soon, though,
- **H.** Besides, since
- **J.** Rather,

43.

- **A.** NO CHANGE
- **B.** fills up
- **C.** fill it
- **D.** filling

44. Which of the following most effectively concludes the sentence and reinforces the primary comparison in the essay?

- **F.** NO CHANGE
- **G.** show us, again, that we don't need an ocean to ride the waves.
- **H.** buy new wet suits since they go on sale.
- **J.** drive away the sunbathers and give us back our surfing terrain.

PASSAGE IV

Anna May Wong: From Extra to Star

[1]

Wong Liu Tsong (Anna May Wong), had longed
45

to be an actress since she was a child observing film
46

productions in her Los Angeles neighborhood as a child. Wong entered the film industry as a teenager in the 1920s, at a time when few opportunities were available to Chinese American actors. Wong, however, was intent on challenging the industrys' boundaries by offering
47

memorable performances. That's exactly what she did.

[2]

Wong progressed quickly from uncredited to credited actress. [A] Shortly after performing her first supporting role, Wong, at seventeen, starred in *The Toll of the Sea*.
48

Around the globe, critics worldwide praised her
49

portrayal of a young woman, whomever rejected in
50

love. Reviewers raved about Wong's ability to convey emotions such as joy and grief through graceful gestures and pantomime—essential components
51

of acting in the era of silent film.
51

45. **A.** NO CHANGE
B. Tsong—Anna May Wong,
C. Tsong (Anna May Wong)
D. Tsong, Anna May Wong

46. **F.** NO CHANGE
G. her childhood when she first observed
H. first initially observing
J. first observing

47. **A.** NO CHANGE
B. industry's boundaries
C. industries boundary's
D. industries boundaries

48. **F.** NO CHANGE
G. audiences watched the seventeen-year-old's performance
H. audiences watched Wong, who was seventeen,
J. Wong at seventeen starred,

49. **A.** NO CHANGE
B. Both at home and abroad, critics
C. Globally, critics
D. Critics

50. **F.** NO CHANGE
G. woman, whom
H. woman whose
J. woman

51. The writer is considering deleting the underlined portion (and ending the sentence with a period). Should the underlined portion be kept or deleted?

A. Kept, because it asserts that the acting techniques Wong employed differed greatly from those of her contemporaries.
B. Kept, because it states why Wong's skillful use of gestures and pantomime was particularly important.
C. Deleted, because it indicates that Wong lacked skills beyond the essential components of acting.
D. Deleted, because it demonstrates that reviewers evaluated Wong's performances harshly.

[3]

Such attention to detail in their performances landed Wong numerous supporting roles in the 1920s. Yet, despite having upstaged lead actors and actresses for nearly a decade, Wong was not offered another starring role. [53] Aware that Hollywood's racist casting practice were limiting, Wong left for Europe in 1928.

52. **F.** NO CHANGE
G. their performances,
H. her performances,
J. her performances

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

> On February 8, 1960, a terrazzo and brass star commemorating Anna May Wong's contributions to film was added to Hollywood Boulevard's Walk of Fame.

Should the writer make this addition here?

A. Yes, because it emphasizes the correlation between Wong's early struggles in the 1920s and her success decades later.
B. Yes, because it supports the paragraph's main point that Wong frequently upstaged her peers.
C. No, because it interrupts the paragraph's discussion of how Wong's inability to secure starring roles led to her leaving for Europe.
D. No, because it contradicts an earlier claim that Wong had difficulty finding starring roles.

54. **F.** NO CHANGE
G. practices were limiting her success,
H. practice were limiting her success,
J. practices was limiting,

[4]

[B] Determined to maintain her popularity as the era of talking pictures evolved, Wong became fluent in German and French. [C] This helped her land a starring role in one of her first "talkies," this film was shot three different times—once in German, once in French, and once in English. [57] Like

55. **A.** NO CHANGE
B. incorporating sound, the film was
C. the film, starring Wong was
D. a film

56. **F.** NO CHANGE
G. once each in a litany of three separate languages that included German, French, and
H. in a list of three languages—German, and also French, and
J. once in each of three ways—German, French, and

57. If the writer were to delete the preceding sentence, the paragraph would primarily lose:

A. a contrast between the ease with which Wong learned German and French and the difficulty Wong experienced in shooting a film three times.
B. an example of how Wong's ability to speak multiple languages enhanced her opportunities in a changing film industry.
C. an explanation of how critics responded to Wong's ability to speak both German and French.
D. an indication that Wong struggled futilely to maintain her popularity in the era of sound in film.

Wong performed there, her
58
performances in plays and operettas
on the continent and in Great Britain
were lauded by critics.

[5]

The American film and theater industry took note of Wong's success. During Wong's return to the United States in 1930, a producer intercepted her at a stopover in London
59
and hurriedly signed her to act in the hit Broadway play
59
On the Spot. A year later, critics praised her performance in a popular Hollywood thriller. [D] Wong, able to consistently garner critical acclaim, sustained her career as a premier American film star.

58. **F.** NO CHANGE
G. her performance in this film,
H. Wong's performances,
J. DELETE the underlined portion.

59. Given that all the choices are accurate, which one best emphasizes the producer's eagerness to secure Wong for a role in *On the Spot* ?

A. NO CHANGE
B. who also produced other Broadway plays signed
C. casting Edgar Wallace's play signed
D. met Wong and asked

Question 60 asks about the preceding passage as a whole.

60. The writer wants to add the following sentence to the essay:

There, Wong's popularity soared.

This sentence would most logically be placed at:

F. Point A in Paragraph 2.
G. Point B in Paragraph 4.
H. Point C in Paragraph 4.
J. Point D in Paragraph 5.

PASSAGE V

Choreographing Stories

[1] Choreographer Jerome Robbins significantly affected the development of Broadway with shows such as *On the Town* and *West Side Story* which he helped
61
elevate the status of dance in musical theater. [2] In variety shows like the Ziegfeld Follies, for example, the showgirls' costumes thoroughly captured the audience's attention. [3] In the early days of Broadway, dance was situated
62
by the elaborate costumes. [4] As a result, the Ziegfeld Girls' dancing seemed almost incidental.

61. **A.** NO CHANGE
B. which they
C. that he
D. that

62. **F.** NO CHANGE
G. overshadowed
H. deceived
J. coated

[5] But by the 1930s, Broadway musicals had begun to tell stories with greater complexity, while lavish costumes gave way to other theatrical elements. [6] Jerome Robbins, along with other choreographers, began using dance to tell the story. [7] However, actors gained a new method of conveying the characters' emotions. [64]

The first Broadway musical Robbins choreographed, *On the Town*, (1944), depicted three sailors on leave in New York. Despite the fact that dramatic scenes in musical theater were usually interrupted in order to feature dancers. Robbins, by contrast, arranged for the actors, himself to perform the dances. His choreography allowed the actors to express the sailors' joy for freedom while continuing the storyline of the show. [69]

Offering authentic emotions to which the audience could relate, conveyed through the medium of dance.

63. **A.** NO CHANGE
B. From now on,
C. Previously,
D. Thus,

64. For the sake of the logic and coherence of this paragraph, Sentence 2 should be placed:
F. where it is now.
G. before Sentence 1.
H. after Sentence 3.
J. after Sentence 4.

65. **A.** NO CHANGE
B. choreographed, *On the Town* (1944),
C. choreographed; *On the Town* (1944)
D. choreographed *On the Town* (1944),

66. **F.** NO CHANGE
G. At the time,
H. Although
J. Just as

67. **A.** NO CHANGE
B. actors, themselves
C. actors themselves
D. actors himself

68. **F.** NO CHANGE
G. one's
H. our
J. his

69. If the writer were to delete the preceding sentence, the paragraph would primarily lose a statement that:
A. suggests that the performers were excited about developing their skills in both dancing and acting.
B. illustrates how Robbins attempted to use choreography in a new way in *On the Town*.
C. explains that expressing emotion was originally considered a key element in *On the Town*.
D. provides evidence that Robbins trained dancers to act out complicated stories.

70. **F.** NO CHANGE
G. The performance of
H. Here were
J. This was

But it was Robbins's choreography in the 1957 musical *West Side Story*—a retelling of *Romeo and Juliet* with two New York street gangs in place of Shakespeare's rival families—in which the story and dancing were most dramatically intertwined. From the gang members' vying for control of the streets to the courtship of the ill-fated young lovers: Robbins melded modern jazz dance with classical ballet to convey the tragic tale.

Nowadays dance—like songs and dialogue—plays a role integrating in musical theater today. Where the spectacle of lavish variety shows had once relegated dance to a minor role, Robbins has won numerous awards, including an Oscar for *West Side Story*.

71. **A.** NO CHANGE
B. more dramatically intertwining.
C. most dramatic, as intertwined.
D. more dramatics intertwined.

72. **F.** NO CHANGE
G. lovers, so
H. lovers,
J. lovers.

73. **A.** NO CHANGE
B. These days, dance—
C. Presently dance—
D. Dance—

74. **F.** NO CHANGE
G. an integration role
H. an integrity role
J. an integral role

75. Given that all the choices are accurate, which one most effectively concludes the sentence and the essay?

A. NO CHANGE
B. Robbins helped dance reach its present status in Broadway musicals through his innovative choreography.
C. Robbins has played minor parts as a dancer in the chorus as well as leading parts in classical ballets.
D. about ten million tickets to Broadway musicals are now sold each year.

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. What is $|5 - x|$ when $x = 9$?

A. -14
B. -4
C. 4
D. 9
E. 14

2. The length of a rectangle is 12 feet. The width of the rectangle is $\frac{1}{2}$ the length. What is the perimeter of the rectangle, in feet?

F. 18
G. 24
H. 30
J. 36
K. 72

3. $(9m - 4n) - (2n + 5m)$ is equivalent to:

A. $4m - 6n$
B. $4m - 2n$
C. $5m + 3n$
D. $7m - 9n$
E. $7m + n$

4. Which of the following numbers has the greatest value?

F. $0.\overline{3}$
G. 0.3
H. 0.33
J. 0.333
K. 0.3333

DO YOUR FIGURING HERE.

5. At a grocery store, Jo Ellen received $1.60 when she returned her cans, glass bottles, and plastic bottles. Jo Ellen received $0.05 for each can, $0.10 for each glass bottle, and $0.05 for each plastic bottle. She knew she had returned 6 cans and 8 glass bottles. How many plastic bottles did Jo Ellen return to the store?

   A. 8
   B. 9
   C. 10
   D. 12
   E. 18

6. Pablo recorded the noon temperature, in degrees Celsius, on 4 consecutive days as part of a science project. On the 1st day, the noon temperature was −4°C. On the 4th day, the noon temperature was 12°C. What was the change in the noon temperature from the 1st day to the 4th day?

   F. −16°C
   G. −4°C
   H. 4°C
   J. 8°C
   K. 16°C

7. Sienna will be paid $75, plus 25% of her total weekly sales, for the hours she is scheduled to work next week. Let w represent Sienna's total weekly sales, in dollars, for next week. Which of the following expressions gives Sienna's pay, in dollars, for the hours she is scheduled to work next week?

   A. $0.25w + 75$
   B. $0.25w + 0.75$
   C. $0.75w + 0.25$
   D. $25w + 75$
   E. $75w + 0.25$

8. Which of the following augmented matrices represents the system of linear equations below?

$$\begin{aligned} 3x + 5y &= 20 \\ 2x - \ y &= \ 9 \end{aligned}$$

   F. $\left[\begin{array}{cc|c} 3 & 5 & -20 \\ 2 & -1 & -9 \end{array}\right]$

   G. $\left[\begin{array}{cc|c} 3 & 5 & 20 \\ 2 & -1 & 9 \end{array}\right]$

   H. $\left[\begin{array}{cc|c} 3 & 5 & 20 \\ 2 & 0 & 9 \end{array}\right]$

   J. $\left[\begin{array}{cc|c} 3 & 5 & 20 \\ 2 & 1 & 9 \end{array}\right]$

   K. $\left[\begin{array}{cc|c} 3 & 2 & 20 \\ 5 & -1 & 9 \end{array}\right]$

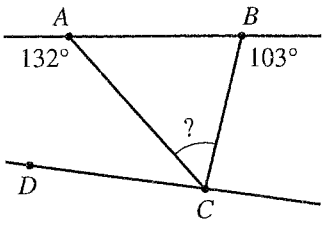
9. If $g(x) = 2x^2 - 3x + 4$, then $g(-3) = ?$

   A. −23
   B. −5
   C. 1
   D. 13
   E. 31

DO YOUR FIGURING HERE.

10. The figure below shows lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{DC}$, line segments $\overline{AC}$ and $\overline{BC}$, and 2 angle measures. What is the measure of $\angle ACB$?

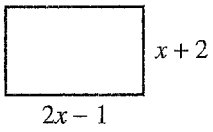
F. $38\frac{1}{2}°$
G. 42°
H. 48°
J. 55°
K. 77°



11. Marietta purchased a car that had a purchase price of $10,400, which included all other costs and tax. She paid $2,000 as a down payment and got a loan for the rest of the purchase price. Marietta paid off the loan by making 48 payments of $225 each. The total of all her payments, including the down payment, was how much more than the car's purchase price?

A. $ 400
B. $ 2,400
C. $ 8,400
D. $10,800
E. $12,800

12. The dimensions of the rectangle shown below are given in inches. Which of the following expressions gives the area, in square inches, of the rectangle?



F. $6x + 2$
G. $x^2 + 3x - 2$
H. $2x^2 - 2$
J. $2x^2 + 3x - 2$
K. $2x^2 + 5x + 2$

13. The population of a particular town is modeled by the equation $P = 120{,}000(1.1)^t$, where t is the number of years after January 1, 2011. Based on the model, which of the following numbers is closest to the population of the town on January 1, 2013 ?

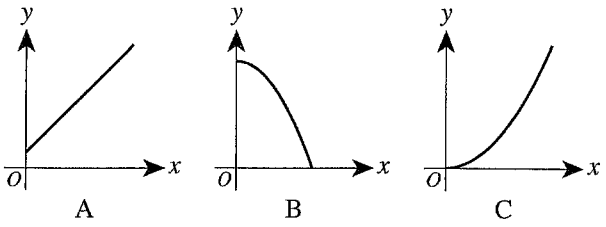
A. 132,000
B. 145,000
C. 160,000
D. 264,000
E. 396,000

DO YOUR FIGURING HERE.

14. The phrases below represent 3 types of measurements as functions of time.

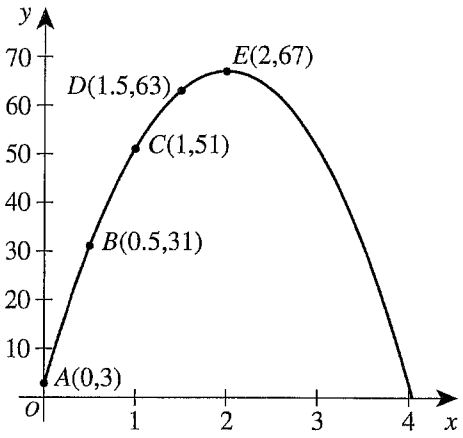
I. The height of an object falling toward the ground
II. The height of a plant growing at a constant rate
III. The distance a car travels while increasing its velocity

Graphs A, B, and C below each represent one of these functions. For all graphs, the x-axis represents time. Which graph is of which function?



	Graph A	Graph B	Graph C
F.	I	II	III
G.	II	I	III
H.	II	III	I
J.	III	I	II
K.	III	II	I

15. In the standard (x,y) coordinate plane below, 5 points are labeled on a parabola. Which of the following lines has the slope of *least* value?



A. $\overleftrightarrow{AB}$
B. $\overleftrightarrow{AE}$
C. $\overleftrightarrow{BC}$
D. $\overleftrightarrow{CD}$
E. $\overleftrightarrow{DE}$

16. Jamal earned scores of 70, 75, 85, and 94 points on the first 4 history projects, and he has 1 more project to complete. What is the minimum score Jamal needs to earn on the 5th project so that the mean of his scores on all 5 projects is at least 2 points more than the mean of the scores he earned on the first 4 projects?

F. 80
G. 81
H. 83
J. 91
K. 96

17. In the figure below, all of the small squares are equal in area, and the area of rectangle $ABCD$ is 1 square unit. Which of the following expressions represents the area, in square units, of the shaded region?

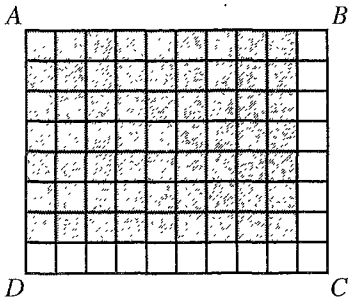
A. $\frac{1}{10} \cdot \frac{1}{8}$

B. $\frac{1}{10} \cdot \frac{7}{8}$

C. $\frac{1}{10} \cdot \frac{9}{10}$

D. $\frac{9}{10} \cdot \frac{1}{8}$

E. $\frac{9}{10} \cdot \frac{7}{8}$



DO YOUR FIGURING HERE.

18. What is the median of the list of numbers below?

6, 3, 5, 7, 12, 9, 5, 5, 11

F. 5
G. 6
H. 7
J. 9
K. 12

19. A batch of 100 defective computer chips consisting of 2 types (I and II) and made by 2 companies (A and B) was selected, and it was determined how many of each type of chip was made by each company. The results are displayed in the table below.

Type of chip	Number of chips made by Company:	
	A	B
I	14	30
II	36	20

What is the probability that a randomly selected chip from this batch of 100 is Type I and manufactured by Company B ?

A. $\frac{30}{100}$

B. $\frac{30}{50}$

C. $\frac{30}{44}$

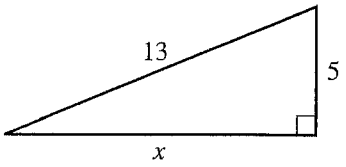
D. $\frac{14}{100}$

E. $\frac{14}{44}$

DO YOUR FIGURING HERE.

20. Carpenters use the term *pitch* to describe the slope of a roof. For example, a roof with a pitch of $\frac{1}{4}$ means the roof has 1 foot of vertical rise for every 4 feet of horizontal distance. The figure below shows a 13-foot-long roof with 5 feet of vertical rise and x feet of horizontal distance. What is the pitch of this roof?

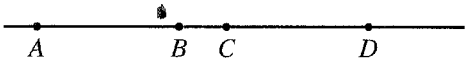
F. $\frac{1}{6}$
G. $\frac{5}{8}$
H. $\frac{5}{12}$
J. $\frac{5}{14}$
K. $\frac{5}{18}$



21. Given that $x \leq 2$ and $x + y \geq 4$, what is the LEAST value that y can have?

A. −6
B. −2
C. 0
D. 2
E. 6

22. As shown below, A, B, C, and D are collinear, with B between A and C and with C between B and D. Given $AC = BD = 12$ cm and given $BC = 3$ cm, what is AD, in centimeters?



F. 9
G. 15
H. 18
J. 21
K. 27

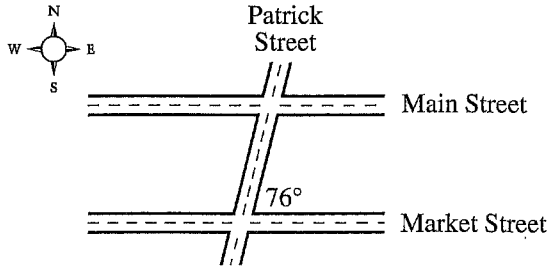
23. Keanu bought a new laptop computer and paid a discount price that was 20% less than the $1,000 list price. He also paid tax on the laptop equal to 6% of the discount price. What is the total amount Keanu paid for the laptop computer?

A. $752
B. $806
C. $848
D. $860
E. $986

DO YOUR FIGURING HERE.

24. In Middletown, Main Street and Market Street are parallel to each other. Patrick Street intersects Market Street to form a 76° angle at the northeast corner, as shown in the figure below. What is the measure of the angle formed at the southeast corner of Main Street and Patrick Street?

(Note: Each street is straight and has the same uniform width.)



F. 76°
G. 90°
H. 104°
J. 142°
K. 152°

25. Of the 900 students enrolled at Sierra Elementary School, 45% live south of Highway R. Of the students who live south of Highway R, 20% do NOT ride the bus to school. How many students who live south of Highway R ride the bus to school?

A. 81
B. 180
C. 324
D. 585
E. 720

26. Which of the following equations represents the line in the standard (x,y) coordinate plane that passes through $(2,-3)$ and has a slope of $-\frac{1}{2}$?

F. $y = -2x + 1$

G. $y = -\frac{1}{2}x - 2$

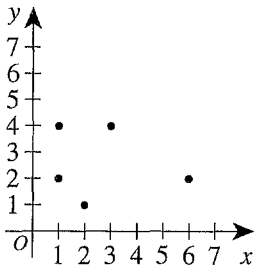
H. $y = -\frac{1}{2}x + 4$

J. $y = \frac{1}{2}x - 4$

K. $y = 2x - 7$

DO YOUR FIGURING HERE.

27. The entire graph of the relation R of the ordered pairs (x,y) is shown in the standard (x,y) coordinate plane below. One of the following sets is the domain of the relation R. Which set is it?



A. {1, 2, 4}
B. {1, 2, 3, 4}
C. {1, 2, 3, 6}
D. {1, 2, 4, 6}
E. {1, 2, 3, 4, 5, 6}

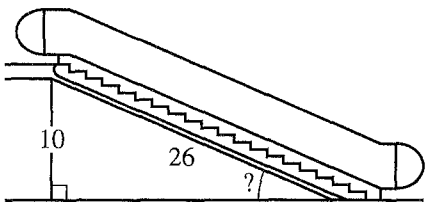
28. On Friday night, the Morrison family set up camp in the Ocala National Forest. On Saturday morning they hiked to a wilderness area 3 miles due north and 4 miles due east of their campsite. The elevation of the wilderness area is the same as the elevation of the campsite. To the nearest 0.1 mile, what is the straight-line distance from the wilderness area to the Morrisons' campsite?

F. 3.5
G. 3.7
H. 5.0
J. 5.5
K. 7.0

29. What positive number when divided by its reciprocal has a result of $\frac{4}{25}$?

A. $\frac{2}{5}$
B. $\frac{2}{25}$
C. $\frac{5}{2}$
D. $\frac{8}{25}$
E. $\frac{25}{8}$

30. The base of an escalator in a store is 26 meters long and has a vertical lift of 10 meters as shown below. Which of the following expressions is closest to the angle of inclination between the base of the escalator and the horizontal floor?

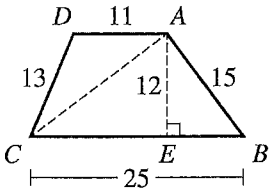


F. $\sin^{-1}\left(\frac{10}{26}\right)$
G. $\sin^{-1}\left(\frac{26}{10}\right)$
H. $\cos^{-1}\left(\frac{10}{26}\right)$
J. $\tan^{-1}\left(\frac{10}{26}\right)$
K. $\tan^{-1}\left(\frac{26}{10}\right)$

DO YOUR FIGURING HERE.

Use the following information to answer questions 31–33.

In the figure shown below, trapezoid $ABCD$ is formed by $\triangle ABC$ and $\triangle ACD$. The lengths are given in inches.



31. What is the area of $\triangle ABC$, in square inches?

A. 64
B. 66
C. 90
D. 132
E. 150

32. Which of the following ratios is equal to $\cos \angle B$?
(Note: FG denotes the length of $\overline{FG}$.)

F. $\frac{AC}{AB}$
G. $\frac{AC}{BC}$
H. $\frac{AE}{AB}$
J. $\frac{AE}{BE}$
K. $\frac{BE}{AB}$

33. Suppose $ABCD$ is placed in the standard (x,y) coordinate plane such that C is at $(0,0)$, B is at $(25,0)$, and A and D have positive x- and y-coordinates. What is the x-coordinate of D ?

A. 1
B. 2
C. 5
D. 12
E. 14

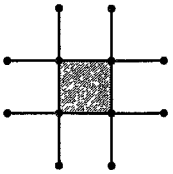
---

34. A family will rent a picnic shelter for \$200 for a reunion. The cost of the shelter will be distributed equally among the people who plan to attend. The current cost per person will decrease by \$1 if 10 more people plan to attend the reunion. How many people are currently planning to attend the reunion?

F. 10
G. 20
H. 40
J. 50
K. 63

DO YOUR FIGURING HERE.

35. The figure below shows 12 congruent line segments, each determined by a pair of adjacent points. The sum of the lengths of the 12 line segments is 36 centimeters. Each intersection of 4 of the line segments forms 4 right angles. What is the area, in square centimeters, of the shaded region?



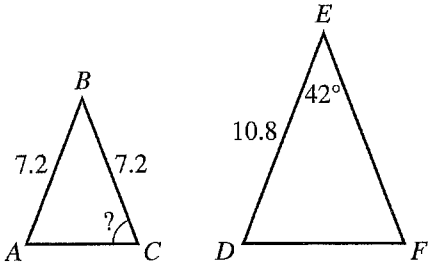
A. 4
B. 6
C. 9
D. 12
E. 16

36. What is the value of b in the solution of the system of equations below?

$$6a + 3b = 12$$
$$-2a + b = -8$$

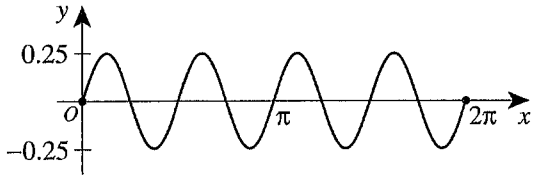
F. −2
G. 1
H. 3
J. 4
K. 10

37. In the figure shown below, $\triangle ABC \sim \triangle DEF$, sides $\overline{AB}$ and $\overline{BC}$ are each 7.2 cm long, side $\overline{DE}$ is 10.8 cm long, and the measure of $\angle E$ is 42°. What is the measure of $\angle C$?



A. 42°
B. 46°
C. 60°
D. 63°
E. 69°

38. The function $f(x) = 0.25 \sin(4x)$ is graphed below for $0 \le x \le 2\pi$. What is the period of the function?



F. $\frac{\pi}{2}$

G. $\frac{\pi}{4}$

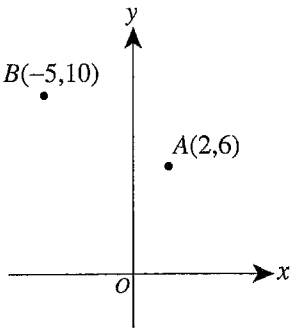
H. $\frac{\pi}{8}$

J. π

K. 2π

DO YOUR FIGURING HERE.

39. Point A lies at (2,6) and point B lies at (−5,10) in the standard (x,y) coordinate plane below. What is the length, in coordinate units, of $\overline{AB}$?



A. $\sqrt{40}$
B. $\sqrt{65}$
C. $\sqrt{125}$
D. 13
E. 17

40. Each student's project in a history seminar is given a point score by the teacher and by each of the other students in the seminar. A student's project grade, g, is determined by the formula $g = \frac{3t+s}{3+n}$, where t is the score the teacher gives, s is the sum of the scores the students give, and n is the number of students in the seminar. What is t in terms of g, s, and n ?

F. $t = g - n - s$

G. $t = gn + g - s$

H. $t = \frac{3gn - s}{9}$

J. $t = \frac{gn - s}{3}$

K. $t = \frac{3g + gn - s}{3}$

41. For all $x \neq -2$, which of the following expressions is equal to $\frac{x^2+5x+6}{x+2} + x + 5$?

A. $x + 8$

B. $2x + 8$

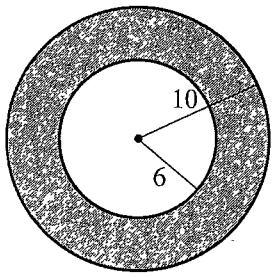
C. $x^2 + 8x + 15$

D. $\frac{2x+8}{x+2}$

E. $\frac{x^2+6x+11}{x+2}$

DO YOUR FIGURING HERE.

42. Two concentric circles are shown below. The radius of the larger circle is 10 feet and the radius of the smaller circle is 6 feet. What is the area, in square feet, of the shaded region bounded by the circles?



F. 8π
G. 16π
H. 36π
J. 64π
K. 100π

43. For $i = \sqrt{-1}$, $(1 + 2i)^2 = ?$

A. $-3 + 4i$
B. $2 + 2i$
C. $2 + 4i$
D. -4
E. -3

44. A box contains a combination of solid-colored tickets: $\frac{1}{10}$ of the tickets are green, $\frac{1}{2}$ are red, $\frac{1}{4}$ are blue, and the remaining 30 tickets are white. How many blue tickets are in the box?

F. 10
G. 20
H. 50
J. 100
K. 200

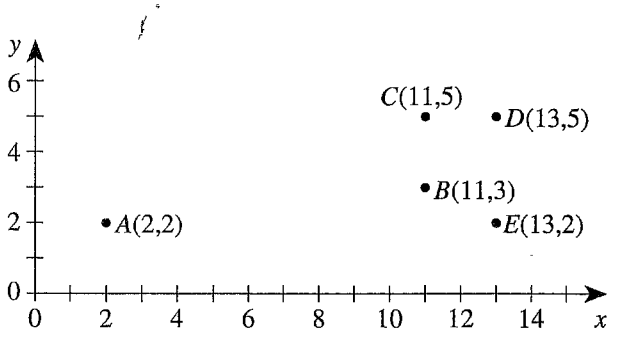
45. Which of the following expressions is the greatest monomial factor of $80x^3y + 48x^2y^2$?

A. $16x^2y$
B. $16x^3y^2$
C. $16x^5y^3$
D. $240x^3y^2$
E. $240x^5y^3$

DO YOUR FIGURING HERE.

Use the following information to answer questions 46–48.

The points graphed in the standard (x,y) coordinate plane below show the positions of 5 stars in a plane relative to a point represented by the origin, where each coordinate unit equals 1 light-year. A *light-year* is the distance that light travels in 1 year, and 1 light-year $\approx 5.9 \times 10^{12}$ miles. The distance from Star A to Star D is approximately 11.4 light-years. Star A has a mass of 3 solar masses; and Stars B, C, D, and E each have a mass of 1 solar mass.



46. Because Stars B, C, D, and E have the same mass, the position determined by the average of the x-coordinates and the average of the y-coordinates of those stars approximates the center of mass of those 4 stars. What are the coordinates of this position?

F. $\left(10,3\frac{1}{3}\right)$

G. $\left(10,3\frac{2}{5}\right)$

H. $\left(10,3\frac{3}{4}\right)$

J. $\left(12,3\frac{1}{3}\right)$

K. $\left(12,3\frac{3}{4}\right)$

47. What is the tangent of the angle formed by $\overrightarrow{CD}$ and $\overrightarrow{CE}$ in the graph?

A. $\frac{2}{\sqrt{13}}$

B. $\frac{3}{\sqrt{13}}$

C. $\frac{2}{3}$

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

E. $\frac{5}{2}$

DO YOUR FIGURING HERE.

48. Which of the following values is closest to the number of miles between Stars A and D ?

F. 2.0×10^{10}
G. 5.2×10^{11}
H. 1.9×10^{12}
J. 6.7×10^{13}
K. 8.6×10^{21}

---

49. In the standard (x,y) coordinate plane, for what value(s) of x, if any, is there NO value of y such that (x,y) is on the graph of $y = \frac{x-3}{(x+3)(x+2)(x-2)}$?

A. -3, -2, and 2 only
B. -2, 2, and 3 only
C. -3 only
D. 3 only
E. There are no such values of x.

50. Which of the following number properties is illustrated in the statement below?

$$3 + (5 + 4) = (5 + 4) + 3$$

F. Associative: $a + (b + c) = (a + b) + c$
G. Commutative: $a + b = b + a$
H. Distributive: $a(b + c) = ab + ac$
J. Identity: $a + 0 = a$
K. Inverse: $a + (-a) = 0$

51. The volume of a right circular cone with radius r and height h is $\frac{1}{3}\pi r^2 h$, where r and h have the same unit of measure. Cones A and B are both right circular cones. The radius of Cone B is 2 times the radius of Cone A. Cone B's height is $\frac{1}{2}$ Cone A's height. Compared to the volume of Cone A, the volume of Cone B is:

A. the same.

B. $\frac{1}{2}$ as great.

C. $\frac{2}{3}$ as great.

D. 2 times as great.

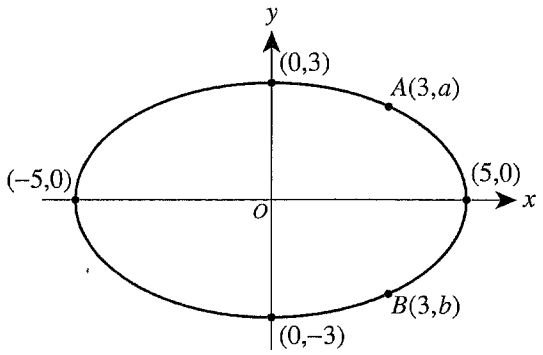
E. 4 times as great.

DO YOUR FIGURING HERE.

52. From point A outside a circle and in the same plane as the circle, 2 rays are drawn tangent to the circle with the points of tangency labeled B and C, respectively. Segment $\overline{BC}$ is then drawn to form $\triangle ABC$. If $\angle A$ measures 70°, what is the measure of $\angle ABC$?

F. 70°
G. 55°
H. 40°
J. 35°
K. Cannot be determined from the given information

53. Graphed in the standard (x,y) coordinate plane below is an ellipse. The center of the ellipse is (0,0), and points (−5,0), (0,3), (5,0), (0,−3), $A(3,a)$, and $B(3,b)$ lie on the ellipse. What is the distance, in coordinate units, from A to B ?



A. 2.4
B. 3
C. 4
D. 4.8
E. 6

54. Which of the following lists of numbers could be the side lengths, in inches, of a triangle?

F. 1, 2, 3
G. 2, 5, 7
H. 3, 7, 11
J. 4, 9, 16
K. 5, 8, 10

55. Carrie and Manuel are side by side when they begin to run at the same time in the same direction around a track. Carrie runs at a constant rate of 30 seconds per lap, while Manuel runs at a constant rate of 50 seconds per lap. How many seconds after beginning to run will Carrie have run exactly 1 more lap than Manuel?

A. 20
B. 40
C. 75
D. 80
E. 125

56. If a is a positive even integer and b is a positive odd integer, then $[(-3)(+3)]^{ab}$ is:

F. positive and even.
G. positive and odd.
H. zero.
J. negative and even.
K. negative and odd.

DO YOUR FIGURING HERE.

57. Consider the fractions $\frac{1}{a}$, $\frac{1}{b}$, and $\frac{1}{c}$, where a and b are distinct prime numbers greater than 3 and $c = 3a$. Suppose that $a \cdot b \cdot c$ is used as the common denominator when finding the sum of these fractions. In order for the sum to be in lowest terms, its numerator and denominator must be reduced by a factor of which of the following?

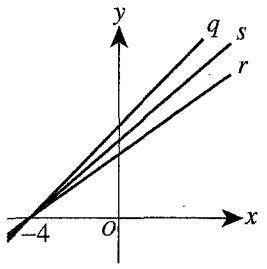
A. 3
B. a
C. b
D. c
E. ab

58. If x and a are positive rational numbers such that $x^{2a} = 3$, then $x^{6a} = ?$

F. 6
G. 9
H. 12
J. 18
K. 27

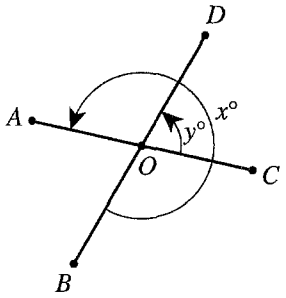
59. In the standard (x,y) coordinate plane below, lines q, r, and s all have an x-intercept of -4. The slope of line q is 1, the slope of line r is $\frac{2}{3}$, and the slope of line s is the average of the slopes of lines q and r. What is the y-intercept of line s ?

A. $\frac{5}{6}$
B. $\frac{8}{3}$
C. 3
D. $\frac{10}{3}$
E. 4



60. As shown in the figure below, $\overline{AC}$ and $\overline{BD}$ intersect at O. Given that $180° < x° < 360°$ and that $x = 4y$, what is the value of y ?

F. 54
G. 60
H. 67.5
J. 72
K. 75



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 several passages in this test. Each passage is accompanied 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

LITERARY NARRATIVE: This passage is adapted from the memoir "My Glove" by Katherine A. Powers (©2008 by the Creative Nonfiction Foundation).

My oldest personal possession is my baseball glove, which I bought for eight dollars at Woolworth's in St. Cloud, Minnesota, in 1960, when I was almost thirteen. It was a "modern" glove in that it had shape, unlike the ancient specimens I came across in my grandfather's house that looked as if they'd been fashioned for trolls and exhumed from a bog. My glove had—has, I should say—a good deal of rawhide lacing. Its metal eyelets number twenty-five. The strap's black nylon label boasts a "W," which might stand for "Wilson," except it doesn't. The glove's inside surface sports another beguiling "W," as well as "Style 2681" and "[illegible] Set Pocket." I can't remember what sort of "Set Pocket" it was. Deep, I'd say. The inscription has been flattened out of existence by almost fifty years of service.

I bought this wonderful thing secretly, because my father had met the few remarks I'd made about "thinking of getting a glove" with his rote response: "You don't want that." (Other things I "didn't want" were blue jeans, a bicycle, a penknife, a fishing pole, a permanent wave, and a pet of any sort.) A baseball glove? What would I do with it? Who would I play with? Boys at school? I was a girl. And what *was* I going to play with? Not a hardball: we were not having anything to do with hardballs. That's how people got their teeth knocked out and the next thing you knew there'd be a broken window and "I'll be out there doing my act with the putty knife."

For a week or so I fraternized with my new glove on the sly. Behind the closed door of the room I shared with my younger sister, I cradled my glove and pushed my face in it, inhaling the deep, fertile leather smell it pumped out. I kneaded it, shaped it, and slammed a ball—a brand-new baseball—in it. Outside the house, around the corner, out of sight, I found a clandestine battery mate, the wall of a brick college dormitory that had no windows on the lowest story. The glove activated all the baseball boilerplate I had amassed from incessant baseball-book reading. Confronting the wall, I flicked off the sign, looked in for another, slapped the glove against my thigh, wound up, and poured one in. Sometimes (if the wall was hitting) I cupped my knee with my glove, waiting for the batter to try to punch one through. I snagged the ball, pounced on it, speared it, whipped it home.

I walked around (out of sight of the house) with the glove tucked under my arm, wishing I could shove it in my back pocket like boys did in books, but of course my pants, when I was allowed to wear pants, had no pockets because my mother had made them. I wished I knew where to get neat's-foot oil, not available at Woolworth's, but no one I could confide in knew anything about that. Another thing I could not do, I might as well confess, was spit in my glove. I could direct the occasional spitting noise at the pocket, yes. But shoot a gob of spit right in there and work it in like you read about? No, I couldn't.

I brought the glove to school, placing it beside me on the old-fashioned bench seat, on top of my books—just like the boys did. In that distant day, or perhaps only in that parochial school, the boys and the girls were not allowed to play sports together at recess, and none of the girls had gloves. But we did play softball and my glove had no problem at all handling the larger sphere. It could handle anything.

Soon enough, unable to keep my love object to myself, I came clean with my parents. Fairly clean, at least: I kept the hardball under wraps, nestling a tennis ball into the glove's pocket in a prissily responsible manner. I told my father I thought I better tell him I'd gotten a baseball glove. It was a really good one. He massaged it with his thumbs, sort of churning them around in the glove. The leather seemed okay, he allowed, but he said he didn't see why the glove had to look the way it did. He whapped his fist in it a few times and then took it with both hands and bent it back and forth as if to reprimand it for the affectation of its deep pocket. He entered briefly into the subject, familiar to all baseball-book readers, of infielders sitting on their gloves to keep them flat so they could turn the ball over fast. I said I knew about that.

He said, "Is this the best you can do for a ball?" I told him that actually I had bought a baseball, but that I only used it against the side of the brick dormitory—you know the wall that doesn't have any windows low down you could accidentally hit. He said that's how you ruin a good ball, leather gets all nicked. I said that was true.

1. It can most reasonably be inferred from the passage that compared to what the narrator thought her father's reaction would be to her purchase of a baseball glove, his actual reaction is:
   - **A.** more angry and regretful.
   - **B.** less harsh and dismissive.
   - **C.** more blameful and stern.
   - **D.** less lighthearted and prideful.

2. In the final two paragraphs (lines 67–89), the predominant approach of the narrator as she responds to her father's pointers and anecdotes about baseball could best be described as:
   - **F.** honest and direct; she tells her father when he explains something that she already knows.
   - **G.** manipulative and self-serving; she pretends to be interested in her father's pointers so he'll be more likely to give her permission to play baseball.
   - **H.** helpful and instructive; she gently corrects her father's misconceptions about playing baseball.
   - **J.** defensive and bitter; she's offended when her father speaks as if he knows more about baseball than she does.

3. The narrator claims that the baseball glove she bought in 1960 was "modern" in that it had:
   - **A.** a fertile leather smell.
   - **B.** a black nylon label.
   - **C.** metal eyelets.
   - **D.** shape.

4. The passage most strongly supports that the narrator generally responded to her father's comment "You don't want that" (lines 19–20) with:
   - **F.** little, if any, surprise.
   - **G.** deep and vocal anger.
   - **H.** a feeling of pity for her father.
   - **J.** appreciation for her father's insight.

5. Based on the passage, which of the following statements represents one of the narrator's typical experiences with playing baseball or softball at school?
   - **A.** The narrator and a few girls who had their own gloves would play baseball on their own.
   - **B.** Sometimes the narrator would play baseball with the boys, but usually she would play softball with the girls, without her glove.
   - **C.** The narrator would play baseball with the boys, since any girl who had her own glove was allowed to play baseball with them.
   - **D.** The narrator would play softball with the girls, and she would be the only one to play with a glove of her own.

6. Which of the following statements, if spoken by the narrator, would best capture the sentiment of the narrator's comments in lines 76–79?
   - **F.** I could tell that my father wished that he had kept one of his baseball gloves.
   - **G.** It was as if my father were scolding my glove for its design.
   - **H.** My father bent my glove too forcefully, just to make me mad.
   - **J.** My father didn't want to try out my glove, considering that he had seen much better ones.

7. Details in the passage suggest that the narrator's father considered a tennis ball to be:
   - **A.** the best choice for the narrator to use for practicing baseball, considering she was a girl.
   - **B.** a better choice than a hardball for first learning how to catch and quickly turn over a ball.
   - **C.** a less-than-ideal choice for practicing baseball, even for the narrator.
   - **D.** a less durable choice than a hardball for practicing pitches against a brick wall.

8. In the passage, the narrator describes a brick wall of a college dormitory as:
   - **F.** fraternizing with her glove.
   - **G.** flicking off the sign.
   - **H.** using baseball boilerplate.
   - **J.** being a clandestine battery mate.

9. The narrator explains that she didn't carry her baseball glove around in her back pocket for which of the following reasons?
   - **A.** She felt the action was crass, much like spitting in her glove.
   - **B.** Her homemade pants didn't have pockets.
   - **C.** She needed to hide her glove, since she hadn't told her parents about it yet.
   - **D.** Her glove didn't fit in her small back pocket.

10. The narrator characterizes herself as coming only "fairly clean" (line 68) with her parents because she:
    - **F.** didn't tell them right away about her glove.
    - **G.** had been using her sister's tennis balls to practice baseball.
    - **H.** didn't tell them at first that she owned a hardball.
    - **J.** had been practicing throwing a tennis ball against a dormitory wall.

Passage II

SOCIAL SCIENCE: This passage is adapted from the article "Model Behaviour" by *The Economist* (©2009 by The Economist Newspaper Limited).

The warmongering orcs depicted in the *Lord of the Rings* trilogy are evil, unpleasant creatures that leave death and destruction in their wake. But if you find yourself in a burning building a few years from now, they might just save your life. That is because the technology used to make hordes of these menacing, computer-generated monsters move convincingly on screen turns out to be just what is needed to predict how crowds of humans move around inside buildings.

The simulation of the behaviour of crowds of people and swarms of animals (not just mythological ones) is being applied to many unusual situations.

When the first film in the *Lord of the Rings* trilogy was released in 2001, much was made of its heavy reliance on computer-generated imagery. But what was perhaps most impressive were the epic battle scenes, which broke new ground in special effects by showing huge numbers of characters with an unprecedented degree of detail and realism. For this the trilogy's director, Peter Jackson, largely has Stephen Regelous to thank. Regelous is the founder of Massive Software, based in Auckland, New Zealand. His firm's software made it possible to generate as many as half a million virtual actors in a single shot, each behaving in an independent and plausible manner.

That is because every character was, in effect, given a brain, says Diane Holland, Massive's chief executive. Each one was modeled as a software "agent" with its own desires, needs and goals, and the ability to perceive the environment and respond to the immediate surroundings in a believable way. Any given orc, for example, could work out which other fighters on the battlefield were in its line of sight, and hence whether it should flee or attack. This produced far more realistic results than orchestrating the motions of the digital extras in a scripted, choreographed way.

Taking a similar approach is Dr. Demetri Terzopoulos, a computer scientist at the University of California in Los Angeles. He is using agents to simulate the behaviour of commuters passing through Pennsylvania Station in New York. His agents have memory, but they also have a sense of time and the ability to plan ahead. An agent entering the station will typically seek out the ticket office, stand in line to buy a ticket, and then perhaps kill some time watching a street performer if he has a few minutes before his train arrives, says Terzopoulos. If he is running late, by contrast, he may try to push his way to the front of the ticket line before sprinting for the platform.

Terzopoulos's research has shown that agents can simulate complex behaviours with great realism. Working with Qinxin Yu, a graduate student, Terzopoulos has modeled how people behave in public when someone collapses. People crowd around to help, and some agents will even remember if they recently saw a police officer nearby, and run to get help, he says. Such realism is useful in the development of automated closed-circuit television security systems. Using real cameras for such research would raise privacy concerns, so he is making agent simulations available instead to researchers who are training cameras to detect unusual behaviour. Another intriguing application is to help archaeologists study ancient ruins. Using a model of the Great Temple of Petra in Jordan, Terzopoulos has evaluated how it would have been used by the people who built it. He has concluded that the temple's capacity had previously been greatly overestimated.

Agents need not even represent humans. Massive has been working with BMT Asia Pacific, a marine consultancy, to model the behaviour of the thousands of ships operating in Hong Kong harbour. This involves simulating the behaviour of the ships themselves, each of which may be under the control of several people, says Richard Colwill of BMT. And rather than assuming that everyone will adhere to the maritime traffic code, which determines who has right of way, it can incorporate acts of bravado and incompetence. "We get about 150 collisions each year in Hong Kong," says Colwill. His firm plans to use the software to determine which traffic-management strategies will be least disruptive during the construction of an immersed road tunnel that will need to be lowered into the harbour.

As agent software becomes better able to capture complex real-world behaviour, other uses for it are sure to emerge. Indeed, this could soon become a crowded field.

11. The main idea of the passage is that:

- **A.** using computer-generated simulations in movies has both advantages and disadvantages.
- **B.** the *Lord of the Rings* trilogy made cinematic history with its computer-generated simulations.
- **C.** computer-generated simulations can be applied to predict behavior in a number of situations.
- **D.** Terzopoulos has expanded the field of computer-generated simulation beyond its uses in film.

12. In the passage, the author's attitude toward computer-generated simulations can best be described as:

- **F.** fearful of their negative consequences.
- **G.** optimistic about their potential uses.
- **H.** boastful about their success.
- **J.** skeptical of their accuracy.

13. Which of the following statements best describes the organization of the passage?

A. A problem with computer-generated simulations is identified, and several solutions are proposed.
B. An example of computer-generated simulation is followed by a generalization and more examples.
C. Summaries of the work of various computer researchers are presented in chronological order.
D. A claim about the efficacy of computer-generated simulations is followed by attempts to refute it.

14. Which of the following questions is directly answered in the passage?

F. What behaviors can't be modeled by computer-generated simulations?
G. What is the intended use for the software being developed by Massive Software and BMT Asia Pacific?
H. How do researchers give a brain to a computerized character?
J. How do programmers decide which characteristics and actions to include in their software?

15. The main purpose of the seventh paragraph (lines 68–82) is to:

A. illustrate the dangers of predicting crowd behavior through computer simulation.
B. summarize Hong Kong's lengthy history of using computer simulations of crowd behavior to direct harbor traffic.
C. contrast BMT Asia Pacific's computer simulation of crowd behavior with actual crowd behavior.
D. extend the discussion of using computer simulations to predict crowd behavior to situations involving inanimate objects.

16. According to the passage, the director of the *Lord of the Rings* trilogy owes thanks to which of the following people?

F. Demetri Terzopoulos
G. Diane Holland
H. Stephen Regelous
J. Richard Colwill

17. The passage indicates that in relation to Terzopoulos's work in computer-generated simulations, Massive Software's work is:

A. more experimental in nature.
B. less often used in films.
C. more realistic in films.
D. similar in approach.

18. The passage indicates that Terzopoulos accounted for which of the following situations in his study of commuter behavior at Pennsylvania Station?

F. A train arriving behind schedule
G. A train being full
H. A commuter getting lost
J. A commuter running late

19. According to the passage, using computer simulations instead of cameras to study public behavior is preferable due to concerns about:

A. privacy.
B. cost.
C. labor.
D. safety.

20. In lines 85–86, the phrase *a crowded field* most nearly refers to:

F. the research and development of agent software to simulate real-world situations.
G. a harbor in need of traffic-management strategies.
H. an open area where real-world crowd behavior is studied.
J. a filming location for the *Lord of the Rings* trilogy.

3

Passage III

HUMANITIES: Passage A is adapted from the article "America, America: Two Plays about the Country's Complexities" by Hilton Als (©2010 by Condé Nast). Passage B is adapted from the article "O.K. Chorale: An English Take on Rodgers and Hammerstein" by John Lahr (©2002 by Condé Nast).

Passage A by Hilton Als

Molly Smith, the artistic director of Arena Stage in Washington, D.C., directed the company's current revival of Richard Rodgers and Oscar Hammerstein II's first musical collaboration, *Oklahoma!* Smith's production is extraordinary in thought and execution and utterly satisfying on so many levels. Smith's conceit is entirely original: instead of taking this nearly perfect show at face value, she has dug back into the history of Oklahoma itself. Sold to the United States as part of the 1803 Louisiana Purchase, Oklahoma was opened for settlement in 1889. By the time it became a state, eighteen years later, the Territory, as it was known, was populated by white settlers from other parts of the country, as well as a number of emancipated slaves and forcibly resettled Native Americans, who braved drought, harsh economic times, and often brutal and complicated racial interactions to make the Territory their home.

Smith doesn't explain any of this in her production—who would rewrite Rodgers and Hammerstein?—but it shows in her casting. As in the original Broadway production, which opened in 1943, there are no stars onstage. Smith raises the roof not so much with "color-blind" casting as by paying attention to how the characters might have looked if they were actual Oklahomans of the period. The wonderful Aunt Eller (E. Faye Butler) and her niece, Laurey (the buoyant and complex Eleasha Gamble), are black, while Laurey's suitor, Curly (the outstanding Nicholas Rodriguez), could be taken for Native American. This deviation from standard casting brings a new force to the musical—which itself changed musicals forever by introducing plot and narrative development into what had previously been considered a frivolous genre. Altogether, the actors seem relieved to be not segregated in black or white shows but together in an utterly American one.

The afternoon I saw *Oklahoma!*, it was clear that the members of the audience didn't feel overwhelmed by a "classic"; instead, they were as moved as I was by the humility and hope that Smith and her company brought to the show.

Passage B by John Lahr

Because of *Oklahoma!*'s enormous subsequent influence, its novelties—no opening ensemble number, chorus girls in long dresses, dancers who don't appear until late in the first act, the integrated score—have lost some of their original lustre. In the Royal National Theatre's three-hour revival (now at New York's Gershwin Theatre), directed by Trevor Nunn, the show's heady mixture of wonder and ambition is best captured in its production values. Anthony Ward's picturesque set immediately submerges us in a gorgeous world of folk innocence.

In the making of musicals, Nunn is a four-star general. His stage pictures spill over with meticulous, articulate energy. But technique, which can make the show work, is not enough to make it wonderful. Here, I think, the issue of cultural chemistry comes into play. American optimism has its root in abundance and in the vastness of the land that *Oklahoma!* celebrates. Britain, on the other hand, is an island the size of Utah. Its culture is one of scarcity; its preferred idiom is irony—a language of limits. In the retranslation of an award-winning English version of an American classic to its natural Broadway habitat, an emotional lopsidedness has become evident, particularly in the casting.

The linchpins of the show are Aunt Eller, played by the gritty, droll comedienne Andrea Martin, who is American and nails it, and the feisty lovelorn Laurey, played by the fine-voiced, demure Josefina Gabrielle, who is English and doesn't. It's not talent that's at issue here—Gabrielle is the first Laurey to dance her own Dream Ballet—but national character. The show is about Western women, and Gabrielle's Laurey lacks that very American sense of gumption, a combination of buoyancy and backbone.

In his memoir, "Musical Stages," Richard Rodgers averred that the show's opening scene—a cowboy strolling onto the stage where a single woman is churning butter—announced to the audience, "Watch out! This is a different kind of musical." He went on to say, "Everything in the production was made to conform to the simple open-air spirit of the story; this was essential, and certainly a rarity in the musical theatre." Trevor Nunn's version of *Oklahoma!* preserves the crowd-pleasing commercial zest of the original; but on the evening I saw the show only a handful of audience members stood to applaud the hardworking cast, confirming my suspicion that the open-air spirit of the evening had been slowly leached away.

Questions 21–23 ask about Passage A.

21. The information in lines 9–18 serves primarily to:

- **A.** explain events in the order they are narrated in *Oklahoma!*
- **B.** note an aspect of the original production of *Oklahoma!* that is missing from Smith's.
- **C.** suggest that the creators of *Oklahoma!* failed to grasp the magnitude of their subject matter.
- **D.** summarize the history that Smith has likely considered in staging *Oklahoma!*

22. Based on the passage, the statement "there are no stars onstage" (lines 22–23) most likely means the:

- **F.** acting is mediocre.
- **G.** power of the production does not rely on the celebrity status of the cast members.
- **H.** actors in the scenes have small roles.
- **J.** script is a poor match for the talents of the actors.

23. The author of Passage A's overall response to the performance of *Oklahoma!* that is the subject of his review is one of:

- **A.** mild disappointment.
- **B.** profound respect.
- **C.** tentative approval.
- **D.** confusion.

Questions 24–27 ask about Passage B.

24. The information between the dashes in lines 43–45 serves as examples of:

- **F.** shortcomings in the British production of *Oklahoma!*
- **G.** differences between two productions of *Oklahoma!*
- **H.** the passage author's favorite elements of *Oklahoma!*
- **J.** elements of the original production of *Oklahoma!*

25. The author of Passage B would most likely agree with which of the following statements about Nunn?

- **A.** His reputation as a mediocre director will be changed by his production of *Oklahoma!*
- **B.** His production of *Oklahoma!* is typical of his work in the way it celebrates the simple life.
- **C.** He is a major figure in the world of musicals, and his production of *Oklahoma!* is flawed.
- **D.** He is a genius at finding new talent for roles that have traditionally been held by stars.

26. The reference to Utah in the discussion of the English version of a uniquely American play primarily serves to:

- **F.** conjure up a state with a history of settlement similar to Oklahoma's.
- **G.** suggest how small Britain is compared to the United States.
- **H.** conjure up a wide-open landscape.
- **J.** suggest that the story told in *Oklahoma!* pertains to other states.

27. To the author of Passage B, the actor who plays Laurey represents:

- **A.** why a British production can't capture the essence of a musical concerned with the national character of the United States.
- **B.** the universal appeal of *Oklahoma!* as a musical that celebrates a diversity of national identities.
- **C.** the idea that *Oklahoma!* lends itself to endless reinvention.
- **D.** the contrasts within an individual character that reflect the larger societal contrasts explored in *Oklahoma!*

Questions 28–30 ask about both passages.

28. A shared element of these two reviews of *Oklahoma!* is the:

- **F.** assertion that casting can play a crucial role in determining the show's success.
- **G.** focus on how a theater professional from overseas interprets a classic of American culture.
- **H.** eagerness to point out that the show succeeded in spite of minor disappointments.
- **J.** opinion that set design can mask some shortcomings of the show.

29. It is most reasonable to infer that the authors of Passage A and Passage B would agree that for a director to reinterpret *Oklahoma!* for today's audiences is an act of:

- **A.** courage, because the musical is both familiar and dated in ways that limit opportunities for making a significant positive impression on audiences.
- **B.** foolishness, because the original is so powerful that attempts to improve upon it amount to meddling with something that isn't broken.
- **C.** arrogance, because it suggests that audiences aren't able on their own to relate a piece from an earlier era to their own lives.
- **D.** respect, because doing so acknowledges that the play deserves a richer treatment than its original cast members were able to accomplish.

30. Unlike the last paragraph of Passage B, the last paragraph of Passage A:

- **F.** focuses on the audience's reaction to the production.
- **G.** bluntly expresses the author's disappointment in the production.
- **H.** minimizes the director's role in the production's outcome.
- **J.** conveys appreciation for the director and cast of the production.

Passage IV

NATURAL SCIENCE: This passage is adapted from the article "Not Dead Yet: A Dying Star Is Caught Flaring Briefly Back to Life" by Charles Liu (©2005 by Natural History Magazine, Inc.).

About a billion years before a sunlike star "dies," or stops generating energy via nuclear fusion, it becomes a red giant, growing dramatically to a hundred times its original diameter. Then, as the red-giant phase ends, the star blows off its outer layers, giving rise to an expanding gas cloud called a planetary nebula. The planetary nebula, in turn, swells in size and drops in density for at most another 100,000 years, exposing the remaining stellar core at its center. That core becomes a white dwarf—the most common celestial cadaver visible in the sky. The white dwarf usually radiates its leftover heat into space for billions of years, and it slowly fades to black.

Some soon-to-be white dwarfs, however, seem to heed the counsel of poet Dylan Thomas: "Do not go gentle into that good night." According to the theory of stellar evolution, the temperature in the stellar core can fluctuate wildly, and sometimes spikes as high as tens of millions of degrees. For a little while at least, the core may even flicker back into stellar life as a giant star, generating new energy with new flares of nuclear fusion.

Alas, such a giant can't last long, because the core is, in essence, running on fumes. Without a substantial fuel source to sustain fusion, a nuclear re-ignition of this kind runs out of gas within a few centuries, and the star heads back toward white dwarfhood. But during its brief return to fusion-powered life, its interaction with the surrounding cloud of gas creates a fascinating astronomical laboratory for the study of stellar and interstellar processes.

The star FG Sagittae, a highly variable star in the constellation Sagitta, seems to be a case in point. FG Sagittae lies at the heart of a planetary nebula called He 1-5. In the past thirty years the star's temperature has dropped from more than 30,000 degrees Fahrenheit to less than 10,000 degrees, though its brightness has changed erratically from year to year. As with an old, grease-choked diesel engine struggling to start back up, the star's efforts to restart nuclear fusion create puffs of thick smoke—carbon atoms coughed up from the fading stellar core. The smoke absorbs the star's radiating heat and periodically obscures the visible light it emits. To see through the haze and examine the goings-on near the star's surface, astronomers must look at its radiation in less obscured wavelengths, such as infrared light.

A research team led by Robert A. Gehrz of the University of Minnesota in Minneapolis has now done just that. Recently the team published the results of twenty years of monitoring the infrared properties of FG Sagittae with three telescopes equipped with infrared photometers—in effect, photon counters. One instrument is in Minnesota, one in Arizona, and one in Wyoming. Gehrz and his colleagues discovered that, though the star's overall brightness and temperature have changed dramatically through the years, carbon dust from the surface of FG Sagittae has been shining more or less steadily at a temperature of about 1,200 degrees F (650 degrees Celsius). That's roughly hot enough to melt aluminum, but substantially cooler than the core of any star undergoing active nuclear fusion. Gehrz and his colleagues conclude that, besides giving rise to clouds of obscuring gas, FG Sagittae is powering a strong stellar wind peppered with this carbon dust. They think this dust has been glowing continuously for the past decade. On the basis of the measured amount of emitted infrared radiation, Gehrz's team estimates that the wind is carrying between 1.5 and 7.5 quadrillion (1.5 to 7.5×10^{15}) tons of stellar material away from FG Sagittae each second—or about eight to forty Earth masses each year.

Sooner rather than later the current burst of new nuclear fusion will cease, and the dusty stellar wind will cease. The stellar core, no longer obscured by a thick, dusty blanket, will turn once more into a hot white dwarf. If, as theoretical models predict, the stellar renaissance of FG Sagittae lasts a few hundred years, the wind will deposit thousands of Earth-masses' worth of carbon-rich matter into the star's surroundings. The carbon atoms, as they cool down, could become seeds for the buildup of interstellar dust grains—which, in turn, could seed the formation of asteroids, moons, planets, and perhaps eventually even life as we know it. Maybe the astronomers of the twenty-fourth or twenty-fifth century will look toward FG Sagittae and see, in its surroundings, the potential makings of a new and distant earth.

31. The passage indicates that one difference between a sunlike star and a dying star is that a sunlike star:

- **A.** has more fuel for nuclear fusion.
- **B.** has a larger planetary nebula.
- **C.** is more often studied with a photometer.
- **D.** has more dramatic fluctuations in brightness.

32. The main purpose of the first paragraph is to:

- **F.** describe how some stars flicker back to stellar life before becoming white dwarfs.
- **G.** use FG Sagittae as an example of a star currently heading toward the white dwarf phase.
- **H.** explain the dying process of stars from the red giant phase through the white dwarf phase.
- **J.** contrast the longevity of a red giant with that of a white dwarf.

33. The author quotes a Dylan Thomas poem in lines 15–16 mainly to introduce the passage's point that:

- **A.** astronomers often feel nostalgic about the stars they have studied.
- **B.** a dying star is sometimes a danger to the stellar matter around it.
- **C.** scientists often refer to white dwarfs as being in a gentle stage of a star's life.
- **D.** some stars flare back into life before fading to black.

34. According to the passage, one reason the brightness of FG Sagittae has appeared to change erratically from year to year is that:

- **F.** the star's light is periodically blocked by another stellar body.
- **G.** smoke sometimes obscures the star's light.
- **H.** wind is distorting the planetary nebula.
- **J.** white dwarfs don't produce visible light.

35. According to the passage, compared to the temperature of the core of a star undergoing nuclear fusion, the temperature of the carbon dust from the surface of FG Sagittae is:

- **A.** about the same.
- **B.** slightly cooler.
- **C.** much cooler.
- **D.** much hotter.

36. The passage states that when studying the wind powered by FG Sagittae, Gehrz's team used the measured amount of emitted infrared radiation to estimate the:

- **F.** likelihood of stellar material produced by FG Sagittae affecting Earth's mass.
- **G.** probability of FG Sagittae becoming a red giant by the twenty-fifth century.
- **H.** reason for the decrease in the amount of dust generated by FG Sagittae.
- **J.** amount of stellar material carried away from FG Sagittae per second.

37. Based on the passage, FG Sagittae's efforts to restart nuclear fusion would best be characterized as:

- **A.** smooth.
- **B.** labored.
- **C.** sudden.
- **D.** impossible.

38. According to the passage, Gehrz's research team used infrared light to study FG Sagittae because infrared light allowed the team to:

- **F.** identify the individual gases that compose the planetary nebula.
- **G.** calculate the exact number of years the star will spend in the white dwarf phase.
- **H.** view the activity close to the surface of FG Sagittae.
- **J.** determine the precise location of FG Sagittae in He 1-5.

39. At the end of the passage, the author muses that the current regeneration of FG Sagittae may eventually result in:

- **A.** the formation of new life in the universe.
- **B.** FG Sagittae's return to the beginning of its life cycle.
- **C.** the death of a distant star.
- **D.** the onset of the red giant phase in a neighboring star.

40. According to the passage, if theoretical models are accurate, the stellar renaissance of FG Sagittae will last for a period of time best described as:

- **F.** a few hundred years.
- **G.** between 10,000 and 30,000 years.
- **H.** approximately 100,000 years.
- **J.** billions of 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 several 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 I

Earth's climate is affected by the *total solar irradiance* (TSI), the rate at which energy from solar radiation is received by Earth per unit area of the surface. In 2000, sunspot records were used to estimate the TSI at a particular Indian Ocean location over the past 1,100 years. Ocean floor sediment that had been deposited at the location over that same period was analyzed for carbon (C), nitrogen (N), and aluminum (Al). The percents by mass of C, N, and Al, respectively, indicated the intensity of monsoons, ocean productivity, and rate of continental erosion (3 measures of climate) over the period. The results are shown in the figure.

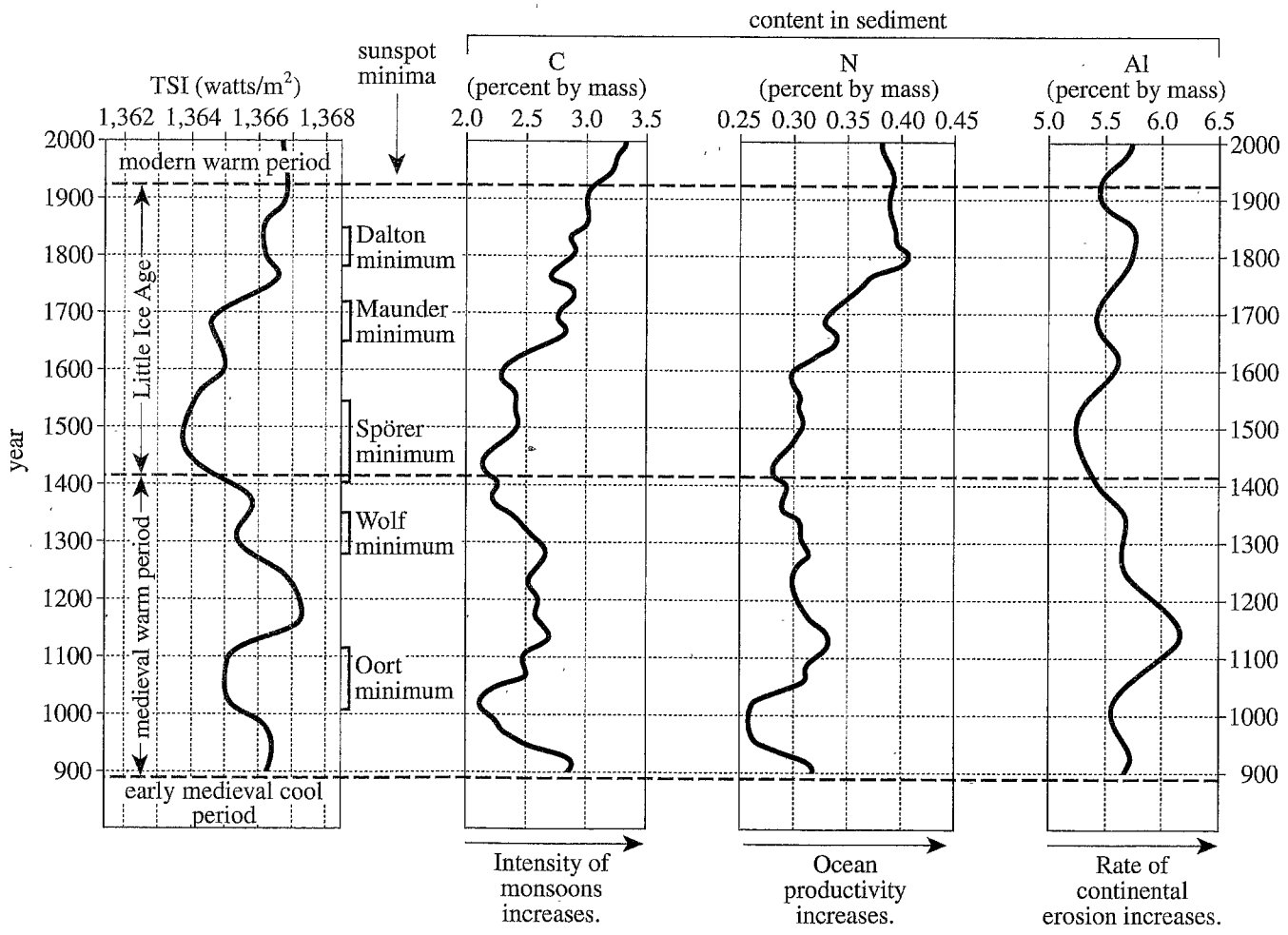


Figure adapted from R. Agnihotri et al., "Evidence for Solar Forcing on the Indian Monsoon During the Last Millenium." ©2002 by Elsevier B.V.

1. The respective percents by mass of C, N, and Al at the Indian Ocean location in the year 1500 were closest to which of the following?

	C	N	Al
A.	2.2	0.31	5.0
B.	2.2	0.33	5.2
C.	2.4	0.31	5.2
D.	2.4	0.33	5.4

2. The figure indicates that the greatest increase in percent by mass of N at the Indian Ocean location occurred over which of the following 100-year periods?

F. 1200 to 1300
G. 1400 to 1500
H. 1600 to 1700
J. 1700 to 1800

3. Based on the figure, at the Indian Ocean location, were monsoons, on average, more intense during the Dalton minimum or during the Spörer minimum, and was ocean productivity, on average, greater during the Dalton minimum or during the Spörer minimum?

	more intense monsoons	greater ocean productivity
A.	Dalton minimum	Dalton minimum
B.	Dalton minimum	Spörer minimum
C.	Spörer minimum	Dalton minimum
D.	Spörer minimum	Spörer minimum

4. During the Little Ice Age, the greatest TSI value at the Indian Ocean location was closest to which of the following?

F. 1,365 watts/m^2
G. 1,366 watts/m^2
H. 1,367 watts/m^2
J. 1,368 watts/m^2

5. Does the figure indicate that the rate of continental erosion in the region of the Indian Ocean location was greater in the year 1150 or in the year 1250 ?

A. 1150, because the percent by mass of N was greater in 1150 than in 1250.
B. 1150, because the percent by mass of Al was greater in 1150 than in 1250.
C. 1250, because the percent by mass of N was greater in 1250 than in 1150.
D. 1250, because the percent by mass of Al was greater in 1250 than in 1150.

6. Over the 1,100-year period, the total solar irradiance at the Indian Ocean location was *least* during which sunspot minimum?

F. Maunder minimum
G. Spörer minimum
H. Wolf minimum
J. Oort minimum

Passage II

Seven 4 g mixtures of glycerol and agar were prepared, each having a different percent glycerol by mass. A plastic film was made from each mixture; all the films were rectangular and had the same dimensions.

Each film was clamped and stretched (see Figure 1) at 25°C until it broke.

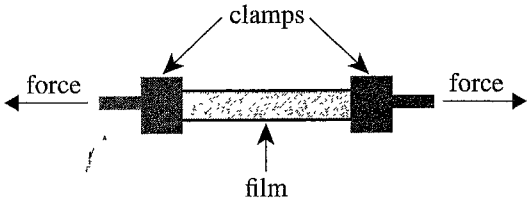


Figure 1

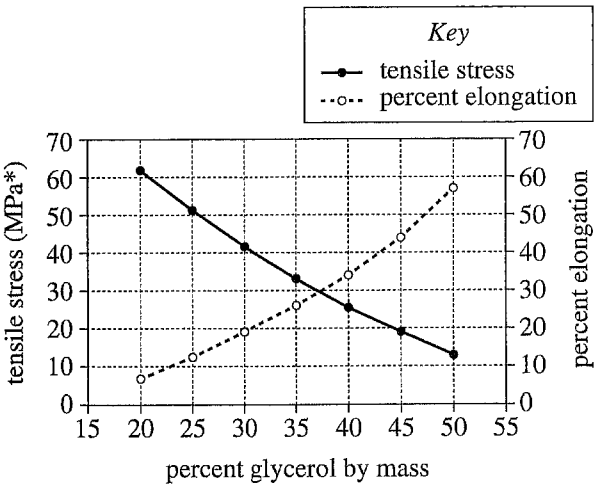
Three properties of the film were determined:

- *Tensile stress*, the force applied per unit area of the film as the film broke
- *Percent elongation*, given by:

$$\frac{\text{final film length} - \text{initial film length}}{\text{initial film length}} \times 100$$

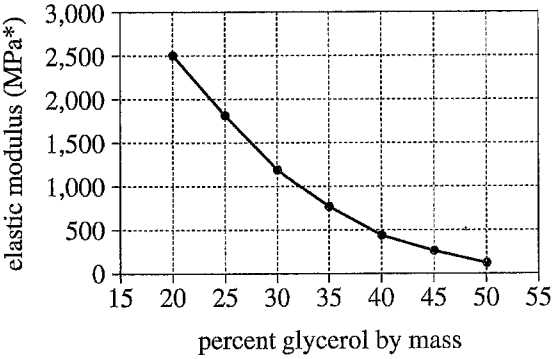
- *Elastic modulus*, a measure of the rigidity of the film

The results for all 7 films are shown in Figures 2 and 3.



*megapascals; 1 MPa = 10^6 newtons per meter squared (N/m^2)

Figure 2



*megapascals

Figure 3

Figures adapted from Eugene S. Stevens et al., "Polymer–Plastics Experiments for the Chemistry Curriculum." ©2006 by Division of Chemical Education, Inc., American Chemical Society.

7. A student predicted that as the percent glycerol by mass increased from 20% to 45%, the elastic modulus would decrease by more than 2,000 MPa. Do the results shown in Figure 3 support this claim?

   A. No; the elastic modulus increased from about 250 MPa to 2,500 MPa.
   B. No; the elastic modulus increased from about 1,200 MPa to 2,500 MPa.
   C. Yes; the elastic modulus decreased from 2,500 MPa to about 250 MPa.
   D. Yes; the elastic modulus decreased from 2,500 MPa to about 1,200 MPa.

8. Suppose a film made from a mixture that was 55% glycerol by mass had been tested. Based on Figure 2, the tensile stress of the film would most likely have been:

   F. less than 13 MPa.
   G. between 13 MPa and 19 MPa.
   H. between 19 MPa and 25 MPa.
   J. greater than 25 MPa.

9. Suppose the initial length of a certain film was 5.0 cm and the final length of the film was 6.0 cm. The percent elongation of the film was:

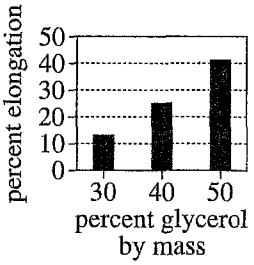
   A. 20%.
   B. 30%.
   C. 40%.
   D. 50%.

10. Based on Figures 2 and 3, as the elastic modulus decreased, the percent elongation:

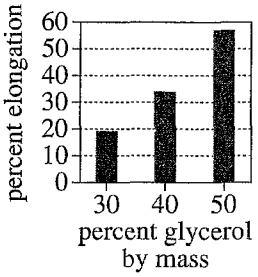
    F. increased only.
    G. decreased only.
    H. increased, then decreased.
    J. decreased, then increased.

11. Based on Figure 2, which of the following graphs best shows the percent elongation results for the films made from mixtures that were, respectively, 30%, 40%, and 50% glycerol by mass?

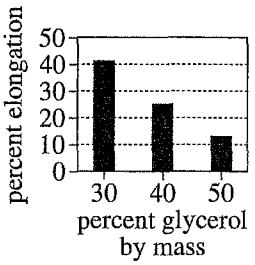
A.



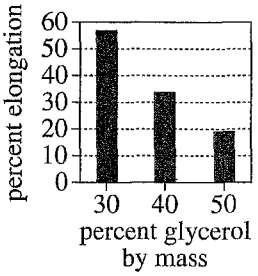
C.



B.



D.



12. At the breaking point of a certain film, a force of 8.0 N was applied to a 2.0×10^{-7} m^2 area of the film. The tensile stress of the film, in N/m^2, is given by which of the following expressions?

    F. $8.0 \times (2.0 \times 10^{-7})$
    G. $8.0 - (2.0 \times 10^{-7})$
    H. $\frac{2.0 \times 10^{-7}}{8.0}$
    J. $\frac{8.0}{2.0 \times 10^{-7}}$

Passage III

Students grew 2 different species of *paramecia* (microscopic, unicellular organisms)—*P. caudatum* and *P. aurelia*—together for 18 days in a test tube containing a growth medium. A constant supply of bacteria (a food source for paramecia) was maintained in the growth medium. Figure 1 shows how the *population density* (number of paramecia per milliliter, mL, of growth medium) of each species changed over the 18 days.

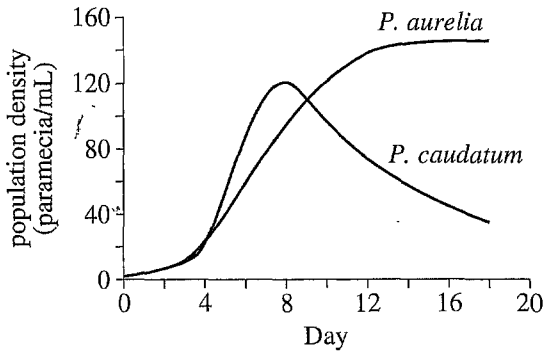


Figure 1

The procedure was repeated except that *P. caudatum* was grown together with *P. bursaria* (see Figure 2).

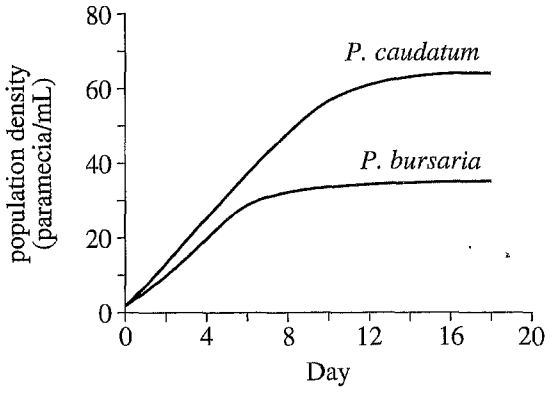


Figure 2

Each of 3 students attempted to explain the results.

Student 1

P. caudatum and *P. aurelia* can grow only near the surface of the growth medium. As the population densities increased, competition for food increased. Eventually, one species outcompeted the other.

Unlike *P. caudatum* and *P. aurelia*, *P. bursaria* harbor cells of photosynthetic algae, called *Chlorella*, in their cytoplasm. *Chlorella* produce O_2 for *P. bursaria*. This allowed *P. bursaria* to feed on bacteria at the bottom of the growth medium. Because *P. caudatum* and *P. bursaria* occupied different regions in the growth medium, there was little competition for food between the 2 species, and they were able to reach stable population densities.

Student 2

Initially, both *P. caudatum* and *P. aurelia* fed on bacteria. But *P. aurelia* can also feed on other paramecia. Thus, when the population densities increased, and competition for bacteria increased, *P. aurelia* began to feed on *P. caudatum*.

P. caudatum and *P. bursaria* are unable to ingest other paramecia, so *P. caudatum* and *P. bursaria* were able to reach stable population densities.

Student 3

P. caudatum and *P. aurelia* were able to find food when their population densities were low. When population densities became too high, *P. aurelia* released a toxin that instantly stopped the *cilia* (short, hairlike projections) on competing paramecia from moving. Because the movement of cilia is necessary to ingest food, the population density of *P. caudatum* declined.

P. caudatum and *P. bursaria* were able to reach stable population densities because neither species can produce the toxin.

13. Based on Student 3's explanation, had *P. aurelia* released the toxin by Day 9 ?

- **A.** No, because the population density of *P. caudatum* was still increasing after Day 9.
- **B.** No, because the population density of *P. aurelia* was still increasing after Day 9.
- **C.** Yes, because the population density of *P. caudatum* was declining by Day 9.
- **D.** Yes, because the population density of *P. aurelia* was declining by Day 9.

14. According to Student 1, when *P. caudatum* and *P. bursaria* were grown together, where in the growth medium—near the top or at the bottom—was each species more likely to be found on Day 16 ?

	P. caudatum	*P. bursaria*
F.	top	top
G.	top	bottom
H.	bottom	top
J.	bottom	bottom

15. Suppose that over the 18 days, the test tubes had been kept in the dark. This information would *weaken* the explanation(s) of which of the students?

A. Student 1 only
B. Student 3 only
C. Students 1 and 3 only
D. Students 2 and 3 only

16. Based on Figure 1, Student 2 would most likely make which of the following statements about food consumption when *P. caudatum* and *P. aurelia* were grown together?

F. *P. caudatum* began to feed on *P. aurelia* by Day 8, causing *P. aurelia*'s population density to decline.
G. *P. caudatum* began to feed on *P. aurelia* by Day 8, causing *P. caudatum*'s population density to decline.
H. *P. aurelia* began to feed on *P. caudatum* by Day 8, causing *P. aurelia*'s population density to decline.
J. *P. aurelia* began to feed on *P. caudatum* by Day 8, causing *P. caudatum*'s population density to decline.

17. Based on Figure 1 and Student 1's explanation, was *P. caudatum* or *P. aurelia* better able to compete for the bacteria?

A. *P. caudatum*, because by Day 18 the population density of *P. caudatum* was stable and the population density of *P. aurelia* was declining.
B. *P. caudatum*, because by Day 18 the population density of *P. aurelia* was stable and the population density of *P. caudatum* was declining.
C. *P. aurelia*, because by Day 18 the population density of *P. caudatum* was stable and the population density of *P. aurelia* was declining.
D. *P. aurelia*, because by Day 18 the population density of *P. aurelia* was stable and the population density of *P. caudatum* was declining.

18. Consider the test tube in which *P. caudatum* and *P. bursaria* were grown together. Which student, if any, claimed that by Day 18 *P. caudatum* reached a higher population density in the tube than did *P. bursaria* because *P. caudatum* was able to ingest both the bacteria and the *P. bursaria* ?

F. Student 1
G. Student 2
H. Student 3
J. None of the students

19. Which of the students described a symbiotic relationship between a paramecium species and another species that is not a paramecium?

A. Student 1 only
B. Student 3 only
C. Students 1 and 3 only
D. Students 2 and 3 only

Passage IV

Paper electrophoresis can be used to separate and identify amino acids:

1. A strip of paper is wetted with a solution of known pH, and a mixture of amino acids is applied as a spot to the middle of the strip.
2. Each end of the strip is immersed in the solution of known pH, and an electric field is applied to the strip such that one end is positive and the other end is negative.
3. Different amino acids travel along the strip different distances and/or in different directions.

Figure 1 illustrates this process.

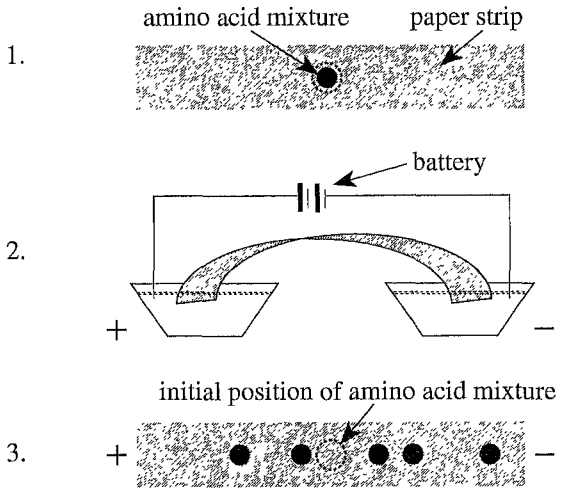


Figure 1

Figure 1 adapted from William B. Wood et al., *Biochemistry: A Problems Approach*. ©1981 by The Benjamin/Cummings Publishing Company, Inc.

The net charge of an amino acid varies with the pH of the solution. The *isoelectric point*, pI, of an amino acid is the pH at which the amino acid has no net charge. At all other pH values, the amino acid *does* have a net charge, and, consequently, will travel along the strip. The direction of travel depends on the sign of the net charge (see Table 1).

Table 1

If solution:	Then net charge of amino acid is:
pH = pI	zero
pH < pI	+
pH > pI	−

Experiment 1

In each of 5 trials (Trials 1–5), paper electrophoresis was performed on leucine (an amino acid) using a solution of known pH. The greater the difference between the pH and leucine's pI, the farther leucine traveled. From the results (see Figure 2), leucine's pI was determined.

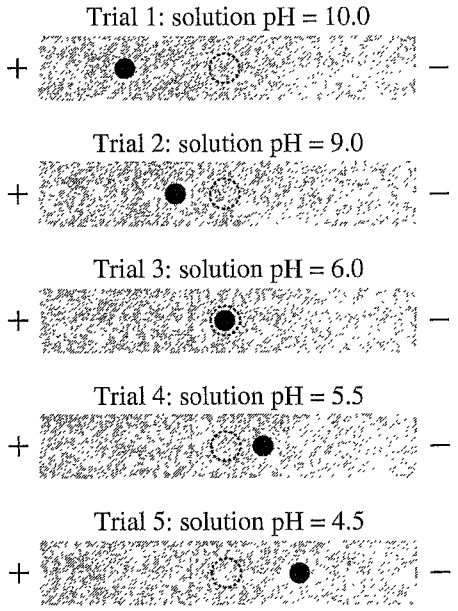


Figure 2

The pI of each of 3 additional amino acids was likewise determined (see Table 2).

Table 2

Amino acid	pI
Aspartic acid	4
Lysine	10
Arginine	12

Experiment 2

In each of 4 trials (Trials 6–9), paper electrophoresis was performed on a mixture of 2 or more of the amino acids studied in Experiment 1 using a solution of known pH. The distance traveled by an amino acid depended only on the difference between the pH and the amino acid's pI: the greater the difference, the farther the amino acid traveled (see Figure 3).

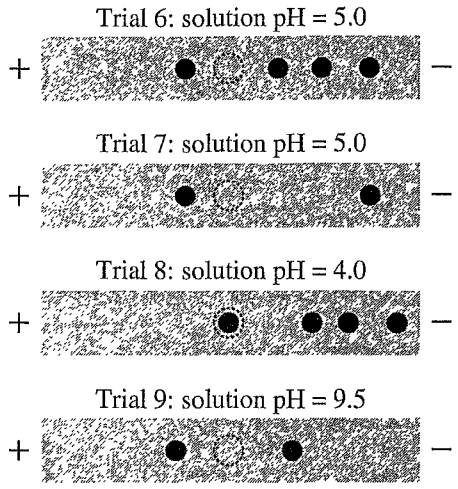
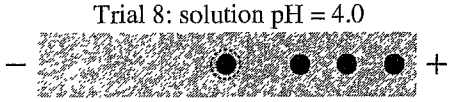


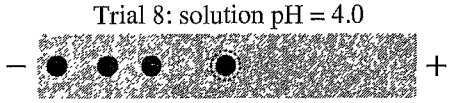
Figure 3

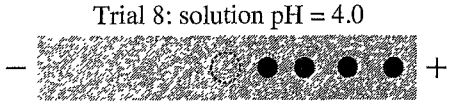
20. What was the purpose of the battery shown in Figure 1 ? The battery was used to:

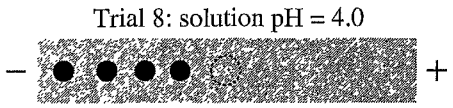
F. apply an amino acid mixture to the paper strip.
G. apply an electric field to the paper strip.
H. immerse the ends of the paper strip in the solution of known pH.
J. wet the paper strip with the solution of known pH.

21. Suppose that in Trial 8 the left end of the paper strip had been negative and the right end of the paper strip had been positive. The results of the trial would have most closely corresponded to which of the following figures?

A.


B.


C.


D.


22. Based on the results of Experiment 1, the pI of leucine is approximately:

F. 3.
G. 5.
H. 6.
J. 8.

23. Which of the following statements best explains the result shown in Figure 3 for Trial 9 ? The amino acid mixture contained 2 amino acids; at a solution pH of:

A. 5.0, one of the amino acids had a net positive charge and one of the amino acids had a net negative charge.
B. 5.0, both of the amino acids had a net negative charge.
C. 9.5, one of the amino acids had a net positive charge and one of the amino acids had a net negative charge.
D. 9.5, both of the amino acids had a net negative charge.

24. In Trial 8, the amino acid that traveled the farthest was:

F. leucine.
G. aspartic acid.
H. lysine.
J. arginine.

25. In Experiment 2, Trial 6 and Trial 7 differed in which of the following ways?

A. The mixture in Trial 6 was made up of more amino acids than was the mixture in Trial 7.
B. The mixture in Trial 7 was made up of more amino acids than was the mixture in Trial 6.
C. The solution used in Trial 6 was more acidic than the solution used in Trial 7.
D. The solution used in Trial 7 was more acidic than the solution used in Trial 6.

26. Suppose paper electrophoresis is performed on 2 amino acids: Amino Acid 1, which has a pI of x, and Amino Acid 2, which has a pI of y. If the solution used has a pH of z, under which of the following conditions would each amino acid most likely have a net negative charge?

F. $x > y > z$
G. $x > z > y$
H. $y > z > x$
J. $z > y > x$

Passage V

Two studies of 6 trials each were performed with several projectiles, blocks, and springs.

In each trial, the following occurred: First, a spring having a *spring constant* of k (a measure of the spring's stiffness) was attached to a block of mass M_b. Next, the block was placed on a frictionless horizontal surface such that the spring was neither stretched nor compressed. Then, a projectile of mass m_p was launched toward the block with a velocity v. Upon impact, the projectile became stuck in the block. The force of the impact compressed the spring by a maximum distance x. Figure 1 illustrates the sequence of events beginning with the launch.

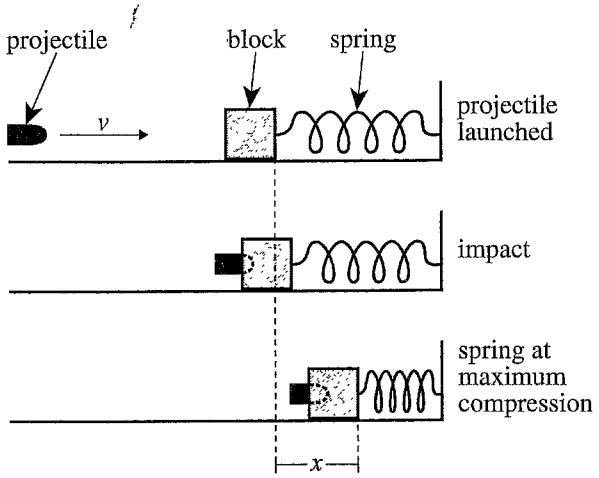


Figure 1

The values of m_p and v were used to calculate KE, the projectile's kinetic energy prior to impact. The values of k and x were used to calculate PE, the elastic potential energy that was stored in the spring when it was at maximum compression.

Study 1

In Trials 1–6, various combinations of m_p and v were tested while M_b equaled 2.0 kg and k equaled 3.0 newtons per meter (N/m). Table 1 shows the value of x, and the values of KE and PE (in millijoules, mJ), for each trial.

Table 1

Trial	m_p (kg)	v (m/sec)	x (m)	KE (mJ)	PE (mJ)
1	0.010	5	0.020	125	0.6
2	0.020	5	0.041	250	2.5
3	0.030	5	0.061	375	5.5
4	0.010	10	0.041	500	2.5
5	0.010	15	0.061	1,125	5.6
6	0.010	20	0.081	2,000	10.0

Study 2

In Trials 7–12, various combinations of M_b and k were tested while m_p equaled 0.010 kg and v equaled 15 m/sec. See Table 2.

Table 2

Trial	M_b (kg)	k (N/m)	x (m)	KE (mJ)	PE (mJ)
7	1.0	3.0	0.086	1,125	11.1
8	2.0	3.0	0.061	1,125	5.6
9	3.0	3.0	0.050	1,125	3.7
10	1.0	5.0	0.067	1,125	11.1
11	1.0	7.0	0.056	1,125	11.1
12	1.0	9.0	0.050	1,125	11.1

27. A *controlled variable* is a variable that is held constant. What were the 3 controlled variables in Trials 4–6 ?

A. m_p, M_b, and k
B. m_p, M_b, and x
C. v, M_b, and k
D. v, k, and x

28. Assume that each projectile and each block could only be tested once. Upon completion of the studies, how many projectile/block pairs had been tested?

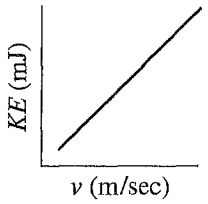
F. 6
G. 12
H. 24
J. 48

29. Was the momentum of the projectile in Trial 3, before impact, the same as the momentum of the projectile in Trial 1, before impact?

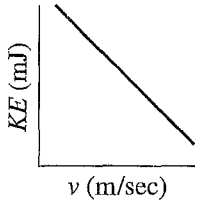
A. No, because the projectiles had different velocities.
B. No, because the projectiles had different masses.
C. Yes, because the projectiles had the same velocity.
D. Yes, because the projectiles had the same mass.

30. Based on the results of Study 1, which of the following graphs best represents the relationship between *KE* and *v* ?

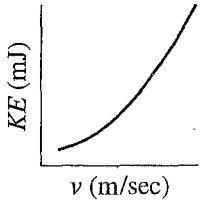
F.



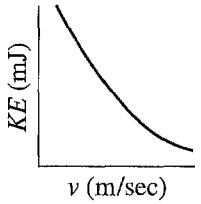
H.



G.



J.



31. Prior to impact, the *mechanical energy* of a projectile/block/spring system equaled *KE*. After impact, when the spring was at maximum compression, the mechanical energy of the system equaled *PE*. Based on the results of the studies, did the system more likely gain mechanical energy or lose mechanical energy as a result of the impact?

A. Gain; in any trial, *KE* was greater than *PE*.
B. Gain; in any trial, *KE* was less than *PE*.
C. Lose; in any trial, *KE* was greater than *PE*.
D. Lose; in any trial, *KE* was less than *PE*.

32. Based on the results of Studies 1 and 2, which of the following combinations of m_p, v, M_b, and k would yield the greatest value of x ?

	m_p (kg)	v (m/sec)	M_b (kg)	k (N/m)
F.	0.010	5	3.0	9.0
G.	0.010	20	1.0	7.0
H.	0.030	5	3.0	5.0
J.	0.030	20	1.0	3.0

33. To best determine the mathematical relationship between k and x, the data obtained in which trials should be considered?

A. Trials 1–3 only, because k was the independent variable in those trials.
B. Trial 1 and Trials 4–6 only, because k was the independent variable in those trials.
C. Trials 7–9 only, because k was the independent variable in those trials.
D. Trial 7 and Trials 10–12 only, because k was the independent variable in those trials.

Passage VI

When sucrose is dissolved in an aqueous solution, it can *hydrolyze* (react with H_2O to break down) to form glucose and fructose. The compound *imidazole* catalyzes the hydrolysis:

$$1 \text{ sucrose} + 1\ H_2O \xrightarrow{\text{imidazole}} 1 \text{ glucose} + 1 \text{ fructose}$$

To study this reaction, chemists prepared several *buffer solutions*. (A buffer solution is a solution that maintains a stable pH.) Each buffer solution had a different pH.

Experiment 1

In each trial, Steps 1–4 were followed:

1. A certain mass of imidazole (or no imidazole) was dissolved in a certain volume of a buffer solution having a pH of 5.24.

2. A test tube containing 8.0 mL of this imidazole solution (or of the buffer solution only) and a test tube containing 2.0 mL of a 500.0 g/L sucrose solution were each partially submerged in a water bath maintained at 85°C.

3. After 30 min, the reaction solution was formed by adding the 8.0 mL of imidazole solution (or of the buffer solution only) to the test tube containing the 2.0 mL of sucrose solution.

4. The concentration of sucrose in the reaction solution was monitored over the next 35 min while the solution was kept at 85°C.

In no two trials was the same mass of imidazole added to the buffer solution.

The measured values of sucrose concentration were then used to calculate values of the total mass of sucrose that was hydrolyzed. Figure 1 shows how the total mass of sucrose that was hydrolyzed varied over time for reaction solutions having 6 different imidazole concentrations.

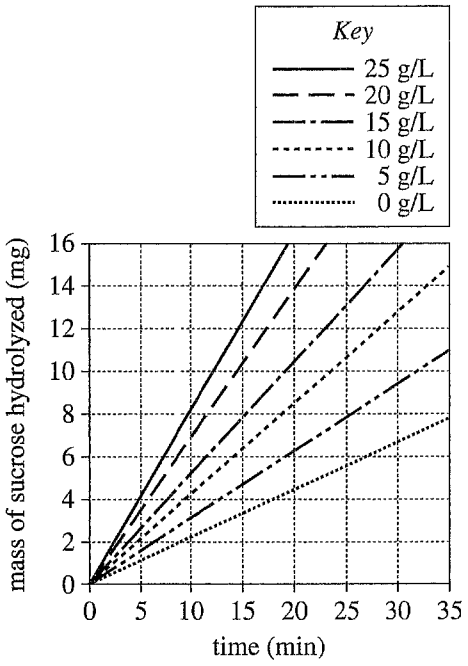


Figure 1

Experiment 2

Experiment 1 was repeated except that, from trial to trial, the pH of the buffer solution was varied and the mass of imidazole added to the buffer solution remained constant (see Figure 2).

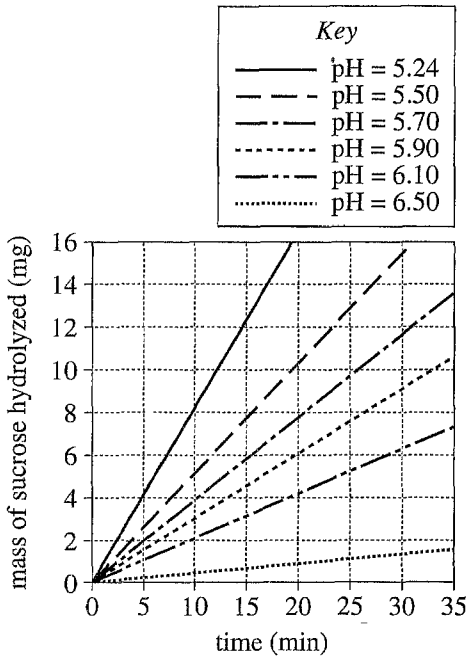


Figure 2

Figures adapted from George W. Farr and James R. Heitz, "Imidazole Catalysis of Sucrose Hydrolysis." ©1974 by International & American Associations for Dental Research.

34. In the trial of Experiment 2 that was done at a pH of 5.50, the mass of sucrose hydrolyzed by 35 min was most likely:

F. less than 13 mg.
G. between 13 mg and 17 mg.
H. between 17 mg and 21 mg.
J. greater than 21 mg.

35. During each trial of the experiments, as the mass of sucrose that was hydrolyzed increased, the concentration of fructose:

A. increased only.
B. decreased only.
C. increased, then remained constant.
D. decreased, then remained constant.

36. Suppose a trial had been done in Experiment 2 at a pH of 6.00. The mass of sucrose hydrolyzed by 20 min would most likely have been:

F. less than 4 mg.
G. between 4 mg and 6 mg.
H. between 6 mg and 8 mg.
J. greater than 8 mg.

37. Based on the results of Experiment 1, the imidazole concentration of the reaction solution in the trial of Experiment 2 done at a pH of 5.24 was most likely:

A. 0 g/L.
B. 5 g/L.
C. 20 g/L.
D. 25 g/L.

38. Which of the following factors was the same in every trial of Experiment 2, but was varied across trials in Experiment 1 ?

F. The temperature at which the reaction was carried out
G. The time over which the glucose concentration was monitored
H. The initial concentration of sucrose in the reaction solution
J. The concentration of imidazole in the reaction solution

39. How many of the 6 buffer solutions tested in Experiment 2 were acidic, and how many were basic?

	acidic	basic
A.	0	6
B.	6	0
C.	2	4
D.	4	2

40. A student claimed that imidazole must be present for the hydrolysis of sucrose to occur. Do the results of Experiment 1 *contradict* this claim?

F. Yes; the line in Figure 1 for 0 g/L has a positive slope.
G. Yes; the line in Figure 1 for 25 g/L has a positive slope.
H. No; the line in Figure 1 for 0 g/L has a positive slope.
J. No; the line in Figure 1 for 25 g/L has a positive slope.

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

Explanation of Procedures Used to Obtain Scale Scores from Raw Scores

On each of the four tests on which you marked any responses, the total number of correct responses yields a raw score. Use the table below to convert your raw scores to scale scores. For each test, locate and circle your raw score or the range of raw scores that includes it in the table below. Then, read across to either outside column of the table and circle the scale score that corresponds to that raw score. As you determine your scale scores, enter them in the blanks provided on the right. The highest possible scale score for each test is 36. The lowest possible scale score for any test on which you marked any responses is 1.

Next, compute the Composite score by averaging the four scale scores. To do this, add your four scale scores and divide the sum by 4. If the resulting number ends in a fraction, round it off to the nearest whole number. (Round down any fraction less than one-half; round up any fraction that is one-half or more.) Enter this number in the blank. This is your Composite score. The highest possible Composite score is 36. The lowest possible Composite score is 1.

ACT Test 73E	Your Scale Score
English	_____
Mathematics	_____
Reading	_____
Science	_____
Sum of scores	_____
Composite score (sum ÷ 4)	_____

NOTE: If you left a test completely blank and marked no items, do not list a scale score for that test. If any test was completely blank, do not calculate a Composite score.

Scale Score	Raw Scores				Scale Score
	Test 1 English	Test 2 Mathematics	Test 3 Reading	Test 4 Science	
36	74-75	59-60	40	39-40	**36**
35	72-73	58	39	37-38	**35**
34	70-71	57	38	36	**34**
33	69	55-56	37	35	**33**
32	68	54	36	—	**32**
31	67	53	35	34	**31**
30	66	52	34	33	**30**
29	64-65	50-51	33	32	**29**
28	63	48-49	32	31	**28**
27	61-62	45-47	31	30	**27**
26	59-60	42-44	30	29	**26**
25	56-58	40-41	29	27-28	**25**
24	53-55	37-39	27-28	25-26	**24**
23	50-52	35-36	26	23-24	**23**
22	47-49	33-34	24-25	21-22	**22**
21	44-46	31-32	22-23	20	**21**
20	41-43	30	21	18-19	**20**
19	39-40	28-29	19-20	17	**19**
18	37-38	25-27	18	15-16	**18**
17	35-36	21-24	17	14	**17**
16	32-34	17-20	15-16	12-13	**16**
15	29-31	14-16	14	11	**15**
14	27-28	12-13	13	10	**14**
13	25-26	9-11	11-12	9	**13**
12	23-24	8	9-10	7-8	**12**
11	20-22	6-7	8	—	**11**
10	17-19	5	7	6	**10**
9	15-16	4	6	5	**9**
8	13-14	—	5	4	**8**
7	10-12	3	4	3	**7**
6	8-9	—	—	—	**6**
5	6-7	2	3	2	**5**
4	5	—	2	—	**4**
3	3-4	1	—	1	**3**
2	2	—	1	—	**2**
1	0-1	0	0	0	**1**

04/22/16

ACT ASSESSMENT TEST INFORMATION RELEASE REPORT

TEST DATE = 04/16 TEST FORM = 73E TEST CENTER = 17045

ITEM NUMBER	1 1234567890	1111111112 1234567890	2222222223 1234567890	3333333334 1234567890	4444444445 1234567890	5555555556 1234567890	6666666667 1234567890	77777 12345
ENGLISH								
CORRECT ANSWER	DJBFCHAHCF	DJBJCJAGAH	DHAHDGAFBG	AHAGCGDFBH	DGAGCJBFDJ	BJCGDFBGAG	DGDHBGCFBH	AHDJB
YOUR ANSWER	++++B+++++	++D+++++++	++++++C+++	C+C+++++++	++++A+C+A+	+++JB++++H	A++GD+AGD+	C+BGC
SUBSCORE	UUURRURUUU	RUURRURURR	UUUURUUURR	UUUURRRRRU	URURURUURU	RURUURRRRR	URRRUUURRU	UURUR
MATHEMATICS								
CORRECT ANSWER	CJAFCKAGEJ	BJBGEJEGAH	DJCHCGCHAF	EKCHCFEFBK	BJAHAKDJAG	DGDKCGBKDJ		
YOUR ANSWER	++++++++++	E+++++++++	++++++++++	+H+++++++++	++++++++++	C++HAJ-G+K		
SUBSCORE	ATAAAAAGGT	AAAGGAAAAT	GTATAGGTAT	TTGGTGTTGA	ATGAAATAGA	TTGTGGAGGT		
READING								
CORRECT ANSWER	BFDFDGCJBH	CGBGDHDJAF	DGBJCGAFAJ	AHDGCJBHAF				
YOUR ANSWER	A+++++++++	+++++++++H	++AF++++B+	++B-A++JB+				
SUBSCORE	LLLLLLLLLL	SSSSSSSSSS	LLLLLLLLLL	SSSSSSSSSS				
SCIENCE								
CORRECT ANSWER	CJAHBGCFAF	CJCGAJDJAG	BHCJAJAGBG	CJDHAGDJBF				
YOUR ANSWER	++++D+++++	++++++++++	++++BG+++F	A++GCJCG++				

1st Row: Correct responses to the items on the ACT tests.

2nd Row: Your Responses:
- A plus (+) indicates your response was correct.
- A letter (A through K) is the response you chose, if your answer was incorrect.
- A dash (-) indicates you omitted the item.
- An asterisk (*) indicates you gridded more than one response.

3rd Row: If the test includes subscores, one of the letters below indicates the category to which each item belongs:

English: U = Usage/Mechanics
R = Rhetorical Skills

Math: A = Pre-Algebra/Elementary Algebra
G = Intermediate Algebra/Coordinate Geometry
T = Plane Geometry/Trigonometry

Reading: S = Social Studies/Sciences
L = Arts/Language

The ACT®