

**DECEMBER 3, 2016
INTERNATIONAL**

The SAT[®]

Test Book

IMPORTANT REMINDERS

1

A No. 2 pencil is required for the test.
Do not use a mechanical pencil or pen.

2

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Test begins on the next page.

Reading Test

65 MINUTES, 52 QUESTIONS

Turn to Section 1 of your answer sheet to answer the questions in this section.

DIRECTIONS

Each passage or pair of passages below is followed by a number of questions. After reading each passage or pair, choose the best answer to each question based on what is stated or implied in the passage or passages and in any accompanying graphics (such as a table or graph).

Questions 1-10 are based on the following passage.

This passage is adapted from E. M. Forster, *A Room with a View*. Originally published in 1908. Lucy Honeychurch has just returned to England from Italy.

The society out of which Cecil proposed to rescue Lucy was perhaps no very splendid affair, yet it was more splendid than her antecedents entitled her to.

Line Her father, a prosperous local solicitor, had built
5 Windy Corner, as a speculation at the time the district was opening up, and, falling in love with his own creation, had ended by living there himself. Soon after his marriage, the social atmosphere began to alter. Other houses were built on the brow of that
10 steep southern slope, and others, again, among the pine-trees behind, and northward on the chalk barrier of the downs. Most of these houses were larger than Windy Corner, and were filled by people who came, not from the district, but from London,
15 and who mistook the Honeychurches for the remnants of an indigenous aristocracy. He was inclined to be frightened, but his wife accepted the situation without either pride or humility. "I cannot think what people are doing," she would say, "but it
20 is extremely fortunate for the children." She called everywhere; her calls were returned with enthusiasm, and by the time people found out that she was not exactly of their *milieu*, they liked her, and it did not seem to matter. When Mr. Honeychurch died, he
25 had the satisfaction—which few honest solicitors despise—of leaving his family rooted in the best society obtainable.

The best obtainable. Certainly many of the immigrants were rather dull, and Lucy realized this
30 more vividly since her return from Italy. Hitherto she had accepted their ideals without questioning—their kindly affluence, their inexplorable religion, their dislike of paper-bags, orange-peel, and broken bottles. A Radical out and out, she learnt to speak
35 with horror of Suburbia. Life, so far as she troubled to conceive it, was a circle of rich, pleasant people, with identical interests and identical foes. In this circle, one thought, married, and died. Outside it were poverty and vulgarity for ever trying to enter,
40 just as the London fog tries to enter the pine-woods pouring through the gaps in the northern hills. But, in Italy, where any one who chooses may warm himself in equality, as in the sun, this conception of life vanished. Her senses expanded; she felt that there
45 was no one whom she might not get to like, that social barriers were irremovable, doubtless, but not particularly high. You jump over them just as you jump into a peasant's olive-yard in the Apennines, and he is glad to see you. She returned with new eyes.
50 So did Cecil; but Italy had quickened Cecil, not to tolerance, but to irritation. He saw that the local society was narrow, but, instead of saying, "Does that very much matter?" he rebelled, and tried to substitute for it the society he called broad. He did
55 not realize that Lucy had consecrated her environment by the thousand little civilities that create a tenderness in time, and that though her eyes saw its defects, her heart refused to despise it entirely.

Nor did he realize a more important point—that if
60 she was too great for this society, she was too great
for all society, and had reached the stage where
personal intercourse would alone satisfy her. A rebel
she was, but not of the kind he understood—a rebel
who desired, not a wider dwelling-room, but equality
65 beside the man she loved. For Italy was offering her
the most priceless of all possessions—her own soul.

1

Which choice best summarizes the passage?

- A) A family decides to live in a society that changes over time.
- B) A couple's basic differences are revealed by their perspectives on a particular community.
- C) A relationship begins to crumble as a result of unexpected revelations.
- D) A character fears ostracism by a community but is ultimately welcomed by the community.

2

A main theme of the passage is that

- A) relationships frequently dissolve because of familial pressure.
- B) social expectations change little from region to region.
- C) alterations in social status are dangerous to couples' stability.
- D) travel to foreign places can cause fundamental shifts in people's attitudes.

3

According to the narrator, Mr. and Mrs. Honeychurch differ primarily with regard to their

- A) responses to their neighbors' mistaken assumptions.
- B) attitudes toward Lucy's travels in Italy.
- C) inclinations toward speculating on others' motives.
- D) impulses to maintain public appearances.

4

The narrator repeats the word “obtainable” (line 28) most likely to suggest

- A) limited opportunity.
- B) social freedom.
- C) personal determination.
- D) individual satisfaction.

5

The narrator indicates that, before her experience of life in Italy, Lucy regarded economic deprivation as

- A) an inexplicable problem.
- B) an irrelevant factor.
- C) an intrusive element.
- D) a tragic consequence.

6

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 28-30 (“Certainly . . . Italy”)
- B) Lines 37-38 (“In this . . . died”)
- C) Lines 38-41 (“Outside . . . hills”)
- D) Line 44 (“Her . . . expanded”)

7

In line 32, the residents of the district are described as possessing a “kindly affluence.” Which choice best supports this description?

- A) Lines 1-3 (“The society . . . to”)
- B) Lines 8-9 (“Soon . . . alter”)
- C) Lines 16-18 (“He was . . . humility”)
- D) Lines 20-24 (“She called . . . matter”)

8

In the passage, Lucy associates Italy with

- A) imminent revolt against institutions.
- B) specific customs involving residents.
- C) general parity between individuals.
- D) intimate communication between fellow travelers.

9

The narrator characterizes Cecil as someone who

- A) is limited in his comprehension of Lucy.
- B) is indisputably heroic in his efforts to rescue Lucy.
- C) has a tendency to conceal his emotions.
- D) prefers seclusion to public interaction.

10

As used in line 54, “broad” most nearly means

- A) plain.
- B) indelicate.
- C) worldly.
- D) essential.

Questions 11-20 are based on the following passages.

These two letters are adapted from John Adams, *Letters of John Adams, Addressed to His Wife*. Originally published in 1841. Both of the letters were written to Abigail Adams on July 3, 1776.

Passage 1

Yesterday, the greatest question was decided, which ever was debated in America, and a greater, perhaps, never was nor will be decided among
 Line men. A Resolution was passed without one
 5 dissenting Colony “that these United Colonies are, and of right ought to be, free and independent States, and as such they have, and of right ought to have, full power to make war, conclude peace, establish
 commerce and to do all other acts and things which
 10 other States may rightfully do.” You will see, in a few days, a Declaration setting forth the causes which have impelled us to this mighty revolution, and the reasons which will justify it in the sight of God and man. A plan of confederation will be taken up in a
 15 few days.

When I look back to the year 1761 and recollect the argument concerning writs of assistance in the superior court, which I have hitherto considered as the commencement of this controversy between
 20 Great Britain and America, and run through the whole period, from that time to this, and recollect the series of political events, the chain of causes and effects, I am surprised at the suddenness, as well as greatness of this revolution. Britain has been filled
 25 with folly, and America with wisdom; at least, this is my judgment. Time must determine. It is the will of Heaven that the two countries should be sundered forever. It may be the will of Heaven that America shall suffer calamities still more wasting, and
 30 distresses yet more dreadful. If this is to be the case, it will have this good effect at least. It will inspire us with many virtues, which we have not, and correct many errors, follies and vices which threaten to disturb, dishonor, and destroy us. The furnace of
 35 affliction produces refinement in states as well as individuals. And the new Governments we are

assuming in every part will require a purification from our vices, and an augmentation of our virtues, or they will be no blessings. The people will have unbounded power, and the people are extremely
 40 addicted to corruption and venality, as well as the great. But I must submit all my hopes and fears to an overruling providence, in which, unfashionable as the faith may be, I firmly believe.

Passage 2

Had a Declaration of Independency been made seven months ago, it would have been attended with many great and glorious effects. We might, before this hour, have formed alliances with foreign states. We should have mastered Quebec, and been in
 50 possession of Canada. . . .

But, on the other hand, the delay of this Declaration to this time has many great advantages attending it. The hopes of reconciliation, which were fondly entertained by multitudes of honest and well
 55 meaning, though weak and mistaken people, have been gradually and, at last, totally extinguished. Time has been given for the whole people maturely to consider the great question of independence, and to ripen their judgment, dissipate their fears, and
 60 allure their hopes, by discussing it in newspapers and pamphlets, by debating it in assemblies, conventions, committees of safety and inspection, in town and county meetings, as well as in private conversations, so that the whole people, in every colony of the
 65 thirteen, have now adopted it as their own act. This will cement the union, and avoid those heats, and perhaps convulsions, which might have been occasioned by such a Declaration, six months ago.

But the day is past. The second day of July, 1776, will be the most memorable epocha in the history of America. I am apt to believe that it will be celebrated by succeeding generations as the great anniversary Festival. It ought to be commemorated, as the day of deliverance, by solemn acts of devotion to God
 75 Almighty. It ought to be solemnized with pomp and parade, with shows, games, sports, guns, bells, bonfires and illuminations, from one end of this continent to the other, from this time forward, forevermore.

80 You will think me transported with enthusiasm,
but I am not. I am well aware of the toil, and blood,
and treasure, that it will cost us to maintain this
Declaration, and support and defend these States.
Yet, through all the gloom, I can see the rays of
85 ravishing light and glory. I can see that the end is
more than worth all the means. And that posterity
will triumph in that day's transaction, even although
we should rue it, which I trust in God we shall not.

11

In Passage 1, Adams suggests which of the following about the relationship between America and Great Britain?

- A) It has grown violent.
- B) It cannot be repaired.
- C) It will one day be revived.
- D) It had once been mutually beneficial.

12

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 16-24 ("When . . . revolution")
- B) Lines 24-26 ("Britain . . . judgement")
- C) Lines 26-28 ("It is . . . forever")
- D) Lines 31-34 ("It will . . . destroy us")

13

According to Passage 2, one of the benefits of a delayed revolution was that it gave people in the colonies an opportunity to

- A) plan their method of attack and secure the necessary resources.
- B) unite in creating a document that would one day be studied and admired.
- C) decide which form of government to adopt after the revolution.
- D) overcome doubts about whether the revolution was really needed.

14

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 45-47 ("Had . . . effects")
- B) Lines 47-48 ("We might . . . states")
- C) Lines 57-65 ("Time . . . act")
- D) Lines 69-73 ("The second . . . Festival")

15

As used in line 53, “attending” most nearly means

- A) accompanying.
- B) viewing.
- C) receiving.
- D) addressing.

16

In the third paragraph of Passage 2 (lines 69-79), Adams uses the words “memorable,” “celebrated,” “commemorated,” and “solemnized” most likely to

- A) convey the idea that the Resolution is an extraordinary achievement.
- B) scold those who are in doubt about the legitimacy of the Resolution.
- C) reveal the efforts that were necessary to secure the approval of the Resolution.
- D) mock the notion that the Resolution was drafted too hastily.

17

The primary purpose of both passages is to

- A) underscore the significance of a momentous occurrence.
- B) announce a strategic victory in a formal manner.
- C) propose a way to end a particular struggle.
- D) reflect on the prevalence of significant revolutions.

18

Which choice best describes the relationship between the two passages?

- A) Passage 2 reconsiders predictions offered in Passage 1.
- B) Passage 2 expands on the subject discussed in Passage 1.
- C) Passage 2 illustrates an application of the ideas introduced in Passage 1.
- D) Passage 2 answers the questions raised in Passage 1.

19

One central idea in both passages is that

- A) political events of lasting significance should be documented.
- B) the revolution will enable virtue to triumph over vice.
- C) the colonies are strongly united despite their many differences.
- D) the future presents both significant challenges and great promise.

20

Compared with Adams's view in Passage 1 of "the people" (line 39), Adams's view in Passage 2 of "the whole people" (lines 57 and 64) is more

- A) optimistic.
- B) detached.
- C) skeptical.
- D) despairing.

Questions 21-31 are based on the following passage and supplementary material.

This passage is adapted from Ed Yong, “Madness of Crowds: Single Ants Beat Colonies at Easy Choices.” ©2013 by National Geographic Society.

Virtually every article or documentary about ants takes a moment to fawn over their incredible collective achievements. Together, ant colonies can
Line raise gardens and livestock, build living rafts, run
5 vaccination programmes, overpower huge prey, deter elephants, and invade continents. No individual could do any of this; it takes a colony to pull off such feats.

But ants can also make mistakes. Like all animal
10 collectives, they face situations when the crowd’s wisdom turns into foolishness.

Takao Sasaki and Stephen Pratt from Arizona State University found one such example among house-hunting *Temnothorax* ants. When they need
15 to find a new nest, workers spread out from their colony to search for good real estate. In earlier work, Sasaki and Pratt have shown that, as a group, the ants are better at picking the best of two closely-matched locations, even if most of the workers have only seen
20 one of the options. It’s a classic example of swarm intelligence, where a colony collectively computes the best solution to a task.

But Sasaki showed that this only happens if their choice is difficult. If one nest site is clearly better than
25 the other, individual ants actually outperform colonies.

When a worker finds a new potential home, it judges the quality for itself. *Temnothorax* ants love dark nests, in particular; with fewer holes, it’s easier
30 to control their temperature or defend them. If the worker decides that it likes the spot, it returns to the colony and leads a single follower to the new location. If the follower agrees, it does the same. Through these “tandem-runs,” sites build up
35 support, and better ones do so more quickly than poorer ones. When enough ants have been convinced of the worth of a site, their migration gathers pace. Workers just start picking up their nestmates and carrying them to the new site.

40 In past experiments, Sasaki and Pratt have always found that ant colonies make better decisions than individual workers. Even though each worker might only visit one or two possible sites, the colony collectively explores all the options and weighs them
45 against one another. And since many individuals need to “vote” for a particular site, “this prevents any one ant’s poor choice from misleading the entire colony,” says Sasaki.

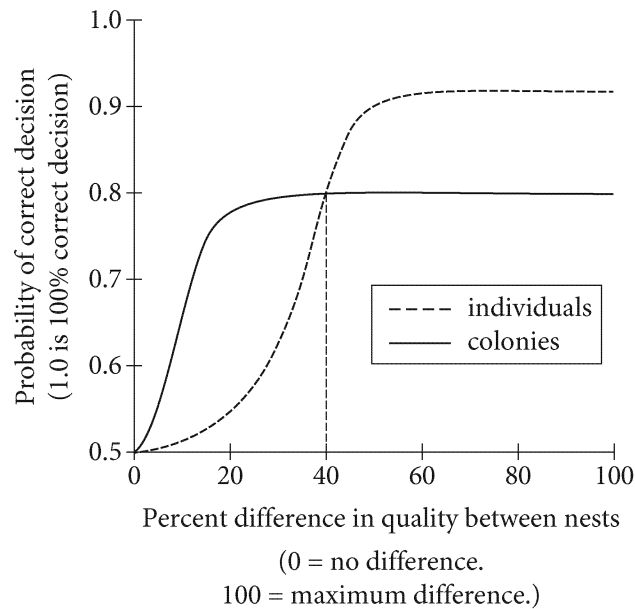
This time, the team wanted to see if the colony
50 keeps its superiority for easy tasks as well as difficult ones. They presented *Temnothorax* ants with two possible nests—one held in constant darkness and another whose brightness could be adjusted. Sometimes, the ants had an easy choice between a
55 dark nest and a blindingly illuminated one. Sometimes, they had to choose between two similar sites, one just marginally dimmer than the other.

As the light difference between the nests got bigger and the task became easier, the ants, whether
60 as individuals or colonies, made more accurate choices. The team expected as much. But to their surprise, the single workers showed the greatest improvements and eventually outperformed their collective peers. In the easiest tasks, they chose the
65 darker nest 90 percent of the time, while the colonies peaked at 80 percent accuracy.

To understand why this happens, consider how the ants choose their nests. If an individual is working by herself, she might visit a few sites in a
70 row and gauge the difference between them. If they’re very similar, there’s a good chance she’ll make the wrong decision. But the colony doesn’t work off the recommendations of any individual; it relies on a quorum, just like the up- and down-voting
75 system of some social websites. Together, the colony can amplify small differences between closely-matched sites and smooth out bad choices from errant individuals.

Still, this system isn’t perfect. If many ants happen
80 to find a bad site very quickly, they might reach a quorum before other workers have time to rouse support for a better alternative. “A bad choice can happen even if one site is much better than the other, because the ants at the bad site will have no
85 information at all about the existence of the much better alternative,” says Sasaki.

A single ant isn't as vulnerable to this problem. "She will visit both sites, easily see that one is better than the other, and nearly always make the right choice," says Sasaki. Colonies, however, put less effort into comparing their options than lone individuals, which sometimes leads them astray.



Adapted from Takao Sasaki et al., "Ant Colonies Outperform Individuals When a Sensory Discrimination Task Is Difficult but Not When It Is Easy."
©2013 by National Academy of Sciences.

21

The central claim in the passage is that

- A) individual ants are superior to colonies in distinguishing between dark and dim nests.
- B) individual ants are better than colonies in making easy nest selection choices.
- C) the choices of an ant colony are better than individual ants' choices.
- D) colonies are most likely to follow individual ants' choices when nest differences are extreme.

22

It can reasonably be inferred that for the purpose of the primary experiment described in the passage, the most important aspect of *Temnothorax* ants was their

- A) unusual strength.
- B) visual acuity.
- C) nest preferences.
- D) large numbers.

23

The author uses the term “tandem-runs” (line 34) to convey a sense of how

- A) the behaviors of individual ants contribute to a collective action.
- B) the efforts of individual ants are sometimes negated.
- C) an individual ant deserts its colony and joins another.
- D) a colony of ants works together to build its nest.

24

In what way did the conditions of the primary experiment described in the passage differ from those of Sasaki and Pratt’s past experiments?

- A) The researchers manipulated the amount of light to vary nest selection difficulty.
- B) The researchers positioned new nest sites at a remote distance from existing ones.
- C) The researchers observed the behavior of individual ants in relation to colonies.
- D) The researchers disrupted some of the ant nests soon after they were built.

25

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 16-20 (“In earlier . . . options”)
- B) Lines 40-42 (“In past . . . workers”)
- C) Lines 42-45 (“Even . . . another”)
- D) Lines 54-55 (“Sometimes, the . . . one”)

26

The account of how “ants choose their nests” (line 68) is intended mainly to

- A) evoke a sense of awe for ants’ industriousness.
- B) summarize the results of a discredited experiment.
- C) provide context for an unexpected finding.
- D) establish how scientists monitor ant behavior.

27

As used in line 75, “system” most nearly means

- A) method.
- B) plot.
- C) grouping.
- D) tendency.

28

The main purpose of the graph is to

- A) represent the speed with which two groups of ants locate their nests when they encounter a range of circumstances.
- B) demonstrate the relative similarity of nests in sites discovered by individual ants and by ant colonies.
- C) indicate the long-term effects of practice on the ability of ants to locate appropriate nests.
- D) compare the success of individual ants and colonies in identifying better nesting locations under different conditions.

29

According to the graph, at which percent difference in quality between nests are individual ants and ant colonies equally likely to make a correct selection?

- A) 20 percent
- B) 40 percent
- C) 60 percent
- D) 80 percent

30

It can reasonably be inferred from the passage that the label “probability of correct decision” on the graph refers to the likelihood of the choice of nest sites that

- A) are less brightly illuminated.
- B) have been selected by a quorum.
- C) are located near food sources.
- D) are structurally sound.

31

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 24-26 (“If one . . . colonies”)
- B) Lines 27-28 (“When . . . itself”)
- C) Lines 28-29 (“*Temnothorax* . . . particular”)
- D) Lines 30-33 (“If the worker . . . location”)

Questions 32-42 are based on the following passage and supplementary material.

This passage is adapted from Adam Grant, “The Best Lie Detectors in the Workplace.” ©2013 by the Washington Post.

Lie detection is a notoriously difficult skill to master. In fact, even most so-called lie detection experts—experienced detectives, psychiatrists, job interviewers, judges, polygraph administrators, intelligence agents and auditors—hardly do better than chance. In a massive analysis of studies with more than 24,000 people, psychologists Charles Bond Jr. and Bella DePaulo found that even the experts are right less than 55 percent of the time. Still, some people are better judges of character than others. So when we need to count on people to assess honesty, we tend to turn to the skeptics among us, expecting that they’ll be thorough and discerning. Consider a clever study by psychologists Nancy Carter and Mark Weber, who presented business professionals with a scenario about an organization struggling with dishonesty in its hiring interviews. They had the chance to choose one of two highly competent senior managers to be the company’s job interviewer. The major difference between the two managers wasn’t experience or skill, it was a matter of personality. One manager was skeptical and suspicious, whereas the other manager had a habit of trusting others. Eighty-five percent chose the skeptical manager to make the hiring decisions, expecting the trusting manager to be naïve and easily duped.

But are we right that skeptics are better lie detectors? To find out, Carter and Weber created videotapes of eight business students interviewing for a job. Half of the interviewees told the truth throughout the interview, while the other half was instructed to tell three significant lies apiece.

Carter and Weber recruited a group of people to watch the videos. Several days beforehand, they had completed a survey about whether they were generally skeptical or trusting of others. After watching the videos, the participants placed their bets about which candidates lied and which told the truth, and then made a choice about which ones they would hire.

The results were surprising. The more trusting evaluators better identified the liars among the group than the skeptics did, and were also less likely to hire those liars. Contrary to conventional wisdom, it’s the skeptics who are easiest to fool. Why would this be? One possibility, according to Carter and Weber, is that lie-detection skills cause people to become more trusting. If you’re good at spotting lies, you need to worry less about being deceived by others, because you can often catch them in the act.

The other possibility is that by trusting others, we sharpen our skills in reading people. Skeptics assume that most people are hiding or misrepresenting something. This makes them interpersonally risk-averse, whereas people who habitually trust others get to see a wider range of actions—from honesty to deception and generosity to selfishness. Over time, this creates more opportunities to learn about the signals that distinguish liars from truth tellers.

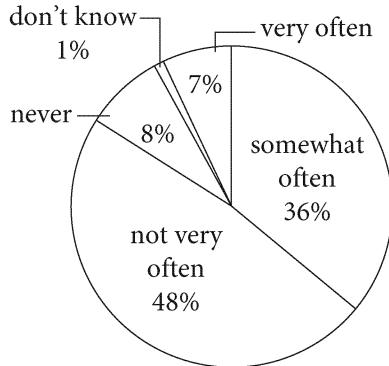
So what signals do trusters use to spot lies? One of the study’s findings is that they pay more attention to vocal cues than skeptics do. This lines up beautifully with a breakthrough review led by the psychologist Alder Vrij. His team examined several decades of research and concluded that most of us rely heavily on nonverbal cues, such as nervousness or confidence, even though they can be misleading.

To effectively spot lies, Vrij and colleagues recommend renewed attention to verbal cues—inconsistencies in stories and incorrect responses to questions for which you already know the answer.

Falsifying Information on Résumés

Figure 1

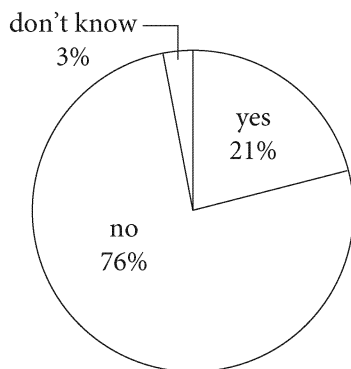
In your opinion, how often do job applicants include dishonest or exaggerated information on their résumés?



Survey of 1,013 senior managers in the United States

Figure 2

Do you know anyone who misrepresented or exaggerated information on his or her résumé?



Survey of 413 workers in the United States

Adapted from "OfficeTeam Survey: One in Five Workers Knows Someone Who Lied on Résumé." ©2011 by OfficeTeam.

32

It can reasonably be inferred from the passage that the majority of the "business professionals" referred to in line 16 believed that

- A) many hiring managers fail to recognize dishonesty in job candidates.
- B) most senior managers are skeptical about those who work for them.
- C) skeptics are better than trustful individuals at detecting lies.
- D) personality is not a critical element of what makes a good manager.

33

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 14-18 ("Consider . . . interviews")
- B) Lines 18-20 ("They . . . interviewer")
- C) Lines 20-24 ("The major . . . others")
- D) Lines 25-27 ("Eighty-five . . . duped")

34

As used in line 22, "matter" most nearly means

- A) issue.
- B) topic.
- C) substance.
- D) amount.

35

The author poses questions in lines 28-29 (“But . . . detectors”), line 46 (“Why . . . be”), and line 62 (“So . . . lies”) primarily to

- A) challenge points made earlier in the passage.
- B) provide transitions to further develop the passage.
- C) identify noteworthy conclusions in the passage.
- D) express uncertainty about claims made in the passage.

36

Based on the passage, what is indicated by the study of people who watched the interview videos?

- A) Skeptics are quite hard to distinguish from people who are trusting of others.
- B) About half of job applicants are truthful in their interviews and about half are deceitful.
- C) Individuals who are trusting tend to make more informed hiring decisions than do those who are skeptical.
- D) Trying to predict the outcome of social science research is unlikely to enhance the results of the research.

37

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 29-33 (“To find . . . apiece”)
- B) Lines 37-41 (“After . . . hire”)
- C) Lines 42-46 (“The more . . . fool”)
- D) Lines 62-64 (“So what . . . skeptics do”)

38

The main distinction between the two possibilities discussed in lines 47-61 (“One . . . tellers”) is that the second possibility considers

- A) honesty to be of primary rather than secondary importance.
- B) skepticism to be a desirable trait rather than an undesirable one.
- C) interpersonal skills to be difficult rather than easy to assess.
- D) trusting people to be a cause rather than an effect of reliable lie detection.

39

As used in line 49, “spotting” most nearly means

- A) shaming.
- B) discerning.
- C) scheduling.
- D) locating.

40

As indicated by figure 1, what percent of senior managers are most trusting of job applicants?

- A) 7 percent
- B) 8 percent
- C) 36 percent
- D) 48 percent

41

Which statement best describes an important difference between the two surveys on which the figures are based?

- A) The first survey poses a question that is speculative in nature, while the second poses a specific, factual question.
- B) The first survey asks about dishonesty among managers, while the second asks about dishonesty among workers.
- C) The first survey samples senior managers only, while the second samples a broad cross section of managers.
- D) The first survey supports the idea that job applicants are generally trustworthy, while the second supports the idea that job applicants will try to engage in deception.

42

It can be inferred that the senior manager who “was skeptical and suspicious” (line 23) would likely fall into which section of figure 1?

- A) “don’t know” or “very often”
- B) “never” or “not very often”
- C) “somewhat often” or “not very often”
- D) “very often” or “somewhat often”

Questions 43-52 are based on the following passage.

This passage is adapted from Richard A. Kerr, “New Look at Ancient Mineral Could Scrap a Test for Early Oxygen.” ©2014 by American Association for the Advancement of Science.

Geologists trying to sniff out signs of oxygen in Earth’s early air have long struggled with a major obstacle: eons-old rocks that provide only a ragged, fragmentary record of the gas. Even so, some have for decades taken the presence of the mineral hematite in a so-called banded iron formation (BIF) in northwestern Australia as a sign that 2.5 billion years ago, Earth’s atmosphere had at least a trace of oxygen. The ruddy mineral was thought to record the moment when photosynthesis first pushed oxygen to levels high enough to fully oxidize iron. [Iron oxidation occurs when iron combines with oxygen to form a new compound, such as hematite.]

A study of that BIF, using the latest analytical techniques, suggests that this rock record has been misread. If this suggestion is true, oxygen actually may have appeared in the atmosphere hundreds of millions of years later than this BIF suggested. Geologists say the study raises serious questions about a supposedly reliable test. “People are recognizing that we have to be more careful,” says geochemist Timothy Lyons. “We need to increasingly focus on doing just what [these authors] did, a more careful characterization of samples.”

In a paper in the *Geological Society of America Bulletin*, geologists Birger Rasmussen, Bryan Krapež, and Daniela Meier reanalyze the mineral makeup of the Dales Gorge BIF, an ancient ocean bottom now in western Australia. Their original intent was to explain how run-of-the-mill BIFs like Dales Gorge turn into the iron-rich ores so heavily mined worldwide.

The team took 400 translucent slivers of Dales Gorge rock from four deep-drill cores and studied them with several kinds of modern optical microscopes, as well as with a scanning electron microscope equipped with an x-ray spectrometer for elemental analysis. That let the researchers see where each microscopic mineral in the rock formed and get a sense of the order of their creation. Knowing the conditions under which each mineral could form, the researchers could tell a tale about conditions in the ocean beneath which the BIF was first laid down—a time when oxygen gas may have been making its first, tentative appearance on Earth.

Their more detailed look at the rocks focused on hematite, which consists of iron combined with as much oxygen as iron’s bonds can hold. Because the Dales Gorge BIF has plenty of oxygen-rich hematite, earlier researchers concluded that oxygen gas from the atmosphere must have already been dissolved in the ocean and in the underlying sediments 2.5 billion years ago, when the makings of this BIF first settled to the ocean bottom.

But the Australian researchers see signs that the BIF’s hematite appeared later. Other iron-rich minerals—ones that, unlike hematite, form in the absence of oxygen gas—were there in the original seafloor sediments, the group argues. But they conclude that this iron was probably not oxidized, producing the hematite, until about 300 million years later, after tectonic forces crumpled the sea floor into mountains and drove oxygen-laden water down into the rock. Given that western Australia hosts the archetypal examples of BIFs in that early time, Rasmussen says, the Dales Gorge formation “probably records fundamental processes that also affected other BIFs at some time in their history.”

Others are not ready to go quite that far. BIF geologist Bruce Simonson praises the team’s “careful study and reasonable conclusions” but adds that “it would be premature to extrapolate their conclusions to all BIFs everywhere.” Even so, both he and Lyons see the new work as a warning shot. “Big stories [of oxygen’s history] have been told by small amounts of data,” Lyons says. Lately, “by being more careful, we’re seeing a more nuanced, more coherent picture.”

43

The author's main purpose in writing about the recent study of the Dales Gorge BIF is to

- A) give a detailed view of the advanced techniques the study employed.
- B) chastise researchers for relying too heavily on the work of their predecessors.
- C) suggest that scientific breakthroughs sometimes happen by chance.
- D) show how the study has led geologists to reconsider certain assumptions.

44

Over the course of the passage, the main focus shifts from

- A) a challenge to a long-standing hypothesis to a presentation of evidence in support of that hypothesis.
- B) a discussion of a specific study to an exploration of its potential applications.
- C) an outline of an accepted theory to a discussion of a study that challenged that theory.
- D) a critique of a research method to support for the method's findings.

45

As used in line 8, "trace" most nearly means

- A) established pattern.
- B) marked path.
- C) tiny amount.
- D) direct route.

46

The passage suggests that Lyons would most likely characterize previous studies of BIFs as

- A) dependent on weak methodology.
- B) revolutionary in advancing geological theory.
- C) completely disproven by later research.
- D) provable with further experimentation.

47

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 1-4 (“Geologists . . . gas”)
- B) Lines 9-13 (“The ruddy . . . hematite”)
- C) Lines 14-18 (“A study . . . suggested”)
- D) Lines 20-24 (“People . . . samples”)

48

According to the passage, the original intent of the Dales Gorge study was to

- A) demonstrate that mining of ore is environmentally safe.
- B) research the process by which BIFs became iron ores.
- C) devise a means of cataloging different types of BIFs.
- D) search for new mineral deposits on the ocean floor.

49

As used in line 41, “conditions” most nearly means

- A) agreements.
- B) stipulations.
- C) circumstances.
- D) qualifications.

50

It can reasonably be inferred from the passage that hematite

- A) might never have formed in the Dales Gorge BIF without the activity of tectonic forces.
- B) most likely appeared on Earth earlier than previous researchers believed.
- C) is necessary for oceanic ecologies to flourish.
- D) is solely found on the floor of the ocean.

51

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 38-40 (“That . . . creation”)
- B) Lines 46-48 (“Their . . . hold”)
- C) Lines 48-54 (“Because . . . bottom”)
- D) Lines 59-64 (“But they . . . rock”)

52

The passage indicates that a possible weakness of the Dales Gorge BIF study is that it

- A) fails to consider alternative approaches.
- B) overstates the implications of its results.
- C) relies excessively on complicated technology.
- D) examines a sample that was too varied.

STOP

**If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.**

Writing and Language Test

35 MINUTES, 44 QUESTIONS

Turn to Section 2 of your answer sheet to answer the questions in this section.

DIRECTIONS

Each passage below is accompanied by a number of questions. For some questions, you will consider how the passage might be revised to improve the expression of ideas. For other questions, you will consider how the passage might be edited to correct errors in sentence structure, usage, or punctuation. A passage or a question may be accompanied by one or more graphics (such as a table or graph) that you will consider as you make revising and editing decisions.

Some questions will direct you to an underlined portion of a passage. Other questions will direct you to a location in a passage or ask you to think about the passage as a whole.

After reading each passage, choose the answer to each question that most effectively improves the quality of writing in the passage or that makes the passage conform to the conventions of standard written English. Many questions include a “NO CHANGE” option. Choose that option if you think the best choice is to leave the relevant portion of the passage as it is.

Questions 1-11 are based on the following passage.

Geographic Information Systems: Helping Urban Foresters Help Cities

Urban forestry is a branch of forestry that focuses on the study and management of the relationship between an urban area and its surrounding ecosystems. Urban foresters view trees as crucial to maintaining quality of life for city dwellers. Trees beautify cities. **1** However, they provide environmental benefits like reducing pollution, minimizing erosion, and **2** the conservation of water.

1

- A) NO CHANGE
- B) Nonetheless,
- C) Conversely,
- D) In addition,

2

- A) NO CHANGE
- B) water-conserving benefits.
- C) water conservation.
- D) conserving water.

Foresters have long used hand tools such as hypsometers **3** (of which there are several types) and increment borers (which allow them to collect samples from tree trunks). While these tools are still important, a new high-tech resource has recently joined their ranks. Geographic information systems (GIS) technology uses photographs taken by satellites to create maplike images of forests. Urban foresters utilize similar **4** informative satellite-generated images to provide information about the current state of a city's resources and to make projections about future conditions.

GIS technology allows urban **5** foresters; to demonstrate the financial benefits of conservation to city planners and other officials. For example, urban forester Gary Moll developed a GIS-based system called CITYgreen, which he used to measure tree **6** loss—in the Atlanta, Georgia, area. Tree loss increases storm-water runoff, which in turn can increase erosion

3

Which choice provides an example that is most similar to the other example in the sentence?

- A) NO CHANGE
- B) (which help them measure tree height)
- C) (some of which have laser range finders)
- D) (most foresters have more than one)

4

- A) NO CHANGE
- B) photographic satellite images
- C) useful satellite images of cities
- D) images

5

- A) NO CHANGE
- B) foresters to demonstrate. The
- C) foresters to demonstrate the
- D) foresters: to demonstrate the

6

- A) NO CHANGE
- B) loss, in the Atlanta
- C) loss in the Atlanta
- D) loss in the Atlanta,

and flooding and harm native wildlife. Using CITYgreen, Moll determined that in a fourteen-year period the effects of tree loss had cost the area \$2 billion. Data based on CITYgreen's GIS images also helped Moll persuade city planners that **7** one could avoid the expense of building a new storm-water treatment facility if enough trees were conserved. Motivated by these potential savings, city officials **8** implemented a comprehensive urban forestry plan.

GIS helps urban foresters perform another essential **9** function. That function is maintaining a thorough inventory of a city's trees. Using GIS, urban foresters can

7

- A) NO CHANGE
- B) he or she
- C) they
- D) we

8

- A) NO CHANGE
- B) were implementing
- C) had implemented
- D) would be implementing

9

Which choice most effectively combines the sentences at the underlined portion?

- A) function that includes
- B) function; that is
- C) function:
- D) function, and that function is

plot tree locations on a map. This information helps them determine which trees need to be removed because of undesirable placement, where more trees should be planted, and exactly how many trees will be affected by the construction of a building, widening of a street, or development of a park. **10** Knowing the consequences of choosing a certain site for construction enables planners to make responsible decisions about city growth.

Urban foresters work to balance environmental conservation with the economic and physical demands of rapidly growing and changing urban spaces. GIS remains an essential tool for implementing smart and advantageous city planning decisions. As Moll notes,

11 “Urban forests and green infrastructure are part of the city ecosystem.”

10

At this point, the writer is considering adding the following sentence.

This is a big responsibility; there are 338 parks within the Atlanta city limits, with plans under way to build more.

Should the writer make this addition here?

- A) Yes, because it ties the content of this paragraph to the content of the previous paragraph.
- B) Yes, because it shows that Atlanta is a growing metropolis in need of urban foresters.
- C) No, because it blurs the paragraph’s focus on the importance of thorough tree inventories.
- D) No, because it contradicts a claim made earlier in the passage.

11

The writer wants a concluding sentence that uses a quotation from Moll to support the main idea of the passage. Which choice most effectively accomplishes this purpose?

- A) NO CHANGE
- B) “GIS shows the relationships between social systems and ecosystems and offers a means for us to weave the city structure into the natural system.”
- C) “People who have done their part to heal the environment have a right to expect similar performance from their political leaders.”
- D) “The first step is to understand how the natural system functions, and the second is to understand the human network’s real needs.”

Questions 12-22 are based on the following passage and supplementary material.

A Pet May Really Be a Child's Best Friend

With the growing prevalence of certain types of allergies in children, parents may understandably be hesitant to acquire pets for their households. The National Center for Health Statistics recently reported that diagnoses of certain types of allergies in children **12** are increasing from 1997 to 2011. The center tracked the proportion of children having a respiratory, skin, or food allergy. As shown in the graph, **13** respiratory allergies, skin allergies, and food allergies all became more common in children over the fifteen years studied. The graph also shows that, of the three types of allergies tracked between 1997 and 2011, **14** food allergies affected the fewest children. Mindful that respiratory allergies, such as an allergy to pet dander, can **15** enrage some types of asthma, the Environmental Protection Agency advises that “the most effective method to control animal allergens in the home is to not allow animals in the home.”

12

- A) NO CHANGE
- B) increased
- C) would increase
- D) have been increasing

13

Which choice offers an accurate interpretation of the data in the graph?

- A) NO CHANGE
- B) skin allergies became more common in children over the fifteen years studied, while food allergies became less common.
- C) skin allergies and food allergies became more common in children over the fifteen years studied.
- D) respiratory allergies became more common in children over the fifteen years studied, while skin allergies remained steady.

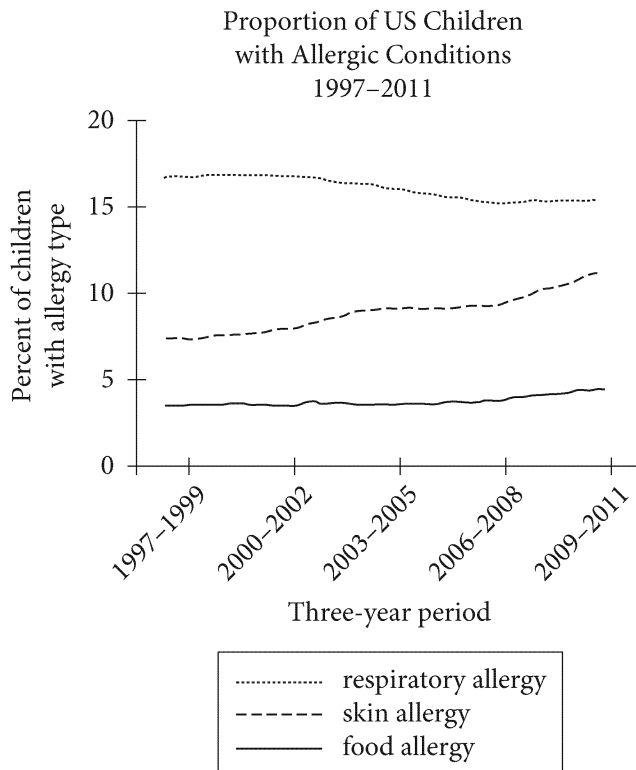
14

Which choice uses the data in the graph most effectively to support the main point of the paragraph?

- A) NO CHANGE
- B) respiratory allergies remained the most common.
- C) skin allergies were on pace to affect the most children in the years to come.
- D) none affected more than 20 percent of children.

15

- A) NO CHANGE
- B) embellish
- C) exacerbate
- D) enlarge



Adapted from National Center for Health Statistics, *Data Brief Number 121*, US Department of Health and Human Services, Centers for Disease Control and Prevention. Published in 2013.

A recent study linking dog ownership with the development of a stronger immune system, however, may persuade parents of children who lack pet-specific allergies to consider pet ownership. While studying the asthma-linked respiratory syncytial virus (RSV) in mice, **16** some interesting observations about pet-related bacteria found in household dust were made by researchers at the University of California, San Francisco, specifically regarding the relationship between bacteria

16

- A) NO CHANGE
- B) researchers at the University of California, San Francisco, made some interesting observations about pet-related bacteria found in household dust,
- C) pet-related bacteria found in household dust were the subject of interesting observations made by researchers at the University of California, San Francisco,
- D) household dust that researchers at the University of California, San Francisco, found to contain pet-related bacteria was the subject of interesting observations,

and infection. The researchers exposed one group of mice to dust from homes with dogs; another group was not exposed to the dust. After eight days, each group was exposed to RSV. The mice that had been exposed to the dust did not show symptoms of RSV infection and were similar in this respect to mice from a third group, which had not been exposed to RSV at all. **17** Further study of the group of mice exposed to the dust revealed that the gastrointestinal (GI) tracts of mice in this group harbored more diverse strains of bacteria than did **18** that of mice in either of the other two groups. This last finding is potentially important because in humans the presence of a wide range of microorganisms in the GI tract is well known to defend against certain pathogens.

Extrapolating from these results, the researchers hypothesized that the **19** greater the variety of different bacteria a child comes in contact with while the immune system is maturing, the less likely it is that the child will develop specific diseases during childhood. The **20** scientists, involved in this recent study, offered no definitive recommendations about pet **21** ownership, concerned parents are well advised to consult a physician before getting a pet. **22** Still, parents previously reluctant to consider a pet might now have a reason to reconsider their decision.

17

- A) NO CHANGE
- B) More looking at
- C) Having a better look at
- D) Getting more of a handle on

18

- A) NO CHANGE
- B) those of
- C) strains in
- D) DELETE the underlined portion.

19

- A) NO CHANGE
- B) greater the variety of
- C) more various different
- D) more different varieties of

20

- A) NO CHANGE
- B) scientists—involved in this recent study—
- C) scientists involved in this recent study,
- D) scientists involved in this recent study

21

- A) NO CHANGE
- B) ownership, and concerned parents are
- C) ownership; concerned parents being
- D) ownership; with concerned parents

22

- A) NO CHANGE
- B) Besides,
- C) In addition,
- D) Instead,

Questions 23-33 are based on the following passage.

Get Lost in Translation

In 2008, Horace Engdahl, then secretary of the Swedish Academy and judge for the Nobel Prize in Literature, made a provocative claim about the state of writing in the United States. “The US is too isolated, too insular,” he said. “They don’t translate enough and don’t really participate in the big dialogue of literature.”

23 Some literary critics sought to clarify what Engdahl referred to as “the big dialogue of literature.” Engdahl’s critics were quick to point out that the United States is a linguistically diverse nation: more than 60.6 million US residents speak a language other than English in their homes. However, those who follow trends in the US publishing industry might **24** confess Engdahl’s point on the issue of translation. Despite the wealth of languages spoken within US borders, only 3 percent of books published annually by US presses are translations of global literature. By comparison, European countries are far more likely to publish books by international writers. The translation advocacy group Literature Across Frontiers reports that translations account for roughly 45 percent of books published in Poland, nearly 25 percent of those published in Spain, and 15 percent of those published in France.

23

Which choice provides the most effective transition into the next point?

- A) NO CHANGE
- B) Not everyone believed Engdahl should serve as a judge for the Nobel Prize.
- C) The comment irked many in the US literary community.
- D) The facts about the publishing industry, on the other hand, tell a different story.

24

- A) NO CHANGE
- B) cease
- C) betray
- D) concede

Books don't just provide knowledge or

25 entertainment: studies suggest that reading literature

is **26** correlated by the development of empathy.

Researchers have found that individuals who read fiction are better at imagining lives and experiences outside of their own. **27** Moreover, by encountering alternative

25

- A) NO CHANGE
- B) entertainment, studies suggest
- C) entertainment. Studies suggesting
- D) entertainment; studies suggesting

26

- A) NO CHANGE
- B) a correlation upon
- C) correlated for
- D) correlated with

27

At this point, the writer is considering adding the following sentence.

Other researchers, however, contend that animated children's books designed for tablets and e-readers may not offer the same benefits.

Should the writer make this addition here?

- A) Yes, because it provides an example of a kind of reading experience that may not offer the same benefits that reading global literature does.
- B) Yes, because it develops the paragraph's response to a counterargument about animated children's books designed for tablets and e-readers.
- C) No, because it detracts from the paragraph's overview of some of the advantages provided by reading literature.
- D) No, because it blurs the paragraph's focus on describing how books provide knowledge and entertainment.

ways of living through literature, **28** greater possibilities can be imagined for their own lives.

29 Professor Caroline Levine, an editor of *The Norton Anthology of World Literature*, argues that reading literature in translation provides access to new ways of thinking: “Unfamiliar literary worlds are among the most effective ways to encounter values and expectations that are strange and unexpected.” While global literature brings us closer to the unfamiliar,

30 they also serve to reinforce cross-cultural

28

- A) NO CHANGE
- B) greater possibilities can be imagined by readers
- C) there’s the ability for readers to envision greater possibilities
- D) readers may be able to envision greater possibilities

29

Which choice most effectively introduces the topic of the paragraph and advances the passage’s main argument?

- A) Alternately, some readers prefer to seek out characters and narratives with which they can identify, choosing to reinforce instead of challenge their worldviews.
- B) Translation advocates argue that these advantages extend even further when a reader engages with global literature.
- C) Organizations such as Words Without Borders work to make connections between US readers and international writers.
- D) Although US readers may not have access to much translated literature, they have many other books to read instead.

30

- A) NO CHANGE
- B) it also serves
- C) it also serve
- D) these also serve

commonalities. “We read not to encounter the Other,”

31 writes Ethiopian American novelist Dinaw Mengestu, “but to see ourselves refracted in a different landscape, in a different time, in shoes and clothes that perhaps bear no resemblance to our own.”

Due to **32** globalization, people, goods, currency, and ideas, flow regularly across borders. If US readers make a dedicated effort to consume more global literature, **33** it’s hypothetically possible that the sales figures for books written by US authors may, in turn, decrease.

31

- A) NO CHANGE
- B) writes the Ethiopian American author, novelist, and writer Dinaw Mengestu,
- C) Dinaw Mengestu, an author who is Ethiopian American and writes novels, writes,
- D) an Ethiopian American novelist who is named Dinaw Mengestu writes,

32

- A) NO CHANGE
- B) globalization, people, goods, currency, and ideas flow
- C) globalization people goods currency and ideas flow
- D) globalization people, goods currency and ideas flow,

33

The writer wants to conclude the passage with an optimistic outlook on the issue discussed in the passage. Which choice most effectively accomplishes this goal?

- A) NO CHANGE
- B) they may have a hard time finding materials to read because the US publishing industry produces so few translations each year.
- C) it may still be difficult to measure whether any of the claims about the benefits of reading translations are true.
- D) US presses may become more invested in publishing it, thus paving the way for increased US participation in “the big dialogue of literature.”

Questions 34-44 are based on the following passage.

Turn Back the Clocks

Daylight saving time (DST), the practice in most regions of the United States of setting clocks ahead one hour in March and back one hour in the fall, is detrimental to businesses and the workers they employ. Studies show that DST disrupts people's circadian rhythms—the natural cycles of activity and sleep—and leads to fatigue and an increase in workplace accidents. Because the drawbacks of DST are far more serious than any purported advantages, the practice should be abandoned.

On the Sunday night following the one-hour time change every March, Americans sleep 40 minutes fewer than average, since they tend to fall asleep later but wake up on time. **34** Forty minutes may not sound like much, but even a small loss of sleep has been shown to decrease the ability of people to concentrate, **35** making sound decisions, and respond quickly to their environment. When the majority of workers are tired, the effects are readily **36** apparent, loss of sleep not only lowers productivity but also leads to injuries. A 2009 study

34

The writer is considering deleting the underlined portion and capitalizing the next word. Should the portion be kept or deleted?

- A) Kept, because it acknowledges a likely objection to the writer's argument.
- B) Kept, because it provides a supporting detail for a general claim made in the previous sentence.
- C) Deleted, because it undermines a claim made later in the sentence.
- D) Deleted, because it fails to identify who might hold the opinion it expresses.

35

- A) NO CHANGE
- B) in making
- C) make
- D) to make

36

- A) NO CHANGE
- B) apparent: loss of sleep
- C) apparent, loss of sleep,
- D) apparent—loss of sleep,

found that the number of injuries reported at a coal mine on the Monday following the time change in March was 5.7 percent higher than average and that those injuries were more severe than average. **37** Moreover, though sleep-related workplace accidents are most prevalent during the few days immediately following the March time shift, one 2007 study found that people's circadian rhythms were disrupted during the entire duration of DST, suggesting that workers could be chronically fatigued until the shift back to standard time.

The main goal of DST when it was instituted decades ago—to **38** reduce and minimize overall energy consumption by taking advantage of as much daylight as **39** possible; is not, a good argument for keeping the practice. It is true that on summer evenings, people get an extra hour of daylight and **40** otherwise don't have to

37

- A) NO CHANGE
- B) To sum up,
- C) On the other hand,
- D) However,

38

- A) NO CHANGE
- B) reduce by minimizing
- C) reduce
- D) have a reduction of

39

- A) NO CHANGE
- B) possible is not
- C) possible—is not
- D) possible; is not

40

- A) NO CHANGE
- B) additionally
- C) unfortunately
- D) therefore

turn lights on as early. **41** However, such energy savings are negated by the fact that people end up using more air-conditioning. Compared with the disadvantages of DST, the advantage of having more daylight in the evening does not make the practice worthwhile.

[1] Abolishing DST would require action by the government. [2] Individual states can opt out of DST through legislation or through an executive order by the governor. [3] However, for travel and communication reasons, a patchwork system is problematic. [4] Indeed, some **42** states—including Arizona and Hawaii, have already done so, and others may soon join them. [5] An act of Congress is needed to change the federal law that instituted DST, but the benefits that would be conferred **43** for tired workers are worth the effort. [6] DST should be abolished nationwide. **44**

41

The writer wants to include a statement that directly refutes the claim that DST helps reduce energy consumption. Which choice most effectively accomplishes this goal?

- A) NO CHANGE
- B) In addition, people tend to go out on summer evenings—either socializing or shopping—and that keeps their electricity usage down.
- C) However, by using more efficient lightbulbs, people can save electricity regardless of when they switch the lights on.
- D) Besides that, longer summer days generally lead to greater water usage.

42

- A) NO CHANGE
- B) states; including Arizona
- C) states; including Arizona,
- D) states, including Arizona

43

- A) NO CHANGE
- B) on
- C) with
- D) by

44

To make the paragraph most logical, sentence 4 should be placed

- A) where it is now.
- B) before sentence 1.
- C) after sentence 2.
- D) after sentence 5.

STOP

**If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.**



Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

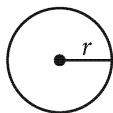
DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding bubble on your answer sheet. For questions 16-20, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

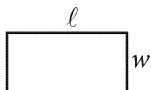
1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

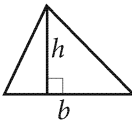


$$A = \pi r^2$$

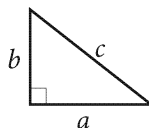
$$C = 2\pi r$$



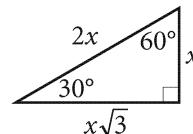
$$A = \ell w$$



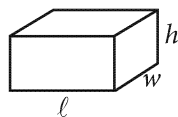
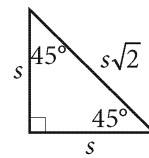
$$A = \frac{1}{2}bh$$



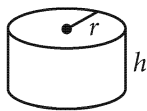
$$c^2 = a^2 + b^2$$



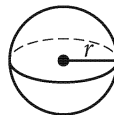
Special Right Triangles



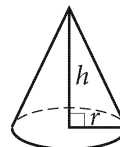
$$V = \ell wh$$



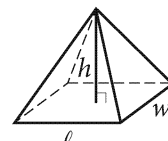
$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}\ell wh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.



1

$$x + y = 10$$

$$x - y = 8$$

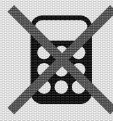
If (x_1, y_1) is the solution to the system of equations above, what is the value of y_1 ?

- A) 9
- B) 2
- C) 1
- D) -1

2

A sports drink is sold in cans with capacities of 10 fluid ounces and 14 fluid ounces. A shipment of 54 cans of these sizes, totaling 636 fluid ounces of the sports drink, arrives at a store. Which of the following systems of equations could be used to determine the number of cans of each size in the shipment, where x is the number of 10-fluid-ounce cans and y is the number of 14-fluid-ounce cans?

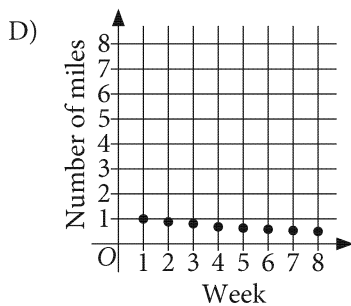
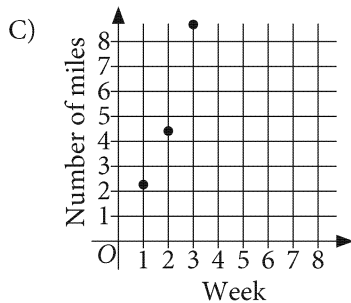
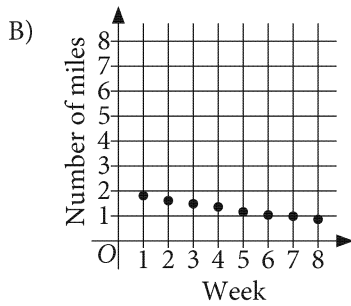
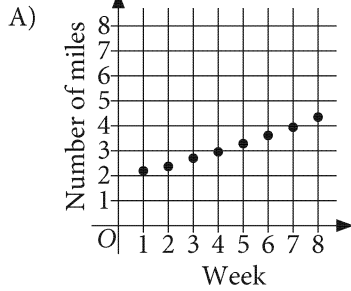
- A) $10x + 14y = 636$
 $x + y = 54$
- B) $10x + 14y = 54$
 $x + y = 636$
- C) $24xy = 636$
 $x + y = 54$
- D) $24xy = 54$
 $x + y = 636$



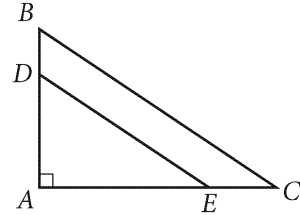
3

$$y = 2(1.1)^x$$

The equation above models the number of miles, y , that Jenna plans to run on week x of an 8-week training regimen. Which of the following graphs models this situation?



4



In the figure above, $AD = 4$, $AE = 6$, and segment DE is parallel to segment BC . What is the ratio of the length of segment BD to the length of segment CE ?

- A) 2:5
- B) 3:5
- C) 2:3
- D) 1:2



5

Claire, a metalsmith, has 500 grams (g) of sterling silver. She wants to use the sterling silver to create at least 20 rings and at least 10 bracelets. She uses 3 g of sterling silver to create each ring and 40 g of sterling silver to create each bracelet. Which of the following systems of inequalities represents this situation, where r is the number of rings and b is the number of bracelets Claire can create with the sterling silver?

- A) $3r + 40b \leq 500$
 $r \geq 3$
 $b \geq 40$
- B) $3r + 40b \leq 500$
 $r \geq 20$
 $b \geq 10$
- C) $20r + 10b \leq 500$
 $r \geq 3$
 $b \geq 40$
- D) $20r + 10b \leq 500$
 $r \geq 20$
 $b \geq 10$

6

The height of an airplane, in feet, while it is in the process of landing is modeled by the equation $h(t) = 13,200 - 11t$, where t is the time, in seconds, since the landing process began. What is the meaning of the value 13,200 in the equation?

- A) The distance the airplane travels while it is landing
- B) The rate of descent of the airplane while it is landing
- C) The speed of the airplane at the start of the landing process
- D) The height of the airplane at the start of the landing process

7

Which of the following expressions is equivalent to $(x - 6)(x + 1) - 3(x - 2)$?

- A) $x^2 - 8x$
- B) $x^2 - 10x$
- C) $x^2 - 8x - 12$
- D) $x^2 - 10x - 12$



8

In the function f defined by $f(x) = x^2 + 5x + t$, what must t represent?

- A) The maximum value of f
- B) The minimum value of f
- C) The x -intercept of the graph of f in the xy -plane
- D) The y -intercept of the graph of f in the xy -plane

9

$$\sqrt{3-x} + 2 = x - 1$$

What is the solution of the equation above?

- A) $x = 1$ only
- B) $x = 2$ only
- C) $x = 3$ only
- D) $x = 2$ and $x = 3$

10

Sam needs to rent a truck to move furniture. Rental Truck Company A charges \$29 per day plus \$0.60 per mile driven. Rental Truck Company B charges \$59 per day and has no charge per mile driven. Sam will rent the truck for 3 days and drive a total of x miles. The solution to which of the following inequalities is all values of x for which the total charge for renting from Company B will be less than the total charge for renting from Company A?

- A) $x > 50$
- B) $x > 107$
- C) $x > 150$
- D) $x > 440$

11

The binomial $x + 2y$ is a factor of which of the following?

- A) $x^2 + 3xy + 2y^2$
- B) $x^2 + 3xy + 3y^2$
- C) $x^2 + 6xy + 6y^2$
- D) $x^2 + 6xy + 9y^2$



12

If $N = \frac{x^2 + x - 6}{x^2 - x - 12} = \frac{x - 2}{x - 4}$ and $N \geq 0$, which of the following must be true?

- A) $x \neq -4$
- B) $x \neq -3$
- C) $x \neq 1$
- D) $x \neq 2$

13

**ENROLLMENT IS OPEN
AT OUR TUTORING CENTER!**

Tuition:

\$25 per student for each tutoring session
Each tutoring session lasts an hour

Discounts:

- First session is free for all new students
- Family discount: 10% off tuition if you enroll more than one child

Books and Supplies: \$20 per student

The figure above shows an advertisement for a tutoring center. The tutoring center allows the two discounts to be used together. A family enrolls two children in the tutoring center program, each for the first time. If each child is signed up for x tutoring sessions, not including the first free session, which of the following functions represents the family's total cost $c(x)$, in dollars?

- A) $c(x) = 45x + 40$
- B) $c(x) = 45x - 5$
- C) $c(x) = 22.5x + 20$
- D) $c(x) = 22.5x - 2.5$

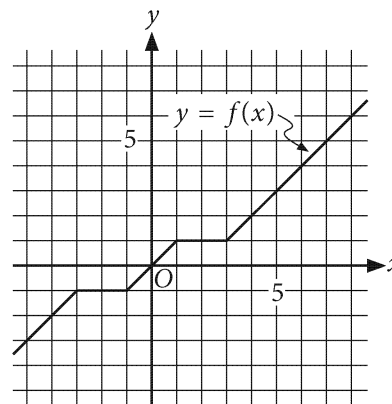


14

If $x > 0$ and $\sqrt{x}\sqrt{x} = x^a$, what is the value of a ?

- A) $\frac{3}{2}$
- B) $\frac{3}{4}$
- C) $\frac{1}{2}$
- D) $\frac{1}{4}$

15




The complete graph of the function f is shown in the xy -plane above. What is the y -intercept of the graph of $y = f(x - 2)$?

- A) -1
- B) 0
- C) 1
- D) 2

DIRECTIONS

For questions 16-20, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
2. Mark no more than one bubble in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
6. **Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Answer: $\frac{7}{12}$ are:

Write
answer in
boxes.

→	7	/	1	2
	0	0	0	
1	1		1	
2	2	2		
3	3	3	3	
4	4	4	4	
5	5	5	5	
6	6	6	6	
	7	7	7	
8	8	8	8	
9	9	9	9	

← Fraction line

Answer: 2.5

	2	.	5
/	/	/	/
.	.	.	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

← Decimal point

Grid in
result.

Acceptable ways to grid $\frac{2}{3}$ are:

	2	/	3

.	6	6	6
	/	/	
	+	+	+
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6			
7	7	7	7
8	8	8	8

.	6	6	7
	/	/	
	*	*	*
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6			6
7	7	7	
8	8	8	8

Answer: 201 – either position is correct

	2	0	1
	/	/	
.	.	.	.
	0		0
1	1	1	
2		2	2
3	3	3	3

2	0	1	
	/	/	
.	.	.	.
		0	0
1	1		1
	2	2	2
3	3	3	3

NOTE:

You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.



16

$$10 = 2.5(3y - 2)$$

According to the equation above, what is the value of y ?

17

The surface area, S , of a cylinder with a radius of 5 is defined by $S = 2\pi(5^2) + 2\pi(5)h$, where h is the height of the cylinder. If the equation is rewritten in the form $h = \frac{S}{x} - y$, where x and y are constants, what is the value of y ?

18

In the unit circle with center O , the length of arc \widehat{PQ} is $\frac{\pi}{3}$. What is the value of the cosine of $\angle POQ$?



19

Janelle is shipping CDs to remote employees. She has two identical boxes filled with packing material that each weigh 3.2 ounces before packing them with CDs. She packed each box with the same number of CDs that each weigh 0.55 ounce. The total weight for the two boxes packed with CDs was 17.4 ounces. What is the total number of CDs that Janelle packed in the two boxes?

20

In the complex number system, what is the quotient

when $\frac{i^4 - 16}{i^4 - 25}$ is divided by $\frac{i^2 - 4}{i^2 - 9}$? (Note: $i = \sqrt{-1}$)

STOP

**If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.**



Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

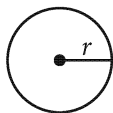
DIRECTIONS

For questions 1-30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding bubble on your answer sheet. For questions 31-38, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

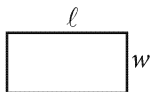
1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

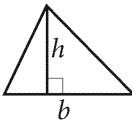


$$A = \pi r^2$$

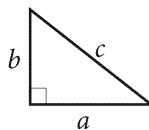
$$C = 2\pi r$$



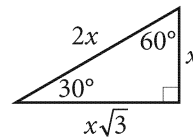
$$A = \ell w$$



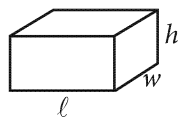
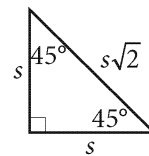
$$A = \frac{1}{2}bh$$



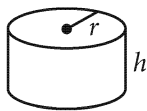
$$c^2 = a^2 + b^2$$



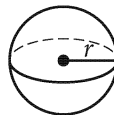
Special Right Triangles



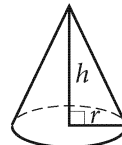
$$V = \ell wh$$



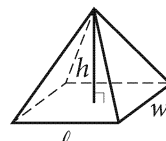
$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}\ell wh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.



1

$$2x(3x^3 - x + 5)$$

Which of the following expressions is equivalent to the one above?

- A) $5x^3 - x + 5$
- B) $6x^3 - x + 5$
- C) $5x^4 - x^2 + 7x$
- D) $6x^4 - 2x^2 + 10x$

2

A recipe recommends cooking a roast between 35 and 45 minutes per pound. Which of the following cooking times for a 10-pound roast follows the recommendation?

- A) 100 minutes
- B) 300 minutes
- C) 400 minutes
- D) 500 minutes

3

Fred wants to save enough money to pay for a car that costs \$7,500 and 12 months of insurance that cost \$110 per month. Fred has already saved \$6,000 and plans to save an additional \$350 per month. Which inequality can be used to determine the number of months, x , Fred could save in order to have enough money to buy the car and pay for 12 months of insurance?

- A) $7,500 - 110x \leq 6,000 - 250(12)$
- B) $7,500 + 110x \leq 6,000 + 250(12)$
- C) $7,500 - 110(12) \leq 6,000 - 350x$
- D) $7,500 + 110(12) \leq 6,000 + 350x$

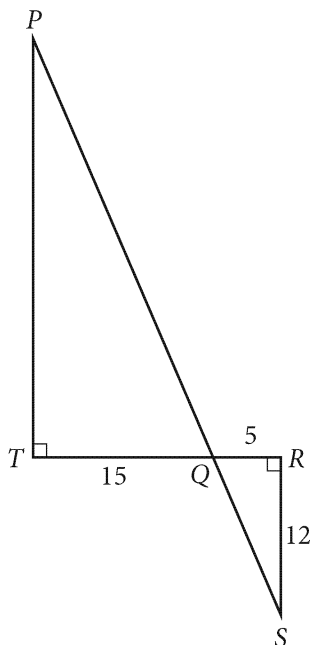
4

If $t^2 - 7t = 18$ and $t > 0$, what is the value of t ?

- A) 9
- B) 8
- C) 5
- D) 2



5



What is the length of \overline{PQ} in the figure above?

- A) 36
- B) 39
- C) $\sqrt{250}$
- D) $\sqrt{369}$

Questions 6 and 7 refer to the following information.

Website P: $y = 0.65x + 1,000$

Website Q: $y = 0.5x + 1,450$

A company wants to place advertisements on two social media websites. The cost to place an advertisement on each site consists of an initial start-up fee plus a fee every time the advertisement is clicked. The equations above show the cost y , in dollars, to place an advertisement that receives x clicks on each site.

6

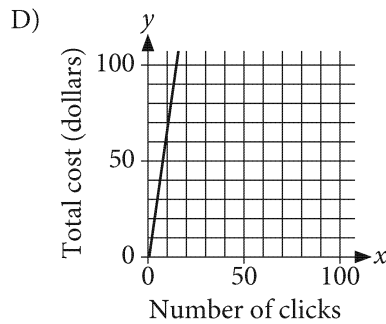
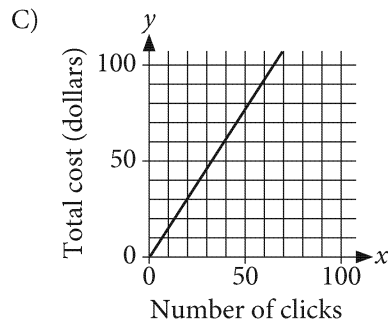
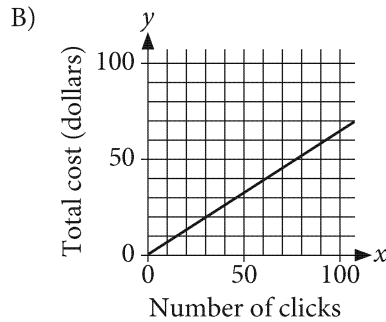
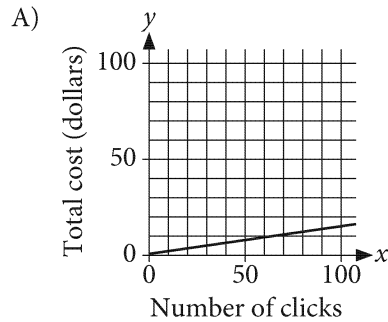
The company has a total budget of \$5,000 to place an advertisement on Website Q. What is the maximum number of clicks the advertisement can receive on Website Q without going over budget?

- A) 1,775
- B) 7,100
- C) 10,000
- D) 12,900



7

The company is also considering placing an advertisement on Website R. Website R charges no initial fee, but charges the same amount as Website P every time the advertisement is clicked. Which of the following graphs represents the cost y , in dollars, of placing an advertisement that receives x clicks on Website R?





8

A sports agent, Ann, earns a commission equal to 10 percent of the salary of each athlete she represents. If her commission from an athlete she represents is \$4,575.00, what is that athlete's salary?

- A) \$45.75
- B) \$457.50
- C) \$45,750.00
- D) \$457,500.00

9

Newton's second law of motion states that a force, F , acting on an object of mass m results in an acceleration, a , and can be represented using the equation $F = ma$. If mass is measured in kilograms (kg), and acceleration is measured in meters per second squared $\left(\frac{\text{meter}}{\text{sec}^2}\right)$, which of the following units could be used to measure force?

- A) $\frac{\text{kg} \cdot \text{meter}}{\text{sec}^2}$
- B) $\frac{\text{kg} \cdot \text{sec}^2}{\text{meter}}$
- C) $\frac{\text{meter}}{\text{kg} \cdot \text{sec}^2}$
- D) $\text{kg} \cdot \text{meter} \cdot \text{sec}^2$



10

Isabel began charging her phone battery when it was 40% charged. After 48 minutes, her phone battery was 80% charged. If the phone battery charges at a constant rate, how many more minutes will it take for her phone battery to be exactly 90% charged?

- A) 4
- B) 8
- C) 10
- D) 12

11

$$x + 2y = 1$$

The graph of the equation above is a line in the xy -plane. In which of the following equivalent forms of the equation does the y -intercept appear as a constant of coefficient?

- A) $x + 2y - 1 = 0$
- B) $y = \frac{1}{2} - \frac{1}{2}x$
- C) $2y = 1 - x$
- D) $x = 1 - 2y$

12

Students and teachers from Pine Brook Elementary School are going on a field trip to the zoo. Admission to the zoo will cost \$7.50 for each student and \$12 for each adult. It will cost a total of \$681 for all 86 people on the field trip for admission to the zoo. How many students are going on the field trip?

- A) 29
- B) 70
- C) 78
- D) 91

13

137, 163, 115, 137, 179, 155, 171

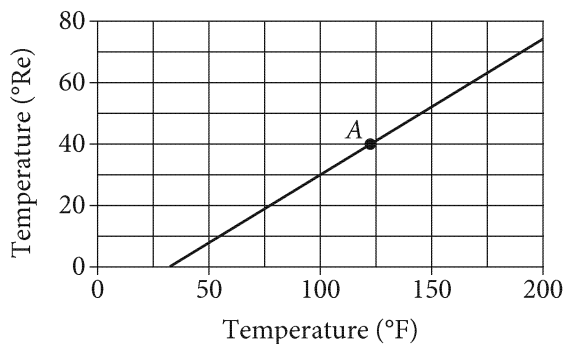
A geologist recorded the heights, in feet, of a geyser's eruptions over a twelve-hour period. The heights are given in the list above. What is the median height recorded by the geologist?

- A) 115
- B) 137
- C) 151
- D) 155



14

Relationship between
Degrees Réaumur and Degrees Fahrenheit



The graph above shows the function r that relates the temperature $r(x)$, measured in degrees Réaumur, and the temperature x , measured in degrees Fahrenheit. If $A(122, 40)$ is a point on the graph of r , which of the following must be true?

- A) A temperature of 122 degrees Réaumur corresponds to a temperature of 40 degrees Fahrenheit.
- B) A temperature of 40 degrees Réaumur corresponds to a temperature of 122 degrees Fahrenheit.
- C) For every increase of 40 degrees Fahrenheit, there is an increase of 122 degrees Réaumur.
- D) For every increase of 40 degrees Réaumur, there is an increase of 122 degrees Fahrenheit.

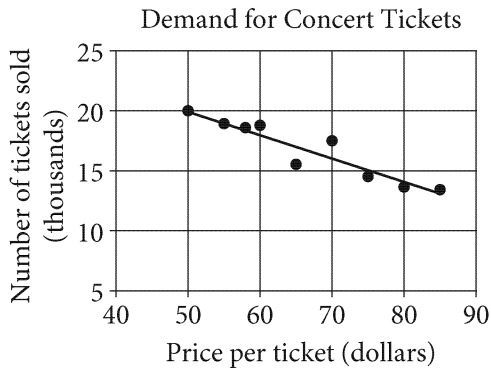
15

If $a + b = 14$ and $a^2 - b^2 = 56$, what is the value of $a - b$?

- A) 2
- B) 4
- C) 5
- D) 9



Questions 16 and 17 refer to the following information.



The scatterplot above shows the relationship between the number of tickets sold and the price per ticket for 9 different concerts. The line of best fit is also shown.

16

Which of the following is closest to the mean number of tickets sold for the 9 concerts shown in the scatterplot?

- A) 20,000
- B) 17,000
- C) 15,000
- D) 13,000

17

For a concert where the ticket price was \$100, the line of best fit correctly predicted the number of tickets sold. How many tickets were sold for that concert?

- A) 6,000
- B) 8,000
- C) 10,000
- D) 12,000

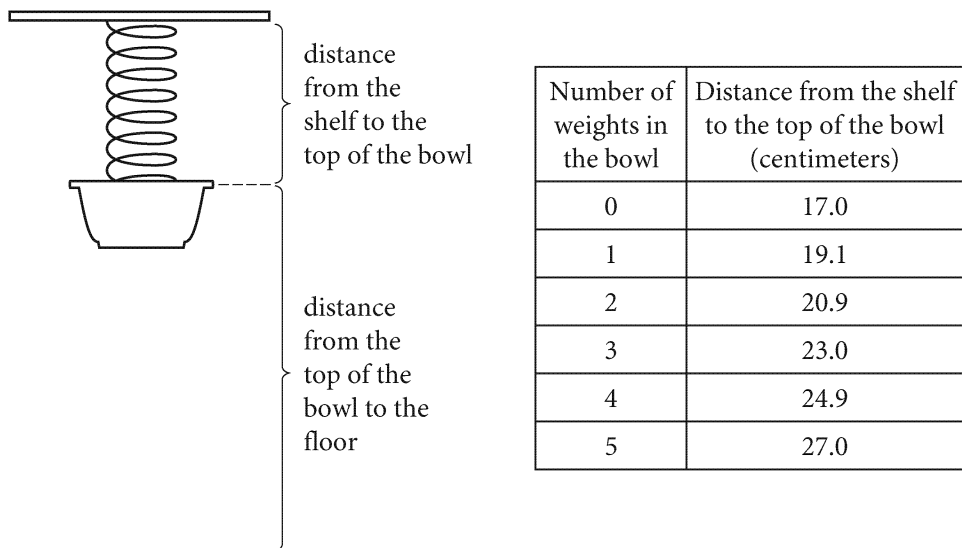
18

If $\frac{2}{5}$ of $10x$ is 6 more than x , what is the value of x ?

- A) 2
- B) 3
- C) 4
- D) 6



Questions 19 and 20 refer to the following information.



In the figure on the left above, a bowl is suspended by a spring from a horizontal shelf. When identical cylindrical weights are placed in the bowl, the spring extends so that the bowl becomes closer to the floor and farther from the shelf. The table on the right above gives a student's measurements of the distances from the shelf to the top of the bowl when various numbers of the weights were in the bowl.



19

Based on the table, each time one of the cylindrical weights is added to the bowl, by approximately how many centimeters does the distance from the top of the bowl to the floor decrease?

- A) 0.5
- B) 1.0
- C) 2.0
- D) 3.5

20

The function $d(n) = cn + b$, where c and b are constants, models the distance $d(n)$, in centimeters, from the shelf to the top of the bowl when n weights are in the bowl. If $g(n) = tn + w$, where t and w are constants, models the distance $g(n)$, in centimeters, from the top of the bowl to the floor when n weights are in the bowl, which of the following must be closest to c ?

- A) t
- B) w
- C) $-t$
- D) $-w$

21

Class	Native continent	
	Australia	Africa
Mammals	8	6
Reptiles	9	17
Birds	27	23

The table above shows the numbers of animals classified by class and native continent for all 90 animals at a local zoo. What fraction of the reptiles are native to Australia?

- A) $\frac{1}{10}$
- B) $\frac{9}{44}$
- C) $\frac{13}{45}$
- D) $\frac{9}{26}$



22

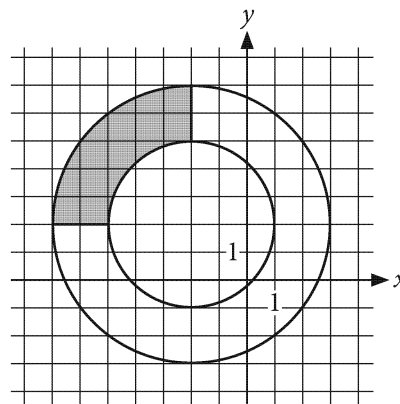
Ages of Participants

36	55	42
25	15	31
25	38	49
44	37	69
15	37	77
32	28	72

A journal article reported the mean age of participants in a study. The ages of the 18 participants in the study are given in the table above. Which of the following statements best describes why the mean age of participants alone may not be a useful measure of center for the distribution?

- A) Outliers may cause the distribution to be skewed.
- B) Repeated numbers may cause the distribution to be skewed.
- C) The number of participants is too small to calculate and report the mean.
- D) Sets containing an even number of data points may cause the distribution to be skewed.

23

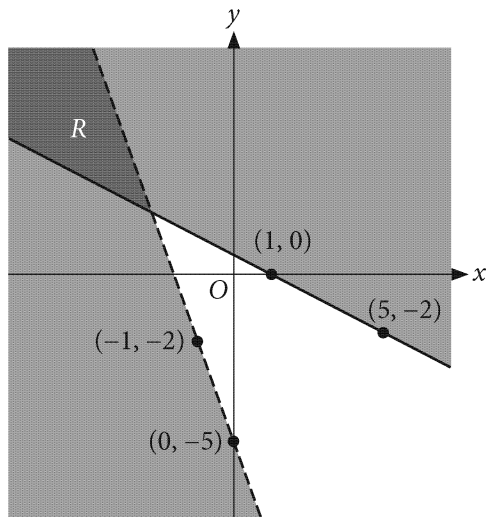


Each circle shown in the xy -plane above has center $(-2, 2)$, and their radii are 3 and 5. What is the area of the shaded region?

- A) 3π
- B) $\frac{7}{2}\pi$
- C) 4π
- D) $\frac{9}{2}\pi$



24



The shaded region R in the xy -plane above is the solution to a system of inequalities. Which of the following ordered pairs satisfies the system of inequalities?

- A) $(-4, 4)$
- B) $(-3, 4)$
- C) $(-1, 1)$
- D) $(0, -5)$

25

Texture	Mineral composition		
	Granitic	Andesitic	Basaltic
Coarse-grained	32	22	42
Fine-grained	16	16	31

The table above shows the distribution of all 159 igneous rocks in a university's earth science laboratory by mineral composition and texture. What fraction of the university's granitic rocks are coarse-grained?

- A) $\frac{96}{159}$
- B) $\frac{32}{159}$
- C) $\frac{32}{96}$
- D) $\frac{32}{48}$

26

In the xy -plane, which of the following does NOT contain any points that are part of the solution set to $3x - 4y > 12$?

- A) The region where $x < 0$ and $y > 0$
- B) The region where $x < 0$ and $y < 0$
- C) The region where $x > 0$ and $y > 0$
- D) The x -axis



27

$$f(x) = a \cdot b^x$$

The function f is defined above, where a and b are both constants greater than 1. Which of the following data sets could be modeled by the function f ?

A) Bouncing Ball

Bounce	x	0	1	2	3	4
Maximum height (inches)	$f(x)$	32	16	8	4	2

B) Experiment

Time (minutes)	x	0	1	2	3	4
Number of observations remaining	$f(x)$	10	8	6	4	2

C) Bacteria Sample

Time (hours)	x	0	1	2	3	4
Population	$f(x)$	2	4	8	16	32

D) Employee Net Pay

Time (hours)	x	1	2	3	4
Net pay (dollars)	$f(x)$	8	16	24	32

28



On a 60-mile road there are 7 rest stops placed at equal intervals, including one at each end of the road, as shown above. What is the distance, in feet, between two consecutive rest stops?

(Note: 1 mile = 5,280 feet)

- A) 31,680
- B) 36,960
- C) 45,257
- D) 52,800



29

The population of a community was 2,000 in 2013, and the population was projected to increase by 50 people each year. Under these conditions, which of the following expressions models the population of the community t years after 2013 ?

- A) $2,000 + (1 + 0.05)^t$
- B) $2,000(1 + 0.025)^t$
- C) $2,000(1 + 0.025t)$
- D) $2,000(1 + 0.05t)$

30

$$(x - p)(x - 3) > 0$$


In the inequality above, p is a constant. If the solution set for the inequality consists of the values of x such that $x < 3$ or $x > 5$, what is the value of p ?

- A) -5
- B) 0
- C) 2
- D) 5


DIRECTIONS

For questions 31–38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
- Mark no more than one bubble in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.

- Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or $7/2$. (If  is entered into the

grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)

- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Answer: $\frac{7}{12}$ are:

Write answer in boxes. →

7	/	1	2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Grid in result. ←

Fraction line ←

Answer: 2.5

	2	.	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Decimal point ←

Acceptable ways to grid $\frac{2}{3}$ are:

	2	/	3
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

.	6	6	6
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

.	6	6	7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Answer: 201 – either position is correct

	2	0	1
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3

2	0	1	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3

NOTE:

You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.



31

A dairy farm produces 5300 pounds of whole milk each day. The farm uses 21.2 pounds of whole milk to produce one pound of butter. At this rate, how many pounds of butter can the dairy farm produce each day?

32

$$(x - 1)^2 + (y - 3)^2 = 16$$

The equation above forms a circle when graphed in the xy -plane. What is the radius of the circle?

33

$$\begin{aligned} 5x - 2y &= 8 \\ x &= 2y \end{aligned}$$

What is the value of x in the system of equations above?

34

In the xy -plane, the graph of the equation $3y - 6x = 8$ intersects the y -axis at the point $(0, a)$. What is the value of a ?



35

$$y = 8x$$

$$y = x^2 + 16$$

If (x, y) is the solution of the system of equations above, what is the value of x ?

36

A cube made of osmium, the element with the highest density, measures 5 centimeters along each edge and has a mass of 2825 grams. What is the density, in grams per cubic centimeter, of the osmium from which the cube is made? (Density is mass per unit volume.)



Questions 37 and 38 refer to the following information.

Most Frequently Reported Prior Career Fields
of the 535 Members of the 113th Congress

	Chamber	
	House of Representatives	Senate
Business	187	27
Education	77	15
Law	154	55
Public service	180	42

The table above gives the distribution, by chamber, of fields in which members of the 113th Congress of the United States most frequently reported spending a portion of their careers before being elected to Congress. There were 435 members in the House of Representatives and 100 members in the Senate at the time these data were collected. Some members reported more than one career field.

37

If x percent of members of the Senate reported education as a prior career field, what is the value of x ?

38

Of the 435 people who reported from the House of Representatives, 78 are female. Assuming that gender and prior career field are independent, how many female representatives would be expected to have reported a prior career field in public service? (Round your answer to the nearest whole number.)

STOP

**If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.**

December 3, 2016 International

ANSWER KEY

Reading Test Answers

1 B	12 C	23 A	34 A	45 C
2 D	13 D	24 A	35 B	46 A
3 A	14 C	25 D	36 C	47 D
4 A	15 A	26 C	37 C	48 B
5 C	16 A	27 A	38 D	49 C
6 C	17 A	28 D	39 B	50 A
7 D	18 B	29 B	40 B	51 D
8 C	19 D	30 A	41 A	52 B
9 A	20 A	31 C	42 D	
10 C	21 B	32 C	43 D	
11 B	22 C	33 D	44 C	

READING TEST
RAW SCORE
(NUMBER OF
CORRECT ANSWERS)

Writing and Language Test Answers

1 D	12 B	23 C	34 A
2 D	13 C	24 D	35 C
3 B	14 B	25 A	36 B
4 D	15 C	26 D	37 A
5 C	16 B	27 C	38 C
6 D	17 A	28 D	39 C
7 C	18 B	29 B	40 D
8 A	19 B	30 B	41 A
9 C	20 D	31 A	42 D
10 C	21 B	32 B	43 B
11 B	22 A	33 D	44 C

WRITING AND
LANGUAGE TEST
RAW SCORE
(NUMBER OF
CORRECT ANSWERS)

Math Test – No Calculator Answers

1 C	11 A
2 A	12 B
3 A	13 A
4 C	14 B
5 B	15 A
6 D	16 2
7 A	17 5
8 D	18 .5, 1/2
9 C	19 20
10 C	20 1.25, 5/4

MATH TEST –
NO CALCULATOR
RAW SCORE
(NUMBER OF
CORRECT ANSWERS)

Math Test – Calculator Answers

1 D	11 B	21 D	31 250
2 C	12 C	22 A	32 4
3 D	13 D	23 C	33 2
4 A	14 B	24 A	34 $8/3$, 2.66, 2.67
5 B	15 B	25 D	35 4
6 B	16 B	26 A	36 22.6
7 B	17 C	27 C	37 15
8 C	18 A	28 D	38 32
9 A	19 C	29 C	
10 D	20 C	30 D	

MATH TEST –
CALCULATOR
RAW SCORE
(NUMBER OF
CORRECT ANSWERS)