



# 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 George Eliot, *Middlemarch*, originally published in 1871. Dorothea and her husband, Mr. Casaubon, a middle-aged scholar, are on their honeymoon in Rome. Will Ladislaw, an artist, is Casaubon's cousin.

"Yes," said Dorothea, without pause; "show him into the salon." Her chief impressions about young Ladislaw were that when she had seen him at

Line Lowick she had been made aware of Mr.  
5 Casaubon's generosity towards him, and also that she had been interested in his own hesitation about his career. She was alive to anything that gave her an opportunity for active sympathy, and at this moment it seemed as if the visit had come to shake  
10 her out of her self-absorbed discontent - to remind her of her husband's goodness, and make her feel that she had now the right to be his helpmate in all kind deeds. She waited a minute or two, but when she passed into the next room there were just signs  
15 enough that she had been crying to make her open face look more youthful and appealing than usual. She met Ladislaw with that exquisite smile of goodwill which is unmixed with vanity, and held out her hand to him. He was the elder by several years, but  
20 at that moment he looked much the younger, for his transparent complexion flushed suddenly, and he spoke with a shyness extremely unlike the ready indifference of his manner with his male companion, while Dorothea became all the calmer  
25 with a wondering desire to put him at ease.

"I was not aware that you and Mr. Casaubon were in Rome, until this morning, when I saw you in the Vatican Museum," he said. "I knew you at once - but - I mean, that I concluded Mr. Casaubon's address  
30 would be found at the Poste Restante, and I was anxious to pay my respects to him and you as early as possible."

"Pray sit down. He is not here now, but he will be glad to hear of you, I am sure," said Dorothea, seating  
35 herself unthinkingly between the fire and the light of the tall window, and pointing to a chair opposite, with the quietude of a benignant matron. The signs of girlish sorrow in her face were only the more striking. "Mr. Casaubon is much engaged; but you  
40 will leave your address-will you not? - and he will write to you."

"You are very good," said Ladislaw, beginning to lose his diffidence in the interest with which he was observing the signs of weeping which had altered her  
45 face. "My address is on my card. But if you will allow me I will call again to-morrow at an hour when Mr. Casaubon is likely to be at home."

"He goes to read in the Library of the Vatican every day, and you can hardly see him except by an  
50 appointment. Especially now. We are about to leave Rome, and he is very busy. He is usually away almost from breakfast till dinner. But I am sure he will wish you to dine with us."

Will Ladislaw was struck mute for a few moments.  
55 He had never been fond of Mr. Casaubon, and if it had not been for the sense of obligation, would have laughed at him as a Bat of erudition. But the idea of this dried-up pedant, this elaborator of small



1

1

60 explanations about as important as the surplus  
stock of false antiquities kept in a vendor's back  
chamber, having first got this adorable young  
creature to marry him, and then passing his  
honeymoon away from her, groping after his  
mouldy futilities (Will was given to hyperbole)-this  
65 sudden picture stirred him with a sort of comic  
disgust: he was divided between the impulse to  
laugh aloud and the equally unseasonable impulse  
to burst into scornful invective.

For an instant he felt that the struggle, was  
70 causing a queer contortion of his mobile features,  
but with a good effort he resolved it into nothing  
more offensive than a merry smile.

Dorothea wondered; but the smile was  
irresistible, and shone back from her face too. Will  
75 Ladislav's smile was delightful, unless you were  
angry with him beforehand: it was a gush of inward  
light illuminating the transparent skin as well as the  
eyes, and playing about every curve and line as if  
some Ariel<sup>1</sup> were touching them with a new charm,  
80 and banishing forever the traces of moodiness. The  
reflection of that smile could not but have a little  
merriment in it too, even under dark eyelashes still  
moist, as Dorothea said inquiringly, "Something  
amuses you?"

85 "Yes," said Will, quick in finding resources.

<sup>1</sup> A magical spirit in Shakespeare's *The Tempest*

1

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

- A) points of view of Dorothea and Ladislav in order to develop the characters' thoughts and explore their actions.
- B) settings of the Vatican and the Casaubons' hotel in Rome in order to emphasize Dorothea's isolation from her husband.
- C) contempt that Ladislav feels for Mr. Casaubon and the affection he feels for Dorothea in order to reveal his inner conflict.
- D) narrator's omniscient perspective and the characters' limited perspectives in order to suggest that the characters know far less about one another than they believe.

2

The passage suggests that while at Lowick, Ladislav expressed uncertainty about his

- A) prospects for marriage.
- B) choice of occupation.
- C) leisure pursuits
- D) standing within his family

3

As used in line 7, "alive to" most nearly means

- A) reliant upon.
- B) eager for.
- C) caring about.
- D) suspicious of.

4

In the passage, Dorothea regards the occasion of Ladislav's arrival mainly as a chance to

- A) seek temporary amusement.
- B) confess the full extent of her sadness.
- C) strengthen her alliance with her husband.
- D) make a good impression on a member of her husband's family.

5

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

- A) Lines 7-13 ("She was . . . deeds")
- B) Lines 13-16 ("She waited . . . usual")
- C) Lines 17-19 ("She met . . . to him")
- D) Line 24-25 ("Dorothea . . . ease")



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6

The comparison of Ladislav's interaction with his "male companion" to his interaction with Dorothea (lines 21-25) mainly serves to reveal the

- A) amount of time Ladislav spends with each.
- B) interests Ladislav shares with each.
- C) degree of self-consciousness Ladislav experiences with each.
- D) enjoyment Ladislav derives from conversations with each.

7

Based on the passage, Ladislav's relationship with Mr. Casaubon is best characterized as

- A) superficially civil, because Ladislav feels indebted to Mr. Casaubon.
- B) blatantly competitive, because Ladislav and Mr. Casaubon share an obligation to Dorothea.
- C) subtly hostile, because Ladislav believes that Mr. Casaubon has been ignoring him.
- D) outwardly spiteful, because Ladislav resents Mr. Casaubon's controlling influence.

8

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

- A) Lines 2-7 ("Her chief . . . career")
- B) Lines 28-32 ("I knew . . . possible")
- C) Lines 45-47 ("But if . . . home")
- D) Lines 55-57 ("He had . . . erudition")

9

The passage makes clear that Ladislav regards Dorothea as

- A) unknowingly self-centered.
- B) excessively moody.
- C) needlessly cautious.
- D) physically attractive.

10

What main effect do the phrases "gush of inward light," "playing about every curve," and "touching them with a new charm," used in the seventh paragraph (lines 73-84), have on the narrator's description of Ladislav's smile?

- A) They underscore Ladislav's true feelings about Mr. Casaubon concealed behind the smile.
- B) They emphasize the enchanting effect of the smile on Dorothea.
- C) They reinforce Ladislav's effort to amuse Dorothea by smiling.
- D) They reveal the smile's power to bring joy even to those who are angry with Ladislav.



**Questions 11-20 are based on the following passages.**

Passage 1 is adapted from Shirley Chisholm, "Address to the United States House of Representatives, 21 May 1969." with 'Equal Rights' for women?" ©1972 by Phyllis Schlafly. to the United States Constitution intended to prohibit discrimination on the basis of gender. Chisholm was a member of Congress when she made her address.

**Passage 1**

More than half of the population of the United States is female. But women occupy only 2 percent of the managerial positions. They have not even  
 Line reached the level of tokenism yet. No women sit on  
 5 the AFL-CIO council or Supreme Court. There have been only two women who have held Cabinet rank, and at present there are none. Only two women now hold ambassadorial rank in the diplomatic corps. In Congress, we are down to one Senator and 10  
 10 Representatives.

Considering that there are about 3 1/2 million more women in the United States than men, this situation is outrageous...

It is for this reason that I wish to introduce today  
 15 a proposal that has been before every Congress for the last 40 years and that sooner or later must become part of the basic law of the land — the equal rights amendment.

Let me note and try to refute two of the  
 20 commonest arguments that are offered against this amendment. One is that women are already protected under the law and do not need legislation. Existing laws are not adequate to secure equal rights for women. Sufficient proof of this is the  
 25 concentration of women in lower paying, menial, unrewarding jobs and their incredible scarcity in the upper level jobs. If women are already equal, why is it such an event whenever one happens to be elected to Congress?...

A second argument often heard against the equal rights amendment is that it would eliminate  
 30 legislation that many States and the Federal Government have enacted giving special protection to women and that it would throw the marriage and  
 35 divorce laws into chaos.

As for the marriage laws, they are due for a sweeping reform, and an excellent beginning would be to wipe the existing ones off the books. Regarding special protection for working women, I cannot

40 understand why it should be needed. Women need no protection that men do not need. What we need are laws to protect working people, to guarantee them fair pay, safe working conditions, protection against sickness and layoffs, and provision for  
 45 dignified, comfortable retirement. Men and women need these things equally. That one sex needs protection more than the other is a male supremacist myth as ridiculous and unworthy of respect as the white supremacist myths that society is trying to cure  
 50 itself of at this time.

**Passage 2**

In the last couple of years, a noisy movement has sprung up agitating for "women's rights." Suddenly everywhere we are afflicted with aggressive females on television talk shows yapping about how  
 55 mistreated American women are, suggesting that marriage has put us in some kind of "slavery," that housework is menial and degrading, and — perish the thought — that women are discriminated against. New "women's liberation" organizations are popping  
 60 up, agitating and demonstrating, serving demands on public officials, getting wide press coverage always, and purporting to speak for some 100,000,000 American women.

It's time to set the record straight. The claim that  
 65 American women are downtrodden and unfairly treated is the fraud of the century. The truth is that American women never had it so good. Why should we lower ourselves to "equal rights" when we already have the status of special privilege?

The proposed Equal Rights Amendment states:  
 70 "Equality of rights under the law shall not be denied or abridged by the United States or by any State on account of sex." So what's wrong with that? Women here are a few examples of what's wrong with that.  
 75 This Amendment will absolutely and positively make women subject to the draft. Why any woman will support such a ridiculous and un-American proposal as this is beyond comprehension...

Another bad effect of the Equal Rights  
 80 Amendment is that it will abolish a woman and her child support and alimony, and substitute them with women's libbers think is a more "equal" policy, that "Such decisions should be within the discretion of  
 Court and should be made on the economic situation  
 85 and need of the parties in the case."



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Under present American laws, the man is always required to support his wife and each child he caused to be brought into the world. Why should women abandon these good laws — by trading them for something so nebulous and uncertain as the "discretion of the court"?

11

In Passage 1, Chisholm mentions the number of women in Congress most likely to

- A) give one example of a profession with very few women in it.
- B) point out how hard it is for women to get legislation passed.
- C) suggest how hard she has worked to become a member of Congress.
- D) imply that if there were more women in Congress, the Equal Rights Amendment would have passed already.

12

As used in line 14, "introduce" most nearly means

- A) establish.
- B) present.
- C) interject.
- D) preface.

13

In Passage 1, Chisholm indicates that the federal government and many state governments have previously

- A) passed laws focused on women's working conditions.
- B) ensured equal rights for women in the workplace.
- C) reformed most of the marriage and divorce laws.
- D) refused to consider special protections for women.

14

In Passage 2, Schlafly's use of quotation marks around "women's rights" (line 52) and "equal" (line 82) chiefly serves to

- A) stress the urgency of the reforms referred to in the quotations.
- B) prevent misunderstanding by indicating that Chisholm's exact words are being used.
- C) suggest that the expressions are typically used in an insulting way.
- D) ridicule the ideological positions underlying the use of these terms.

15

In Passage 2, Schlafly's use of the words "afflicted," "aggressive," and "yapping" (lines 53-54) serves to support her main argument by

- A) acknowledging her understanding of the complexity of the debate on gender equality.
- B) conveying her implicit critique of the contentious nature of American political debate.
- C) suggesting that the positions taken by her opponents are unreasonable and annoying.
- D) portraying her as personally attacked by her opponents rather than challenged on her argument's merits.

16

Which choice best supports the idea that Schlafly believes that women's circumstances are already superior to those of men?

- A) Lines 59-63 ("New . . . women")
- B) Lines 64-66 ("It's . . . century")
- C) Lines 67-69 ("Why . . . privilege")
- D) Lines 70-73 ("The proposed . . . of sex")



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17

According to Schlafly in Passage 2, the Equal Rights Amendment would eliminate a woman's right to

- A) join the military.
- B) receive alimony.
- C) be a homemaker.
- D) have custody of her children.

18

Based on Passage 1, Chisholm would most likely respond to Schlafly's assertion in lines 66-67 of Passage 2 ("The truth . . . good") with

- A) concern, because of the polarizing nature of such perspectives on women.
- B) disagreement, because of the economic plight of many women in the country.
- C) resignation, because there are valid arguments on both sides of this issue.
- D) dismay, because of the number of women in America who hold such beliefs.

19

Based on the passages, which statement describes how Schlafly would most likely respond to Chisholm's remarks about the marriage and divorce laws of that time

- A) Revoking the marriage and divorce laws requires an amendment to the United States Constitution.
- B) Activists who believe that marriage is akin to slavery overlook other ill effects of gender discrimination.
- C) The Equal Rights Amendment should codify gender equality in areas other than child support and alimony payments.
- D) Current marriage and divorce laws should not be changed because they provide a significant benefit to women .

20

Which choice from Passage 2 provides the best evidence for the answer to the previous question?

- A) Lines 53-58 ("Suddenly . . . against")
- B) Lines 75-76 ("This . . . draft")
- C) Lines 76-78 ("Why . . . comprehension")
- D) Lines 86-91 ("Under . . . Court")



**Questions 21-30 are based on the following passage.**

This passage is adapted from Jenny Jennings Forest, "Even Birdbrains Learn from Experience." ©2013 by Sigma Xi, the Scientific Research Society.

Figaro was only a birdbrain: a captive cockatoo (Cacatua goffini). But when Alice Auersperg, cognitive biologist at the University of Vienna, spied him wielding 10 tools he had spontaneously invented from twigs and splinters, she was amazed. Such innovative tool use was known to exist only primates and New Caledonian crows.

Auersperg first saw Figaro make, shorten, and bend stick tools to rake in a small stone he had dropped through a mesh partition. She replaced the stone with a series of cashew nuts and observed Figaro repeat his performance. Auersperg's observations culminated in a study showing that cockatoos can solve elaborate multistep lock puzzles, without intermediate behavioral reinforcements, and immediately transfer their new knowledge to a novel challenge.

Figaro shows that cockatoos can "plan interventions in the physical world well ahead of being reinforced," says Auersperg's coauthor, Alex Kacelnik, a behavioral ecologist at the University of Oxford. Figaro's achievement raised the question, To what extent can cockatoos plan ahead, completing a series of actions toward a mentally represented distant goal — without support? Auersperg and colleagues reasoned that if a cockatoo must complete a chain of actions to receive a substantial reward at the end, and if each action leads only to the possibility of achieving the next action, then the bird would be unlikely to attain the final goal by mere chance. Randomly attempting the actions in the wrong order, for example, would lead to failure.

To test cockatoos' planning and mechanical capacities, Auersperg designed a box housing a visible cashew nut blocked by five interlocking devices. The locks were concatenated so that the bird would have to solve the lock puzzle farthest from the reward before gaining access to the next, and so on. The team made each lock unique so that the knowledge required to open it would be novel.

Auersperg's team began by testing the cockatoos' learning process to discern whether and to what extent the 10 birds in their study could solve all five puzzles without intermittent rewards or observation of birds already trained. The researchers had no

precedent for predicting how much time and support the cockatoos would require. In the end, only one bird, named Pipin, solved all five locks within the number of sessions, number of trials, and amount of time that Auersperg used to define success. But Pipin completed the entire puzzle, utterly unassisted in only 100 minutes — a "rapid route to perfection," Auersperg notes. The team supported the other nine birds with reinforcement until they opened the five locks.

The team then subjected all 10 birds to an experiment designed to reveal the nature of their newly acquired knowledge: whether it was rote, or it indicated understanding of mechanical functions. The scientists removed or resequenced parts of the original puzzle. In response, "the birds immediately approached the now most relevant piece of equipment downstream from the goal," says Kacelnik. Instead of rigidly adhering to the original lock sequence, in other words, they strategized according to the various functions of the interlocking mechanisms.

The cockatoos explored the locks playfully, using their bills, tongues, and feet; individuals differed in how they opened the locks. However, all 10 birds progressed logically: Once they had solved a lock, they spent no time on that lock in future sessions, but focused on the next challenge in the chain. This stepwise approach to the complex sequence shows that cockatoos can, without reinforcement, work backward from a distant goal.

21

The primary purpose of the passage is to

- A) discuss a study of cockatoos cognitive abilities.
- B) profile a researcher studying cockatoos' behavior.
- C) explain a theory about cockatoos' planning skills.
- D) analyze data on cockatoos' memorization practices.



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22

The central idea of the passage is that cockatoos

- A) can use knowledge gained from observing other species to achieve their own goals.
- B) recall information from previous experiences and apply it to wholly new situation.
- C) are capable of perceiving and completing multiple independent steps to accomplish an objective.
- D) reconcile conflicting goals by assessing which goal is easiest to reach.

23

In the context of the passage as a whole, the main function of the first paragraph is to

- A) introduce a phenomenon first discovered in the studies presented in the passage.
- B) outline the controversy that the analysis presented in the passage is intended to settle.
- C) explain the hypothesis that the experiments discussed in the passage were designed to test.
- D) describe an incident that helped inspired the research discussed in the passage.

24

Which statement about Figaro's development of tools is best supported by the passage?

- A) Figaro developed tools that were similar in appearance to those used by New Caledonian crows.
- B) Figaro developed tools that enabled him to open the locks that Auersperg and her colleagues designed.
- C) Figaro developed tools without previously observing other cockatoos using tools.
- D) Figaro developed tools on his own initiative and to solve a problem he had not anticipated.

25

As used in line 12, "performance" most nearly means

- A) actions
- B) efficiency
- C) presentation
- D) imitation

26

Based on the passage, one premise of the researchers' first experiment was that presenting cockatoos with unique locks that had to be solved successively would

- A) forestall the objection that the cockatoos were trying to achieve intermediate goals rather than a single final goal.
- B) bolster the claim that the cockatoo planned their actions knowing that they would not receive reinforcement as they progressed.
- C) reduce the possibility that the cockatoos could succeed in the experiment without possessing the skills being assessed.
- D) ensure that the experiment was evaluating cockatoos' intellectual capabilities rather than their mechanical capabilities.

27

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

- A) Lines 22-25 ("Figaro's . . . support")
- B) Lines 25-31 ("Auersperg . . . chance")
- C) Lines 33-36 ("To test . . . devices")
- D) Lines 36-38 ("The locks . . . so on")





28

The fourth and fifth paragraphs (lines 33-55) primarily serve to

- A) describe the design and outcome of the first lock experiment.
- B) summarize the views of other researchers on cockatoo intelligence.
- C) contrast the first lock experiment with other assessment of animal cognition.
- D) speculate on the significance of the results of both lock experiments.

29

As used in line 42, "discern" most nearly means

- A) differentiate.
- B) determine.
- C) notice.
- D) question.

30

Which choice most accurately describes the results of the first lock experiment?

- A) Only one of the cockatoos was able to open all of locks, but that cockatoo required support from the researchers to do so.
- B) All of the cockatoos opened all of the locks, but only one cockatoo did so without support from the researchers
- C) Nine of the cockatoos were unable to open any of the locks, but one cockatoo opened some of the locks.
- D) The cockatoos that received support opened all the locks, but the cockatoo that did not receive support opened only some of the locks.

**Questions 31-41 are based on the following passage and supplementary material.**

This passage is adapted from Ben Branstetter, "Every Time You Send Someone an Emoji, a Little Part of Language Dies." ©2015 by Daily Dot Media. Emoji are small images that are generally used in text messaging.

Language — what you're reading right now — is entirely made up of symbols. The words you're reading are translated by your literate mind and given the meaning you've been taught they have.   
 5 Even the letters themselves, though seemingly abstract now, once relied on literal translations. The letter "H," for example, comes from the Egyptian hieroglyph for "fence." In fact, a row of Hs — HHHHHH — certainly drags this millennia-   
 10 old meaning out.

The English language is the product of thousands and thousands of years of such symbolic layering — literal images forming single symbols forming words like "heart," "hearth," and "hearthstone." The more   
 15 separated it has become from the objects and actions of the physical world, the more it has enabled us to communicate the full complexity of life as we know it.

And while language is always evolving — change   
 20 can often look a lot like deterioration — there has been a recent return to the literal symbolism of the hieroglyphs of old. Emoji are certainly symbols, and they have the meaning we give them and nothing else — just like letters and logos. But their reliance   
 25 on physical imagery — on smiley faces, devil horns — means they limit us from leaving the physical world. The abstraction of language is a necessary tactic to further develop our understanding of things we cannot see. Emoji make this mission all the more   
 30 difficult.

A recent study done by Match.com would seem to contradict me. The dating site analyzed the texting behavior of 5600 single Americans and found emoji   
 35 ues is not replacing language as much as it is replacing inflection. Led by Rutgers anthropologist Helen Fisher, the study found texting "jeopardizes your ability to express your emotion" and emoji have filled this hole as "another way to express emotion."

Fifty percent of the study's subjects found emoji   
 40 to show "personality" and 35 percent felt it made "expressing feelings" easier. Easier than language? Easier than the infinite combinations and words in front of you? Easier than the way you actually process thoughts in your mind, to the point some

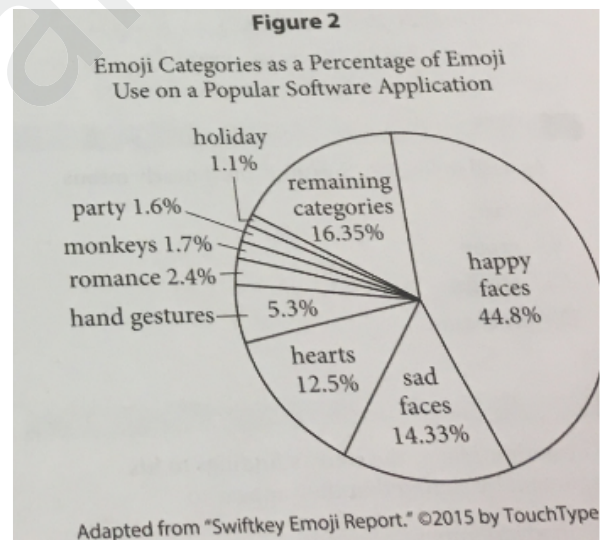
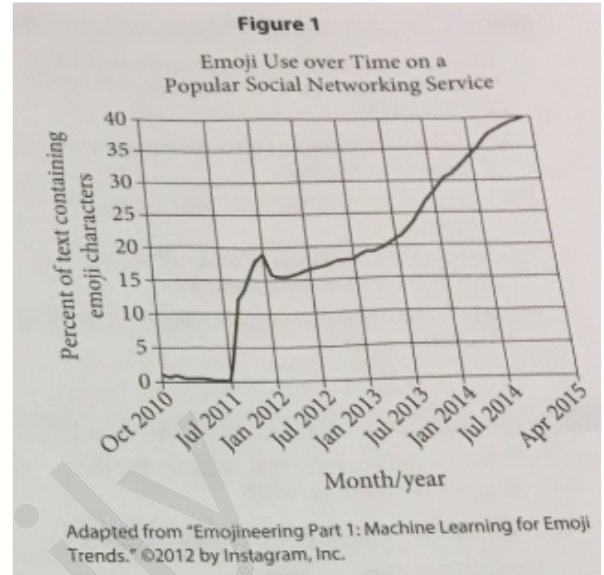


45 scientists believe we don't actually have thoughts until we develop language? While sarcasm might be a bit difficult over text, I've never struggled with getting my meaning through text to the point of needing pre-ordinated cartoons to make my feelings understood.

50 Of course, the emoji pool is always growing. Currently, the Unicode Consortium recognizes 722 distinct emoji, an astonishing amount. However, even this impressive number of symbols is limited by its very method of production. Whereas a language is built and altered by all who speak it, emoji is controlled by the elites of the technology world.

This has shown itself nowhere as strongly as it has in reaction to the homogeneity of emoji faces. The demand for ethnic diversity among the characters urged the Consortium to release a veritable color palette of smiling, frowning, winking, and smirking faces. Whereas the Oxford English Dictionary responds to the growth of the English language, emoji must wait itself for the decisions of an unelected committee.

70 And the reliance of emoji upon already- filled language standards means it could actually serve as a stop sign for the development of language. Because it can only use images of physical items or actions — or pre-existing symbols like the dollar sign — emoji can never grow organically to help represent abstract concepts. All it can ever be is a direct translation of the languages we speak now.





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31

The passage most directly suggests that in order to achieve the fullest possible knowledge of the world, people must be

- A) skilled at translating abstract meaning into appropriate symbols.
- B) aware of the rich history of their respective languages.
- C) unwilling to use emoji or other symbolic characters with literal meanings.
- D) able to communicate about intangible as well as observable reality.

32

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

- A) Lines 11-14 (“The English . . . hearthstone”)
- B) Lines 19-24 (“And . . . logos”)
- C) Lines 24-29 (“But . . . see”)
- D) Lines 55-57 (“Whereas . . . world”)

33

As used in line 29, “mission” most nearly means

- A) task.
- B) group.
- C) voyage.
- D) procedure.

34

The author relates the study's findings to his argument by stating that they appear to

- A) inadvertently reinforce it.
- B) partially invalidate it.
- C) openly address it.
- D) directly oppose it.

35

As used in line 46, “develop” most nearly means

- A) set forth.
- B) elaborate on.
- C) expand.
- D) learn to use.

36

In the passage, the author challenges the claim that emotion can be difficult to express through text by

- A) citing current research that presents a contrasting view.
- B) stating an opinion based on his personal experience with language.
- C) distinguishing between emotional expression in writing and in speech.
- D) asserting the inadequacy of images for representing concepts.

37

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

- A) Lines 35-38 (“Led . . . emotion”)
- B) Lines 39-41 (“Fifty . . . easier”)
- C) Lines 46-50 (“While . . . understood”)
- D) Lines 69-73 (“Because . . . concepts”)



38

The author's perspective on the Unicode Consortium is best characterized as

- A) dismissive, because he believes that the consortium upholds outdated language standards.
- B) critical, because he believes that the consortium wields inappropriately restrictive authority.
- C) apprehensive, because he believes that the consortium is rapidly expanding its influence on how people communicate.
- D) unfavorable, because he believes that the consortium is deliberately limiting the production of new emoji.

39

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

- A) Lines 53-55 (“However . . . production”)
- B) Lines 59-63 (“The demand . . . faces”)
- C) Lines 63-66 (“Whereas . . . committee”)
- D) Lines 67-69 (“And . . . language”)

40

As indicated by figure 1, the most substantial increase in emoji use on the social networking service occurred between which dates?

- A) October 2010 and July 2011.
- B) July 2011 and January 2012.
- C) January 2012 and July 2012.
- D) January 2013 and July 2013.

41

The author would most likely regard the overall trend represented in figure 1 with

- A) disapproval, because it suggests a decline in the complexity with which people communicate about their lives.
- B) regret, because it indicates a loss of respect for the ancient history of contemporary English.
- C) curiosity, because it hints at future developments in the ongoing evolution of language.
- D) acceptance, because it points to continued growth in emoji use that is unlikely to reverse.



**Questions 42-52 are based on the following passage and supplementary material.**

This passage is adapted from Laura Kiesel, "Invasive Plants May Adapt to Climate Change Better than Native Species." ©2014 by American Institute of Biological Sciences.

The purple loosestrife (*Lythrum salicaria*)—an invasive wetlands plant that was introduced to North America some 50 years ago—has become the bane of conservationists who have struggled to keep it under control. The plant has crowded out cover species, such as cattails, and harmed native biodiversity in the United States and Canada.

Evolutionary biologist and University of Toronto professor Spencer Barrett wanted to challenge the assumption that invasive plants thrived in their new habitats without internally changing their characteristics. To accomplish this, he and postdoctoral fellow Robert Colautti, of the University of British Columbia, planted purple loosestrife in different regions in North America to determine whether and how the plants adapted to distinct climates. Specifically, they transplanted purple loosestrife from northern Virginia to Timmins, Ontario, and vice versa in what is known as a common garden experiment.

"The common garden experiment is an invaluable tool for understanding how the functioning of an organism's genes are influenced by its environment and how this... interaction ultimately affects growth, development, survival, and reproduction in nature," says Colautti.

What Barrett and Colautti found was surprising: Purple loosestrife tended to produce fewer fruits the farther away it was from its original introduction site. That was not all. Compared with the plants transplanted to Timmins from the south, the local purple loosestrife in Timmins bloomed 20 days earlier in the spring and remained small and, in doing so, maximized seed production in the shorter growing season. These local plants also yielded up to 37 times as many fruits as the southern plant grown at the same location. In contrast, the northern Ontario plants that were grown in Virginia averaged only a quarter of the seeds of the locally adapted purple loosestrife because of their earlier flowering when they were still very small.

Barrett and Colautti concluded that the purple loosestrife's adaptations to different climates through changes in size and flowering times were just as important as the lack of natural pests in determining

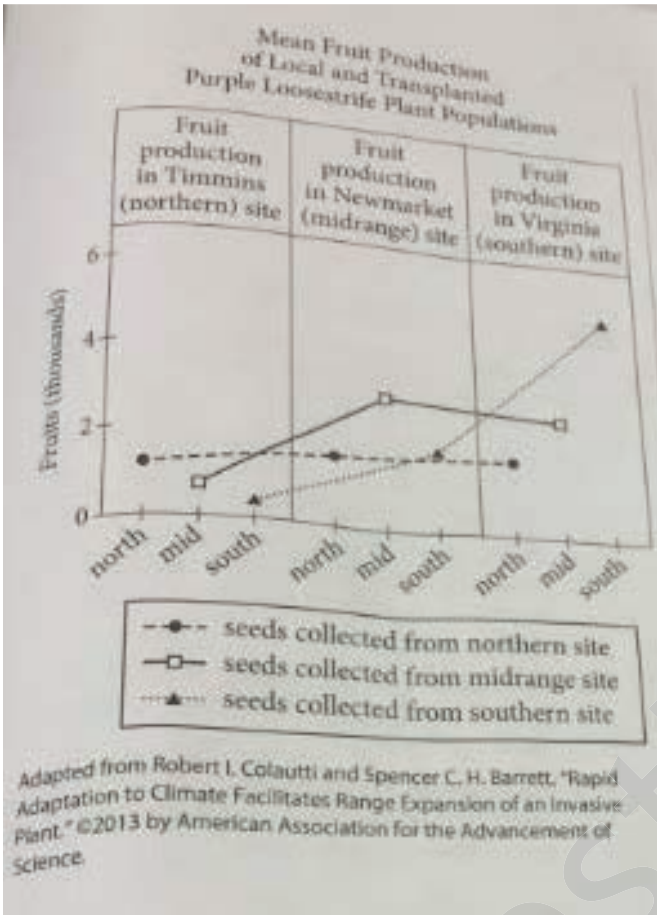
their ability to thrive. In addition, the plant was found not only to have adapted to a drastically different climate as it migrated but to have evolved this ability in a matter of mere decades.

Colautti notes that the purple loosestrife found in North America contains far more genetic variability than the purple loosestrife indigenous to Europe, Asia, Africa, and parts of Australia, which suggests that there were multiple introductions of the plant from different continents to the eastern seaboard of the United States. This counters the idea of parallel introductions, which would suggest that the purple loosestrife plants that thrive in northern Canada may have been introduced from a northern climate, such as in Scandinavia, whereas those in Virginia may have been introduced from a warmer climate. Instead, the populations likely reproduced with each other, thereby maximizing their genetic variability. Barrett believes that it is the plant's identity as an outbreeder, or a plant that sexually reproduces with others in its species as opposed to cloning itself, that contributes to its resilience in new climates.

"Purple loosestrife plants are adapting because they have a lot of genetic variability," says Barrett. "More genetic variation allows for more opportunities for natural selection, which enabled the plant's northward migration."

Elizabeth Wolkovich, assistant professor in organismic and evolutionary biology at Harvard University, has conducted research comparing different temperature-dependent shifts in invasive plants. She believes that Barrett and Colautti's studies support the phenological flexibility model of plant invasions. This model suggests that species that can shift their phenologies (how they respond to cues in seasonal and climactic changes) will be very successful invaders as the climate changes.

"Species that tend to be moved around a lot may increase their genetic diversity at any particular site, which could make them more locally adapted... and, therefore, better able to exploit climate change and its earlier growing season than native species," says Wolkovich.



42

In describing purple loosestrife as the "bane" (line 4) of conservationists, the author most likely means that purple loosestrife

- A) destroy ecosystems wherever it is introduced.
- B) creates a need for conservationists all across North America.
- C) presents a significant challenge for conservationists.
- D) serve as an important symbol to conservationists.

43

The passage suggests that if plants from any North American population of purple loosestrife were transplanted in equal numbers to both a nearby location and a distant one, the plants in the nearby location would likely be

- A) less invasive than the plants in the distant location .
- B) more prolific than the plants in the distant location .
- C) smaller in size than the plants in the distant location .
- D) earlier blooming than the plants in the distant location.

44

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

- A) Lines 8-12 ("Evolutionary . . . characteristics")
- B) Lines 12-17 ("To accomplish . . . climates")
- C) Lines 27-29 ("What . . . site")
- D) Lines 42-46 ("Barrett . . . thrive")

45

It can reasonably be inferred from the passage that the differences noted in the common garden experiment between plants originally from the northern site and plants originally from the southern site result from

- A) mutations in subsequent generations after the plants were transplanted to the experiment sites.
- B) an absence of interbreeding among the various North American varieties of purple loosestrife.
- C) the transplanting of unrepresentatively weak specimens of southern plants to the northern site.
- D) adaptations undergone by purple loosestrife since its introduction to North America.



1

1

46

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

- A) Lines 17-20 (“Specifically . . . *experiment*”)
- B) Lines 37-41 (“In contrast . . . small”)
- C) Lines 46-49 (“In addition . . . decades”)
- D) Lines 56-61 (“This . . . climate”)

47

The main purpose of the information about Wolkovich's research is to

- A) offer expert corroboration through repeating the findings reported by Barrett and Colautti.
- B) demonstrate how Barrett and Colautti's work conforms with another theory.
- C) challenge Barrett and Colautti's interpretation of the data linking fruit production in invasive plants to seasonal and climatic changes.
- D) revise Barrett and Colautti's hypothesis about the adaptability of invasive plants.

48

In the eighth paragraph (lines 73-82), the focus of the passage shifts from

- A) a discussion specific to purple loosestrife to a more general discussion about invasive plants.
- B) an analysis of purple loosestrife productivity in different locations to an analysis of it in a single location.
- C) a summary of a research study of purple loosestrife to a summary of a follow-up study conducted by another researcher.
- D) a description of the general nature of invasive plants to a description of the local and transplanted populations of a specific species.

49

As used in line 86, “exploit” most nearly means

- A) promote.
- B) utilize.
- C) abuse.
- D) impose.

50

According to the graph, which statement about mean fruit production from seeds collected at the midrange site is true?

- A) Plants grown from midrange seeds were more productive when transplanted to the northern site than when transplanted to the southern site.
- B) Plants grown from midrange seeds produced the same amount of fruit when transplanted to the northern site as when transplanted to the southern site.
- C) Plants grown from midrange seeds produced approximately 3,000 fruits when raised in the midrange site.
- D) Plants grown from midrange seeds were more productive at each of the three sites than plants grown from any other seeds.



51

Which choice states a relationship between local and transplanted purple loosestrife that is indicated by the graph?

- A) In the northern site, transplants from the southern site showed a higher mean fruit production than the local plants did.
- B) In the southern site, transplants from the midrange site had a higher mean fruit production than the local plants did.
- C) The range in mean fruit production of all three varieties was smaller for the northern site than for the other sites.
- D) Plants grown from seeds collected from the southern site produced the same mean number of fruits at the northern site as the local plants did.

52

Taken together, the passage and the graph support which conclusion about purple loosestrife?

- A) Purple loosestrife shows greater variation in mean fruit production from year to year in Virginia than it does in Newmarket.
- B) The amount of fruit produced by purple loosestrife in North America each year exceeds that of purple loosestrife on all other continents combined.
- C) The total fruit production of North American purple loosestrife increases every year as the plants adapt more completely to their surroundings.
- D) The mean fruit production of North American purple loosestrife is lower in climates with short growing seasons than in climates with long growing seasons.

**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.

### Robonaut 2: A Revolution in Robotics

What if an astronaut could have an **1** extra pair of hands. NASA, in conjunction with private companies, has realized this possibility through the development of humanoid robotic technologies. The latest of its anthropomorphic robots, the Robonaut 2 (R2), is capable of replicating human movements with precision.

1

- A) NO CHANGE
- B) extra pair-of hands!
- C) extra pair of hands?
- D) extra, pair of hands?



First sent to the International Space Station in 2011, R2 **2** mimics the form and function of the human body. The robot's head houses high-definition and infrared camera eyes that allow operators to see what the robot sees and control its movements. Its arms and hands are equipped with elastic joints as well as cables that function like human tendons, enabling R2 to use the same instruments astronauts use. Tiny **3** sensors in the robot's fingertips, analogous to nerve endings, enable the robot to measure and adjust the force it applies, thereby providing an essential safety feature. While R2 initially consisted of a head, torso, and arms mounted on a rolling pedestal, it was equipped with mechanical legs in early 2014, an innovation that has enhanced the robot's mobility.

2

Which choice most effectively sets up the examples provided in the paragraph?

- A) NO CHANGE
- B) has been given increasingly demanding tasks by engineers on the station.
- C) began its long journey of development in 1997, when the first Robonaut was unveiled.
- D) was actually intended to be a prototype that would be carefully studied on Earth.

3

- A) NO CHANGE
- B) sensor's in the robot's
- C) sensor's in the robots
- D) sensors in the robots



R2's current onboard role is limited to mundane yet **4** crucially essential maintenance tasks. For example, the job of monitoring air vents requires that a gauge be held in a fixed position for an extended period of time; shifting this task to R2 produces more accurate measurements and frees astronauts to focus on more complex work. **5** Furthermore, by studying robotics engineer Robot Ambrose and his team obtain **6** data. The data they obtain are necessary to their ongoing development of the robot's software.

4

- A) NO CHANGE
- B) essentially crucial
- C) essential
- D) routine

5

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

In fact, in 2007, NASA signed a Space Act Agreement with a private company in order to guarantee that enough resources would be available for the development of R2.

Should the writer make this addition here?

- A) Yes, because it contributes valuable information about the history of R2's development.
- B) Yes, because it illustrates the point made in the opening paragraph about the participation of private companies.
- C) No, because it diverges from the paragraph's discussion of the kinds of work that R2 does.
- D) No, because it does not specify the kinds of resources that were needed in the development process.

6

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

- A) data
- B) data---data that are
- C) data, the obtaining of which is
- D) data; these data are



[1] NASA believes that R2, once fully developed, will have wide-ranging applications. [2] By performing dangerous tasks such as repairs to the exterior of the space station, R2 will keep astronaut safer and eliminate the need for additional specialized equipment. [3] Scientists even envision R2 as a remote-controlled surgeon. [4] Performing the role of a scout, **7** the surface of Mars might one day be explored by the robot and provide astronauts with maps and soil samples; such data would help astronauts prepare for future exploration. [5] The robot might also perform a caretaking function by maintaining the space station between missions. [6] According to Dr. Zsolt Garami, a medical **8** researcher works in conjunction with NASA, the robotic hands of R2 might one day perform intricate operation while human doctors monitor it from thousands of miles away. **9**

7

- A) NO CHANGE
- B) Mars's surface might one day be explored by the robot
- C) the robot might one day explore the surface of Mars
- D) one day, the surface of Mars might be explored by the robot

8

- A) NO CHANGE
- B) researcher, which works
- C) researcher, and working
- D) researcher who works

9

To make this paragraph most logical, sentence 3 should be placed

- A) where it is now.
- B) after sentence 1.
- C) after sentence 5.
- D) after sentence 6.



Fusing human dexterity with technological resilience, R2 marks a unique achievement in the development of humanoid robotic technology. As **10** their own capabilities continue to evolve, R2 stands **11** to transform the ways ordinary people back on Earth perform their daily activities.

10

- A) NO CHANGE
- B) their
- C) its
- D) it's

11

The writers wants to make a reasonable prediction that stays within the context established by the passage. Which choice most effectively accomplished this goal?

- A) NO CHANGE
- B) to play an even more vital role aboard the International Space Station.
- C) for the tremendous potential of robotics in just about any field of human endeavor.
- D) tall as an achievement whose scale NASA is unlikely to replicate anytime soon.



Questions 12-22 are based on the following passage.

### Stitches for Health

Experts on well-being often recommend that individuals take up hobbies and activities that can improve their mental health. Although knitting, crocheting, and other yarn arts are not often mentioned in discussions of such health-improving **12** pastimes; research suggests that **13** it should be. With studies showing that people who engage in knitting, crocheting, and related crafts see significant improvements in their mood and mental health, even those who have not previously considered yarn arts should be encouraged to give them a try.

[1] Perhaps the most compelling reason to consider taking up yarn arts is that they make people feel happier. [2] Their rhythmic, repetitive motions bring about a state of relaxation in which breathing slows, levels of stress hormones decline, and elevated heart rate and blood pressure fall to more desirable levels. [3] According to physician and writer Perri Klass, an enthusiastic knitter, this calming effect can improve **14** their outlook during stressful events such as medical appointments and airline flights. [4] A 2010 study found that teaching hospital nurses how to knit and helping them develop the new skill significantly lowered the nurses' self-reported burnout level. **15**

**12**

- A) NO CHANGE
- B) pastimes, but
- C) pastimes, while
- D) pastimes,

**13**

- A) NO CHANGE
- B) this
- C) some
- D) they

**14**

- A) NO CHANGE
- B) one's
- C) his or her
- D) DELETE the underlined portion.

**15**

This writer is considering adding the following sentence to the paragraph.

Yarn arts have also proved effective at relieving occupational stress.

To make this paragraph most logical, this sentence should be placed

- A) after sentence 1.
- B) after sentence 2.
- C) after sentence 3.
- D) after sentence 4.



Yarn arts have also been shown to aid cognitive functioning. In a 2012 study of the effects on the brain of crafts like knitting and quilting, Dr. Yonas Geda of the Mayo Clinic found that crafting may help build up cognitive reserves, reduce the accumulation of potentially harmful proteins in the brain, and **16** the brain's ability to buffer toxic chemicals increases. Professor Sharon Gutman of Columbia University, who has also studied the cognitive effects of knitting, explains that knitting activates multiple parts of the brain **17** at the same time, even simultaneously, stimulating and maintaining neural connections. **18** A 2013 survey of knitters found that

16

- A) NO CHANGE
- B) the ability to buffer toxic chemicals in the brain increases.
- C) increase the brain's ability to buffer toxic chemicals.
- D) increasing the brain's ability to buffer toxic chemicals.

17

- A) NO CHANGE
- B) at the same time concurrently,
- C) simultaneously,
- D) simultaneously, while concurrently,

18

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

Hobbyists as well as scientists have noticed these positive effects.

Should the writer make this addition here?

- A) Yes, because it provides an effective transition to the discussion of the survey.
- B) Yes, because it elaborates on the research of Professor Gutman mentioned in the previous sentence.
- C) No, because it interrupts the discussion of the cognitive benefits of yarn arts.
- D) No, because it fails to explain why the opinions of hobbyists be considered.



many respondents felt that knitting improved their memory and **19** concentration. They also felt that it helped them organize their thoughts. Furthermore, **20** the frequency of knitting seemed to have a greater effect on respondents' reports of improvement in memory than on their reports of improved concentration, raising the possibility that the benefits of knitting may be cumulative.

Self-Reported Effects of Knitting on Cognitive Processes

	Frequency of knitting	Average response on a 5-point scale (1="definitely not," 5="definitely")
Organize thoughts	3 times per week or more	3.43
	fewer than 3 times per week	3.17
Forget problems	3 times per week or more	3.33
	fewer than 3 times per week	3.16
Strengthen memory	3 times per week or more	3.89
	fewer than 3 times per week	3.37
Improve concentration	3 times per week or more	3.87
	fewer than 3 times per week	3.57

Adapted from Jill Riley, Betsan Corkhill, and Clare Morris, "The Benefits of Knitting for Personal and Social Wellbeing in Adulthood: Findings from an International Survey." ©2013 by the College of Occupational Therapists Ltd.

19

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

- A) concentration and
- B) concentration plus it also
- C) concentration; they felt it
- D) concentration-even so, it

20

Which choice provides accurate and relevant data from the chart to support the claim made later in the sentence?

- A) NO CHANGE
- B) those who knitted three or more times per week reported these results at a higher rate than did those who knitted less frequently,
- C) many respondents also reported that they used knitting to forget about the problems that were preoccupying them,
- D) the smallest gap between respondents who knitted three or more times per week and those who knitted less frequently was in the use of knitting to forget about problems,





The abundant evidence that yarn arts can improve mental health **21** make them an attractive option for people looking to relieve stress, get a mental boost, or just start a new hobby. With social networks and video sharing sites making it easy to learn new techniques and share one's creations with others, **22** there's never been a better time to pick up some needles and start stitching.

21

- A) NO CHANGE
- B) makes
- C) have made
- D) are making

22

The writer wants a conclusion that suggests how a reader might act on the information in the passage. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) it is an ideal time for researchers to gather much needed information about yarn arts.
- C) interest in yarn arts extends well beyond the health professions.
- D) practitioners of yarn arts have benefited greatly from the popularity of the Internet.



Questions 23-33 are based on the following passage and supplementary material.

### How It Sounds to Be Free: The Voice of Nina Simone

[1] When singer-songwriter Nina Simone walked onto the stage at the Montreux Jazz Festival in Montreux, Switzerland, in 1976, she had already been known as the “High Priestess of Soul” for two decades. [2] Instead, she stood there in the spotlight—grave and statuesque in a black **23** gown, and waited for the applause to end. [3] Throughout the 1960s, Simone’s songs helped articulate the pain, sorrow, and dreams of the civil rights movement better perhaps than **24** did any other African American artist of her generation. [4] In Switzerland, Nina Simone—the diva, the jazz pianist, the activist, the balladeer—took the stage as if it were her pulpit. [5] As the crowd’s applause swelled up to greet her, she did not wave or smile. [6] When the auditorium was silent at last, she sat down at her piano and began to sing. **25**

23

- A) NO CHANGE
- B) gown
- C) gown;
- D) gown—

24

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

25

To make this paragraph most logical, sentence 2 should be placed

- A) where it is now
- B) after sentence 3
- C) after sentence 4
- D) after sentence 5



2

2

Having trained as a classical pianist, Simone **26** hoped to attend the prestigious Curtis Institute of Music in Philadelphia. Perhaps it was true: while her pianism was **27** precise, Simone's voice was considered to be too spontaneous and organic for classical music. Simone sang in contralto, the lowest—and the rarest—female singing register. This low range gave Simone's voice a deep, rich timbre and an air of commanding authority.

26

Which choice most effectively sets up the argument that follows in the paragraph?

- A) NO CHANGE
- B) began singing in jazz clubs in Atlantic City.
- C) claimed she came to singing entirely by mistake.
- D) found inspiration in the virtuosity of Romantic-era pianists such as Chopin.

27

- A) NO CHANGE
- B) precise;
- C) precise.
- D) precise—



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While Simone's vocal range may not have been the widest, her emotive range was vast: from sultry sadness to explosive anger, from profound joy to wistful heartbreak. Concerned less with the technical perfection of her singing than with the feeling she conveyed to her audience, Simone took inspiration **28** of gospel, folk, and jazz and found a voice uniquely her own. **29** Therefore, Simone was always strong-willed, and she resisted singing the sweet nothings audiences wanted to hear. In her performances, Simone was as unpredictable — **30** having been born in Tryon, North Carolina, in 1933—as she was uncompromisingly earnest. Even when Simone sang jazz standards or contemporary pop songs, she sang from deep inside herself, trying again to find the soul of the **31** song anew and determined to sing nothing but the truth.

28

- A) NO CHANGE
- B) from
- C) with
- D) in

29

- A) NO CHANGE
- B) Moreover,
- C) However,
- D) Subsequently,

30

Which choice provides an example that most effectively supports the statement made earlier in the sentence?

- A) NO CHANGE
- B) becoming an expatriate in Liberia, then Switzerland, then France—
- C) ad-libbing new lyrics, improving new endings to her songs—
- D) being able to play almost any song by ear—

31

- A) NO CHANGE
- B) song
- C) song once more
- D) song newly



When Simone **32** sang, “I wish I Knew How It Would Feel to Be Free” at the 1976 concert in Montreux, her voice was soaring and defiant. After listing the many ways she wished she could be free, **33** Simone deviated from the typical ending of the song. She worked it up to a frenzied crescendo: “how it feels not to be chained to anything.” And when she turned and sang directly to the audience, “I know how to be free,” it was hard not to believe her.

32

- A) NO CHANGE
- B) sang;
- C) sang:
- D) sang

33

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

- A) Simone deviated from the typical ending of the song and she worked
- B) Simone deviated from the typical ending of the song; by doing so she worked
- C) by Simone’s deviating from the typical ending of the song she worked
- D) Simone deviated from the typical ending of the song, working



Questions 34-44 are based on the following passage and supplementary material.

### Eventful Technology

As businesses expand into the global market, professional conferences, where individuals working in the same field have discussions face-to-face, become even more complicated to organize. These conferences must be planned down to the last detail and carried out seamlessly — **34** such tasks are ones executed by event planners. When planning conferences, event planners coordinate each guest's hotel accommodations, schedule the panel discussions, **35** manage the necessary transportation, security features, and catering requirements. This position requires time management expertise, excellent interpersonal skills, as Maaïke Fleur can attest, **36** the ability to delegate tasks properly.

34

- A) NO CHANGE
- B) these are two of the tasks
- C) tasks such as these are ones
- D) two tasks

35

- A) NO CHANGE
- B) managing
- C) and manage
- D) while managing

36

Which choice best introduces the main idea of the passage?

- A) NO CHANGE
- B) a strong command of technology.
- C) experience in digital marketing.
- D) knowledge of computer programming.



In 2013, Fleur’s employer, the Global Reporting Initiative (GRI), tasked her with planning the “Global Conference on Sustainability and Reporting.” This conference included 1,600 participants from 69 countries attending 52 sessions and roundtable discussions. GRI also hired the company **37** QuickMobile. GRI had QuickMobile develop a customized mobile event application (app) to be used by the conference participants.

At the onset, Fleur wanted to utilize the app to improve the efficiency of her daily tasks. **38** In particular, she wanted to simplify how she responded to unexpected schedule changes during the conference. Replacing a bulky three-ring binder (a hallmark of the event-planning **39** profession), Fleur used the app to store key documents on her mobile device and to send out alerts regarding scheduling revisions. Fleur also recognized that the app **40** saved time during the planning process, as she was able to use it as a placement for the 75-page program book developed for the conferences, which saved 13 trees and over 100 liters of water. Participants were thus encouraged to download the app to stay informed of conference.

37

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

- A) QuickMobile to develop
- B) QuickMoile for the purpose of their developing
- C) QuickMobile, a company that would develop
- D) QuickMobile, a company that would develop

38

- A) NO CHANGE
- B) Nevertheless,
- C) However,
- D) Similarly,

39

- A) NO CHANGE
- B) profession);
- C) profession)—
- D) profession),

40

Which choice best sets up the information that follows in the sentence?

- A) NO CHANGE
- B) was very intuitive to use,
- C) promoted sustainability practices,
- D) allowed for more rapid communication,



As an event planner, fleur needed not only to manage the conference **41** and also to determine if her decisions were successful. Fleur used the app to poll participants on their **42** opinions of the conference's logistics. Fleur found that more than 1,350 attendees downloaded the app and that 75 percent of them rated the **43** app, as "very good," which suggested the attendees were satisfied with the virtual program book.

41

- A) NO CHANGE
- B) but also to
- C) but would also
- D) as she also needed to

42

- A) NO CHANGE
- B) opinion's of the conference's
- C) opinions of the conferences'
- D) opinions of the conferences

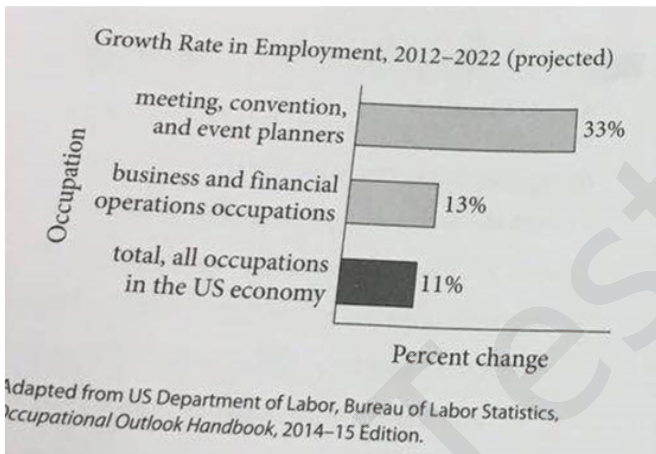
43

- A) NO CHANGE
- B) app as
- C) app as:
- D) app as,





Fleur's action demonstrate how technology can help event planners coordinate successful conferences. New technologies may continue to emerge as the number of event planners increases—the US Bureau of Labor Statistics expects a growth rate of 33 percent in the profession from 2012 to 2022. **44** The bureau also predicts that individuals with expertise in virtual software will have an advantage in the job market, so Fleur's use of the mobile events app to plan GRI's conference may be an example of a burgeoning career trend.



44

At this point, the writer is considering adding the following information from the chart.

In addition, business and financial operations occupations are projected to grow 13 percent in the same time span.

Should the writer make this addition here?

- A) Yes, because it accurately summarizes the information about business and financial operations occupations presented in the chart.
- B) Yes, because it provides supporting information for the claims about employment growth made in the paragraph.
- C) No, because it fails to compare the growth rate of business and financial operations occupations with that of all occupations.
- D) No, because it provides an irrelevant statistic that does not support the paragraph's claims about how the field of event planning is changing.

## STOP

**If you finish before time is called, you may check your work on this section only.  
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# Math Test – No Calculator

## 25 MINUTES, 20 QUESTIONS

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

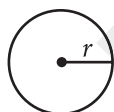
### DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle 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

- The use of a calculator **is not permitted**.
- All variables and expressions used represent real numbers unless otherwise indicated.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures lie in a plane unless otherwise indicated.
- 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

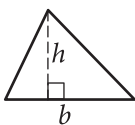


$$A = \pi r^2$$

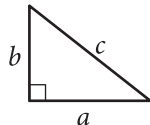
$$C = 2\pi r$$



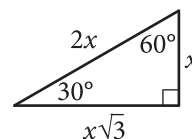
$$A = \ell w$$



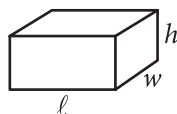
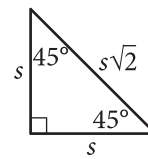
$$A = \frac{1}{2}bh$$



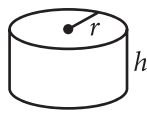
$$c^2 = a^2 + b^2$$



Special Right Triangles



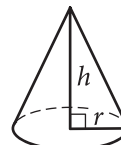
$$V = \ell wh$$



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



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



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



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

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

The number of radians of arc in a circle is  $2\pi$ .

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



1

What is the solution of  $9n+20=-16$ ?

- A) -4
- B)  $-\frac{20}{9}$
- C)  $\frac{4}{9}$
- D) 4

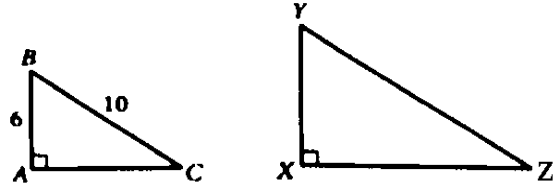
2

$$10v-6t=3,310$$

The equation above models the relationship between the speed of sound  $v$ , in meters per second, in dry air, and the temperature of the air  $t$ , in degrees Celsius. Which of the following expresses  $v$  in terms of  $t$ ?

- A)  $v=\frac{3}{5}t + 331$
- B)  $v=\frac{3}{5}t + 551,7$
- C)  $t=\frac{5}{3}t + 331$
- D)  $t=\frac{5}{3}v + 551,7$

3



Right triangles ABC and XYZ above are similar. What is the tangent of angle Z?

- A)  $\frac{3}{5}$
- B)  $\frac{3}{4}$
- C)  $\frac{4}{3}$
- D)  $\frac{5}{3}$



4

The equation  $5q+7r=t$  can be used to determine the total charges,  $t$ , in dollars, for an order of sandwiches and salads from Dilini's Catering. If  $q$  represents the number of sandwiches in the order and  $r$  represents the number of salads in the order, which of the following is the best interpretation of the number 7 in this context?

- A) The number of salads in the order
- B) The number of sandwiches in the order
- C) The charge, in dollars, for each salad
- D) The charge, in dollars, for each sandwich

5

Which of the following is equivalent to  $x^{\frac{5}{2}}$ , where  $x>0$

- A)  $\frac{x^5}{x^2}$
- B)  $x^5 - x^2$
- C)  $\sqrt{x^5}$
- D)  $(\sqrt[5]{x})^2$

6

$$3(1 - x) = -3x + b$$

In the equation above,  $b$  is a constant. If the equation has no solution, which of the following must be true?

- A)  $b \neq -3$
- B)  $b \neq -1$
- C)  $b \neq 1$
- D)  $b \neq 3$

7

What values of  $x$  satisfy  $x^2+5x+6=9x+3$  ?

- A) 1 and 3
- B) 1 and -3
- C) 2 and 3
- D) 2 and -3



8

$$4x - 2y > 8$$

Which of the following ordered pairs  $(x, y)$  are in the solution set for the inequality above?

- I.  $(-1, -10)$
  - II.  $(2, 0)$
  - III.  $(1, -2)$
- A) I only  
 B) II only  
 C) III only  
 D) I and II only

9

$$x^{16} - x^{14} = k(x^{15} - x^{14})$$

$$x > 1$$

Based on the two conditions listed above, what is  $k$  in terms of  $x$ ?

- A)  $x - 1$   
 B)  $x + 1$   
 C)  $\frac{1}{x - 1}$   
 D)  $\frac{1}{x + 1}$

10

Which of the following is equivalent to  $(x - \frac{1}{2})(5x - \frac{1}{4})$ ?

- A)  $5x^2 - \frac{3}{4}x + \frac{1}{8}$   
 B)  $5x^2 - 2x - \frac{1}{8}$   
 C)  $5x^2 - \frac{9}{4}x - \frac{1}{8}$   
 D)  $5x^2 - \frac{11}{4}x + \frac{1}{8}$

11

In the  $xy$ -plane, line  $\rho$  passes through the points  $(1, -1)$  and  $(-1, -5)$ . Line  $m$  is perpendicular to line  $\rho$  and has a  $y$ -intercept that is 4 units greater than the  $y$ -intercept of line  $\rho$ . What is an equation of line  $m$ ?

- A)  $y = -\frac{1}{2}x - 7$   
 B)  $y = -\frac{1}{2}x + 1$   
 C)  $y = 2x - 3$   
 D)  $y = 2x + 1$



3



3

12

$$\begin{aligned}y &= x^2 + x - 2 \\ x + y &= 1\end{aligned}$$

If  $(x,y)$  is a solution of the system of equations above, which of the following is a possible value of  $xy$ ?

- A) 7
- B) 1
- C) -1
- D) -12

13

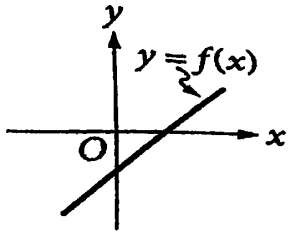
$$\begin{aligned}x &= 2y - 5 \\ y &= -2x + 5\end{aligned}$$

The ordered pair  $(x,y)$  satisfies the system of equations above. What is the value of  $x+y$ ?

- A) -5
- B) 0
- C)  $\frac{5}{2}$
- D) 4

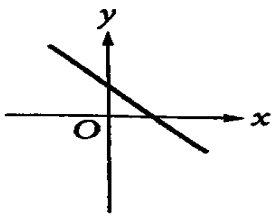


14

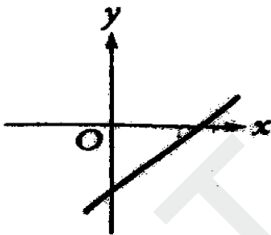


The graph of the function  $f$  is shown in the  $xy$ -plane above. The function  $f$  is defined by  $f(x) = mx + b$ , where  $m$  and  $b$  are constants. Which of the following could be the graph of the function  $g$ , where  $g(x) = -mx - b$ ?

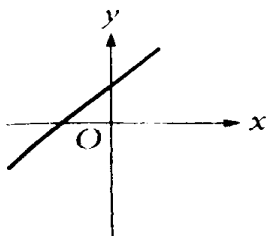
A)



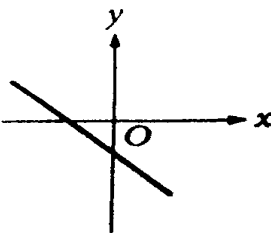
B)



C)

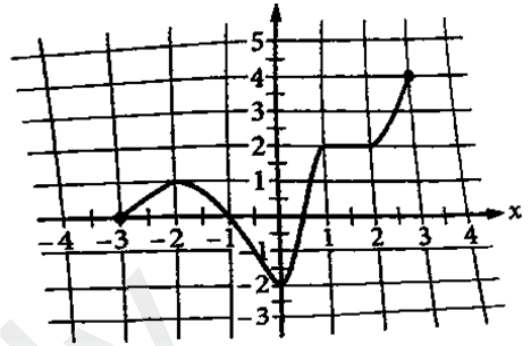


D)



15

The entire graph of  $y = f(x)$  is shown in the  $xy$ -plane below.



Which of the following could be the product of all the values of  $x$  for which  $f(x) = 0$ ?

A) -2

B) 0

C)  $\frac{3}{2}$ D)  $\frac{2}{3}$





**DIRECTIONS**

For questions 16-20, 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 circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle 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.

Write answer in boxes. →

← Fraction line

← Decimal point

Grid in result.

Answer: $\frac{7}{12}$			
7	/	1	2
.	.	.	.
0	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

Answer: 2.5			
2	.	5	
.	.	.	.
0	0	0	0
①	①	①	①
②	●	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	●
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

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

3	1	/	2
.	.	.	.

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

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

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

.	6	6	6
.	.	.	.
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	●	●	●
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧

.	6	6	7
.	.	.	.
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
⑦	⑦	⑦	●
⑧	⑧	⑧	⑧

Answer: 201 – either position is correct

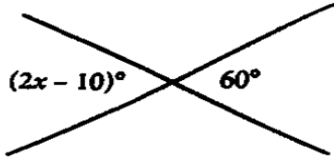
2	0	1	
.	.	.	.
0	●	0	0
①	①	①	●
②	●	②	②
③	③	③	③

2	0	1	
.	.	.	.
0	●	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

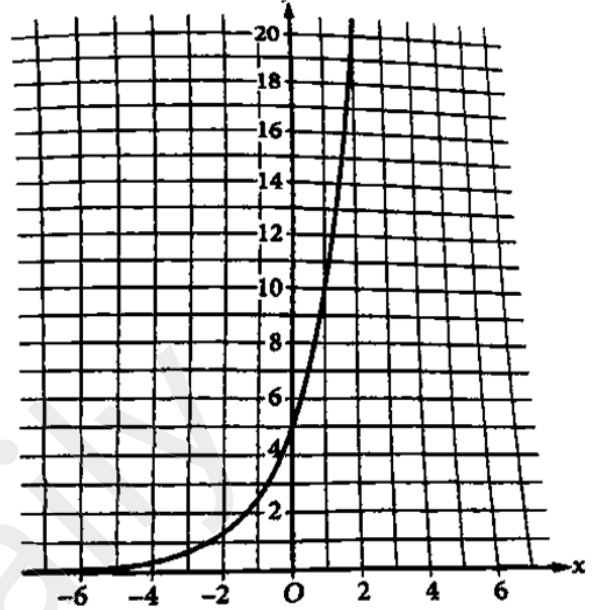


Two lines intersect in the figure above. What is the value of  $x$ ?

17

For a service visit, a technician charges a \$38 fee plus an additional \$12 for every  $\frac{1}{4}$  hour of the work. If the technician's total charge was \$158, for how much time, in hours, did the technician charge?

18



The graph of the function  $f$  is shown in the  $xy$ -plane above. The equation that  $f$  is  $f(x) = ab^x$ , where  $a$  and  $b$  are integers. What is the value of  $a$ ?

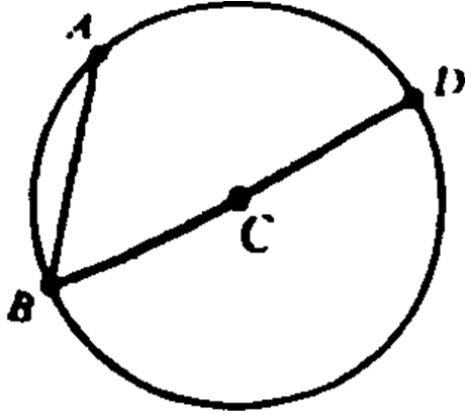


3



3

19



Note: Figure not drawn to scale.

In the circle above, C is the center. If the measure of  $\angle ABC$  is  $60^\circ$  and radius  $BC = 10$ , what is the length of  $AB$ ?

20

$$x^2 - 6x - 10 = 0$$

The quadratic equation above has solutions  $x = a + \sqrt{b}$  and  $x = a - \sqrt{b}$ , where  $a$  and  $b$  are constants.

What is the value of  $b/a$ ?

# STOP

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



**No Test Material On This Page**

TestDaily



扫码进入「TD真题捕手」获取答案



# Math Test – Calculator

## 55 MINUTES, 38 QUESTIONS

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

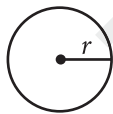
### DIRECTIONS

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

### NOTES

- The use of a calculator is permitted.
- All variables and expressions used represent real numbers unless otherwise indicated.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures lie in a plane unless otherwise indicated.
- 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

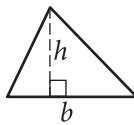


$$A = \pi r^2$$

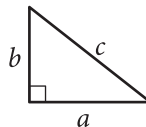
$$C = 2\pi r$$



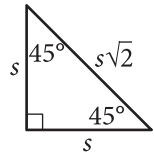
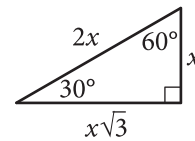
$$A = \ell w$$



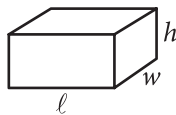
$$A = \frac{1}{2}bh$$



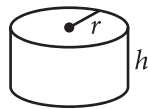
$$c^2 = a^2 + b^2$$



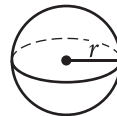
Special Right Triangles



$$V = \ell wh$$



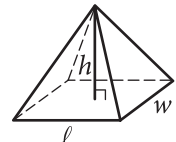
$$V = \pi r^2 h$$



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



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



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

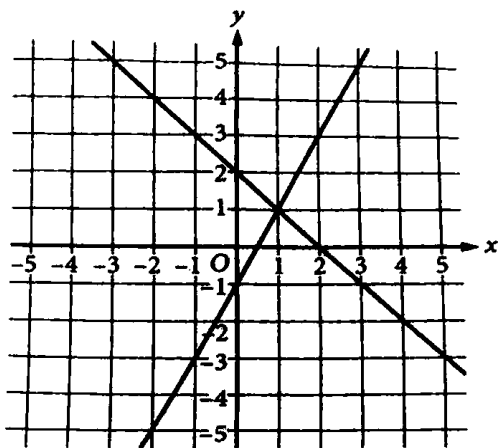
The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is  $2\pi$ .

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



1



In the  $xy$ -plane, what is the solution  $(x,y)$  to the system of equations graphed above?

- A)  $(0,-1)$
- B)  $(0,2)$
- C)  $(1,1)$
- D)  $(2,0)$

2

$$x^2 - 16 = 0$$

If  $x$  is a solution of the equation above, which of the following is a possible value of  $x$ ?

- A) -16
- B) -4
- C) 8
- D) 16

3

Ivan opened a checking account with an initial deposit of  $x$  dollars, and then he deposited \$55 into the account each week for 13 weeks. At the end of the 13 weeks, he had deposited \$800 into the account. If no other deposits or withdrawals were made, what is the value of  $x$ ?

- A) 55
- B) 85
- C) 140
- D) 800

4

$$\begin{aligned} y - 7x &= 13 \\ 8x &= 3y \end{aligned}$$

Which ordered pair  $(x,y)$  is the solution to the system of equations above?

- A)  $(-8,-3)$
- B)  $(-3,-8)$
- C)  $\left(1, \frac{3}{8}\right)$
- D)  $\left(\frac{8}{3}, 1\right)$



5

A certain cake recipe calls for 3 cups of flour to make 12 servings. If 40 servings of the cake are being made, how many cups of flour will be needed for this recipe?

- A) 0.9
- B) 4
- C) 10
- D) 31

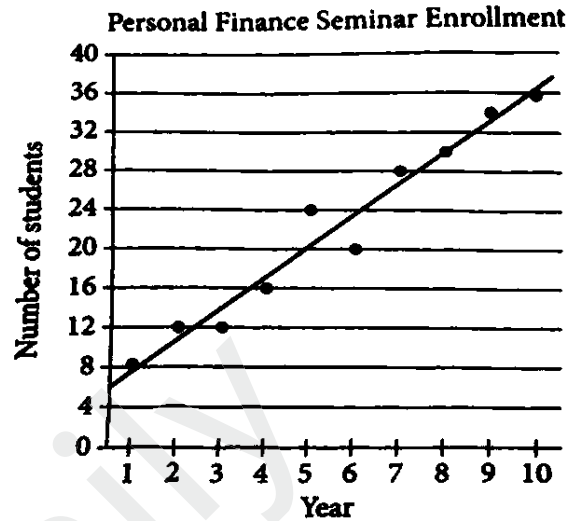
6

The function  $f$  is defined by  $f(x) = 3x^2 - 8x + 17$ .

What is the value of  $f(-2)$ ?

- A) - 11
- B) 13
- C) 21
- D) 45

7



The number of students enrolled in a personal finance seminar for each of 10 years is shown in the scatterplot above. A line of best fit is also drawn. For how many of these 10 years was enrollment in the seminar less than predicted by this line of best fit?

- A) 2
- B) 4
- C) 6
- D) 8



8

The 25 brightest stars in the night sky were classified by spectral type and luminosity class, as shown in the table below.

Spectral type	Luminosity class	Number of stars
B	supergiant	3
	giant	2
	main sequence	5
A	supergiant	1
	main sequence	5
F	main sequence	1
G	giant	1
	main sequence	2
K	giant	3
M	supergiant	1
	giant	1

What percentage of the stars represented in the table have a luminosity class of main sequence?

- A) 13%
- B) 36%
- C) 52%
- D) 67%

9

$$t = (2r - 4)$$

$$w = (2r + 4)$$

The equation above define  $t$  and  $w$  in terms of  $r$ .

What is  $\frac{tw}{4}$  in terms of  $r$ ?

- A)  $r^2 - 4$
- B)  $r^2 - 16$
- C)  $4r^2 - 4$
- D)  $4r^2 - 16$



**Questions 10 and 11 refer to the following information.**

To determine whether a certain author wrote a famous book, a research studied the works known to have been written by the author. The researcher collected a total of 5,000 distinct words of length 3, 4, 5, 6, or 7 letters from these works, and the table below summarizes information about these 5,000 words.

Length of word	Number of distinct words	Total number of letters
3 letters	293	879
4 letters	731	2,924
5 letters	1,038	5,190
6 letters	1,350	8,100
7 letters	1,588	11,116
Total	5,000	28,209

10

The number of distinct 7-letter words collected is approximately how many times as great as the number of distinct 3-letter words collected?

- A) 0.2
- B) 0.5
- C) 3
- D) 5

11

To the nearest percent, what percent of the 5,000 distinct words the researcher collected are 6 or 7 letters long?

- A) 27%
- B) 32%
- C) 41%
- D) 59%



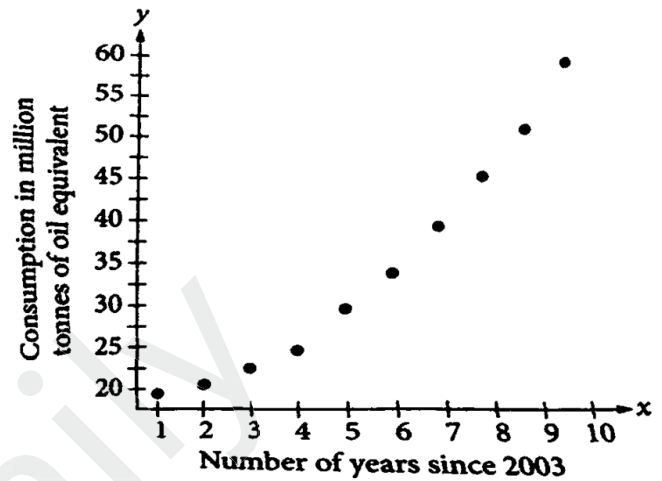
12

A recipe that serves 4 people calls for  $a$  apples and  $m$  mangoes. According to this recipe, what is the total number of apples and mangoes needed to serve 20 people?

- A)  $4a+4m$
- B)  $5a+5m$
- C)  $20a+20m$
- D)  $24a+24m$

13

United States Consumption of Certain Types of Renewable Energy since 2003



Which of the following equations best models the relationship between the variables in the scatterplot above?

- A)  $y = -16(60)^x$
- B)  $y = 16(0.86)^x$
- C)  $y = 16(1.14)^x$
- D)  $y = 16(20)^x$

**Questions 14 and 15 refer to the following information.**

In 2014, quarterly sales for full-service restaurants and shoe stores in the United States each increased by a constant rate. For the first quarter of 2014, full-service restaurants had total sales of \$63,083 (in millions), and each quarter their sales increased approximately \$1,597 (in millions). For the first quarter of 2014, shoe stores had total sales of \$8,143 (in millions), and each quarter their sales increased approximately \$32 (in millions).

14

Of the following equations, which best models the linear relationship in 2014 between the total quarterly sales (in millions),  $y$ , for full-service restaurants and the number of quarters,  $x$ , since the first quarter of 2014?

- A)  $y=1,597x+63,083$
- B)  $y=1,597x-63,083$
- C)  $y=63,083x+1,597$
- D)  $y=63,083x-1,597$

15

If the same linear trend for shoe store sales continues, how many quarters after the first quarter of 2014 will the total quarterly sales (in millions) for shoe stores in the United States first exceed \$8,500?

- A) 11
- B) 12
- C) 265
- D) 266

16

$$\frac{6}{x^2 - 9} = \frac{2}{x - 3} - \frac{1}{x + 3}$$

Which statement describes the solution to the equation above?

- A) 3 is the only solution.
- B) -3 is the only solution.
- C) 3 and -3 are both solutions.
- D) There are no solutions.

17

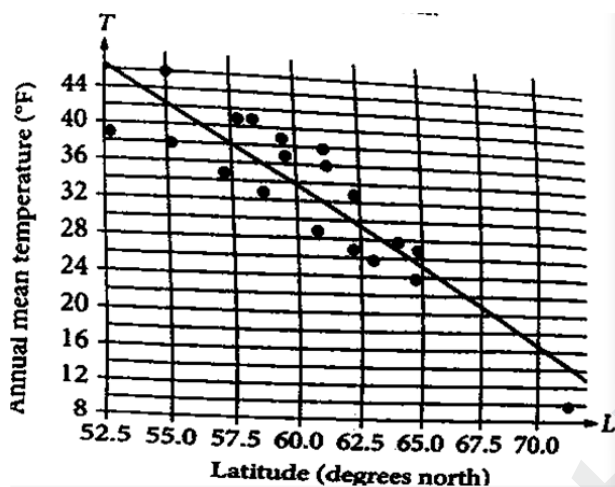
A data set consists of the values 250, 320, 430, 452, 600, and 17,167. If the outlier is removed, what will happen to the value of the mean of the data set?

- A) The mean will remain the same.
- B) The mean will decrease.
- C) The mean will increase.
- D) There is not enough information to determine how the mean will change.



Questions 18 and 19 refer to the following information.

The scatterplot below gives the latitude  $L$ , in degrees north, and the annual mean temperature  $T$ , in degrees Fahrenheit ( $^{\circ}\text{F}$ ), for 19 different locations in Alaska. A line of best fit for the data is also shown.



The equation of the line of best fit is  $T = -1.71L + 136$ .

18

Which of the following is the best interpretation of the number  $-1.71$  in the equation of the line of best fit?

- A) Each  $1^{\circ}\text{F}$  increase in annual mean temperature corresponds to a predicted  $1.71$ -degree increase in north latitude.
- B) Each  $1^{\circ}\text{F}$  increase in annual mean temperature corresponds to a predicted  $1.71$ -degree decrease in north latitude.
- C) Each  $1$ -degree increase in north latitude corresponds to a predicted  $1.71^{\circ}\text{F}$  increase in annual mean temperature.
- D) Each  $1$ -degree increase in north latitude corresponds to a predicted  $1.71^{\circ}\text{F}$  decrease in annual mean temperature.

19

Saint Paul Island, Alaska, is one of the 19 locations shown in the scatterplot. It has a latitude of  $57.2$  degrees north and an annual mean temperature of  $35^{\circ}\text{F}$ . How many location shown in the scatterplot have both a greater north latitude and a greater annual mean temperature, in  $^{\circ}\text{F}$ , than Saint Paul Island?

- A) Two
- B) Four
- C) Six
- D) Nine



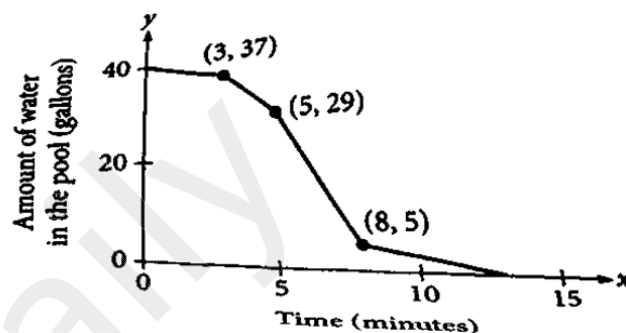
20

To determine if gender and number of siblings are related to whether 9-year-old children like to read, Sarah selected a random sample of 40 boys with fewer than 3 siblings and a random sample of 30 girls with 3 or more siblings from the 9-year-old children in her city. For each child, she recorded the child's age, gender, and whether the child reported liking to read. Why is it inappropriate for Sarah to draw a conclusion from her study?

- A) The two samples are not of equal size.
- B) The two samples should have been chosen from different cities.
- C) There is no upper bound on the number of siblings of the 30 girls.
- D) Sarah will not be able to tell whether a difference in liking to read is related to the difference in gender or to the difference in number of siblings.

21

A pump can be set to extract water from a pool at one of three different rates: 1 gallon per minute, 4 gallons per minute, or 8 gallons per minute. The graph below shows the amount of water left in the pool from the time the pump was turned on was the pump switched to a rate of 8 gallons per minute?

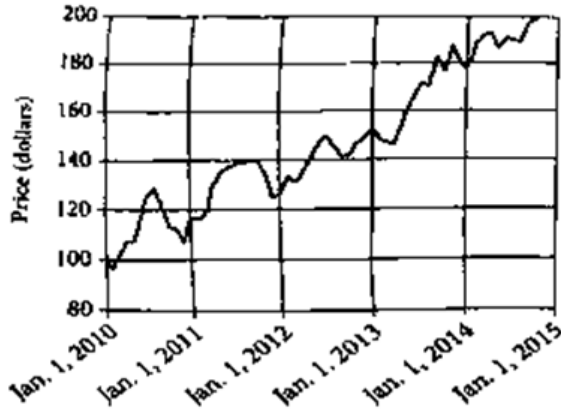


- A) 3
- B) 5
- C) 8
- D) 29



22

The price of an investment over a period of 5 years is shown in the graph below.



During which of the following time periods did the price of the investment have the largest increase?

- A) Jan. 1, 2011, to Jan. 1, 2012
- B) Jan. 1, 2011, to Jan. 1, 2013
- C) Jan. 1, 2012, to Jan. 1, 2014
- D) Jan. 1, 2013, to Jan. 1, 2014

23

Starting in 1970, the population of a city doubled every 10 years until 2010. The population of the city was 36,000 in 1970. Which of the following expressions gives the population of the city in 2010?

- A)  $36,000(2)^4$
- B)  $36,000(2)^{10}$
- C)  $36,0002^{40}$
- D)  $36,000(2)(40)$

24

The decibel level  $d$  of each successive measure of the refrain of a song can be modeled by the equation  $d=5n+40$ , where  $n$  is the number of measures from the beginning of the refrain and  $0 \leq n \leq 12$ . According to the model, what is the change in decibel level between each successive measure of the refrain?

- A) 5
- B) 12
- C) 40
- D) 60

25

The line in the  $xy$ -plane that is the graph of the linear function  $f$  has slope 2 and contains the point  $(0,7)$ . What is the value of  $f(2)$ ?

- A) 9
- B) 11
- C) 14
- D) 16



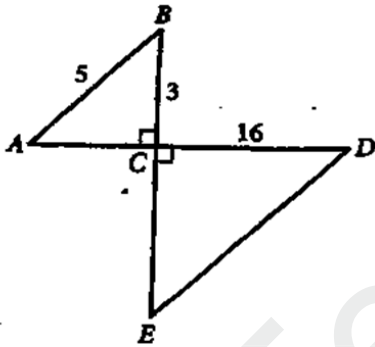
26

$$(3x+a)-4(ax-3)=7x+11$$

In the equation above,  $a$  is a constant. If the equation holds true for all values of  $x$ , what is the value of  $a$ ?

- A) 6
- B) 4
- C) 1
- D) -1

27



Note: Figure not drawn to scale.

In the figure above,  $\angle B$  is congruent to  $\angle E$ . What is the value of  $\sin D$ ?

- A)  $\frac{3}{5}$
- B)  $\frac{4}{5}$
- C)  $\frac{16}{5}$
- D)  $\frac{16}{25}$

28

In the  $xy$ -plane, the graph of  $y = 5 - (x - 3)^2$  is the image of the graph of  $y = 4 - x^2$  after which of the following transformation?

- A) A translation of 1 unit up and 3 units to the right
- B) A translation of 1 unit down and 3 units to the right
- C) A translation of 1 unit up and 3 units to the left
- D) A translation of 3 units down and 1 unit to the right



29

The efficiency of an engine is the proportion of its fuel energy that the engine can convert into motion energy. The equation  $E=1-x/p$  relates an engine's efficiency,  $E$ , to its exhaust temperature  $x$ , in kelvins, and its operating temperature  $p$ , in kelvins. A particular automobile engine has an operating temperature of 473 kelvins and an exhaust temperature of 293 kelvins. Based on the engine's efficiency, about how many joules of motion energy can the engine obtain from 40,000,000 joules of fuel energy?

- A) 15,200,000
- B) 24,800,000
- C) 64,600,000
- D) 105,000,000

30

Earth's outer core can be modeled by a spherical shell that extends from a distance of approximately 1,200 kilometers from Earth's center to approximately 3,400 kilometers from Earth's center. Which of the following is closest to the volume of Earth's outer core, in cubic kilometers?

- A)  $1.52 \times 10^7$
- B)  $3.18 \times 10^7$
- C)  $4.46 \times 10^{10}$
- D)  $1.57 \times 10^{11}$







31

$$\frac{1}{2}(2ax - 4) = 3$$

Based on the equation above, what is the value of  $4ax$ ?

32

A doctor prescribes a medication for a 66-pound child. In each dose, the child is to be given 8 milligrams of the medication for every kilogram of the child's body weight. The medication is to be given to the child 2 times per day for 5 days. How much medication, in milligrams, should be provided for the entire 5-day treatment plan? (1 kilogram = 2.2 pounds)

33

x	f(x)	g(x)
1	4	0
4	6	12
6	4	7
9	1	10
12	9	8

The table above shows several values of function  $f$  and function  $g$ . According to the table, if  $f(4) = a$ , what is  $g(a)$ ?



34

Survey Results of Households

Number of children per household	Frequency
0	$x$
1	3
2	2
3	5
4	2

In the table above, the median number of children per household is 2. What is one possible value of  $x$ ?

35

$$(x + 3)^2 + (y - 1)^2 = 121$$

The graph of the equation above in the  $xy$ -plane is a circle. What is the diameter of the circle?

36

The graphs of lines  $t$  and  $v$  in the  $xy$ -plane are perpendicular. The equation of line  $t$  is  $\frac{2}{3}x + \frac{5}{6}y = -10$ . What is the slope of line  $v$ ?



Questions 37 and 38 refer to the following information.

Street A	Street B
261	271
290	253
267	272
282	262
273	270
269	288
293	263
288	265
279	259

The table above shows the weights, in pounds, of the manhole covers on two city streets. City regulations require that each manhole cover weigh at least 250 pounds and no more than 300 pounds.

37

The median weight of the manhole covers on Street A is how many pounds greater than the median weight of the manhole covers on Street B?

38

The mean weight of the 9 manhole covers on Street B is 267 pounds. If an additional manhole and manhole cover are added to Street B, and if the mean weight, in pounds, for the 10 manhole covers on Street B is an integer greater than 267, what is one possible weight, in pounds, of the additional manhole cover?

# STOP

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

# The SAT<sup>®</sup>

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# 2017-11 U.S. Essay

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As you read the passage below, consider how Michael Menaker uses

- evidence, such as facts or examples, to support claims.
- reasoning to develop ideas and to connect claims and evidence.
- stylistic or persuasive elements, such as word choice or appeals to emotion, to add power to the ideas expressed.

**Adapted from “Menaker: Why humans shouldn’t go to Mars” by Michael Menaker. Originally published on Jan 10, 2015.**

- <sup>1</sup> Mars has been in the news a lot lately.
- <sup>2</sup> Just recently, studies have shown that the red planet “belches” methane, harbors organic molecules and once was warmer and wetter than previously believed — all possible indicators of past, and maybe even present, simple life there. And last month NASA launched its Orion spacecraft in a first step to eventually send humans on a journey to Mars.
- <sup>3</sup> The space agency calls a future human mission to Mars its “next giant leap.” Actually, attempting to eventually send humans to Mars is a pricey, risky leap. And a poor use of a great deal of money.
- <sup>4</sup> There are, of course, good reasons for exploring Mars. The first is that Mars is the easiest place to reach to look for direct evidence of life beyond Earth. One of the biggest questions in science is whether or not life has originated more than once in the universe. Mars is the best place to look. Another reason to explore is to study the geology of Mars, to answer a range of planetary questions that can improve our understanding of our solar system.
- <sup>5</sup> But there are many reasons not to send people to another planet. Mars, as close as it is, is a planet too far. It would take well over a year to get there, work there and come back. It may prove impossible to get the astronauts back — a one-way trip is being considered, which raises troubling ethical questions. The astronauts would absorb dangerous doses of cosmic radiation. The mental anguish they are likely to suffer from living for so long in isolation, much of the time in zero to little gravity, is a recipe for profound psychological damage.
- <sup>6</sup> It’s also ridiculously expensive. Cost estimates are in the tens of billions of dollars. Based on previous experience with big government projects, we can expect the final cost to double or triple. By attempting to send humans to Mars we would divert a great deal of public money from potentially improving life on Earth for millions of people to just putting a few humans on another planet.

- 7 So why bother? The simple answer is people have a peculiar fascination with things that are hard to do. President John F. Kennedy famously stated in a 1962 speech, “We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard.” So we went to the moon between 1969 and 1972, a technical tour de force; a propaganda victory over the Soviet Union, our space-age rival. Inspirational at the time, but that was more than four decades ago and what, really, have we done with the moon? Planted a flag. Indeed we did gain advances in rocketry, computers, communications, avionics and robotics, but these were spinoffs from the difficult engineering task of finding a way to make “one small step for a man” on a close-by and barren sphere of rock and dust. We could have done just as well technologically by sending only robots.
- 8 Sending people to Mars will prove especially daunting. And I say this as a scientist who loves challenges. But the challenge ought to make good sense. Sending humans to Mars doesn't.
- 9 The fact is, we already have been to Mars. We are there right now. We have been operating rovers on the surface of Mars since 1997, and landed another one, Curiosity, in 2012. The results have been spectacular. The robots have operated better than and for far longer than expected and are sending back excellent data and images that tell us more about that planet every day than any human on constant life support ever could. Science is about discovery and we will continue to discover marvelous things by looking beyond our planet. It is the robots that are taking us there. At a fraction of the cost of human space travel.
- 10 And there's a bigger reason for not wasting more money on human trips to nearby desert spheres. We currently are underfunding basic science right here on Earth. Our young scientists are poised and eager to make important discoveries on the planet where we need them most. They are destined to make amazing discoveries, if only we would adequately fund them.
- 11 Mars is undeniably interesting. It's tantalizing and captures our imagination. But we've been there, we are there and we will continue to learn more from that marvelous red planet. If life exists there, or ever has, we will find evidence of it — with our robots.
- 12 In the meantime, there are urgent Earth-bound problems to solve. Let's focus our resources on the basic sciences, which are beneficial for every person on this planet, and for the planet itself — the only one we don't need a rocket to reach.

Write an essay in which you explain how Michael Menaker builds an argument to persuade his audience that humans shouldn't go to Mars. In your essay, analyze how Menaker uses one or more of the features listed in the box above (of features of your own choice) to strengthen the logic and persuasiveness of his argument. Be sure that your analysis focuses on the most relevant features of the passage.

Your essay should not explain whether you agree with Menaker's claims, but rather explain how Menaker builds an argument to persuade his audience.



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