



# SAT® 2018 Jun NA

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1

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2

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**Test begins on the next page.**

# Reading Test

**65 MINUTES, 52 QUESTIONS**

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

**DIRECTIONS**

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

**Questions 1-10 are based on the following passage.**

This passage is adapted from Jane Austen, *Persuasion*. Originally published in 1818. Anne is one of three daughters of Sir Walter Elliot, a widower. Lady Russell is a longtime family friend.

Captain Frederick Wentworth had come into Somersetshire in the summer of 1806; and having no parent living, found a home for half a year, at Line Monkford. He was, at that time, a remarkably fine young man, with a great deal of intelligence, spirit and brilliancy; and Anne an extremely pretty girl, with gentleness, modesty, taste, and feeling. Half the sum of attraction, on either side, might have been enough, for he had nothing to do, and she had hardly any body to love; but the encounter of such lavish recommendations could not fail. They were gradually acquainted, and when acquainted, rapidly and deeply in love. It would be difficult to say which had seen highest perfection in the other, or which had been the happiest; she, in receiving his declarations and proposals, or he in having them accepted.

A short period of exquisite felicity followed, and but a short one. Troubles soon arose. Sir Walter, on being applied to, without actually withholding his consent, or saying it should never be, gave it all the negative of great astonishment, great coldness, great silence, and a professed resolution of doing nothing for his daughter. He thought it a very degrading alliance; and Lady Russell, though with more

tempered and pardonable pride, received it as a most unfortunate one.

Anne Elliot, with all her claims of birth, beauty and mind, to throw herself away at nineteen; involve herself at nineteen in an engagement with a young man, who had nothing but himself to recommend him, and no hopes of attaining affluence, but in the chances of a most uncertain profession, and no connexions to secure even his farther rise in that profession; would be, indeed, a throwing away, which she grieved to think of! Anne Elliot, so young; known to so few, to be snatched off by a stranger without alliance or fortune; or rather sunk by him into a state of most wearing, anxious, youth-killing dependence! It must not be, if by any fair interference of friendship, any representations from one who had almost a mother's love, and mother's rights, it would be prevented.

Captain Wentworth had no fortune. He had been lucky in his profession, but spending freely what had come freely, had realized nothing. But, he was confident that he should soon be rich; full of life and ardour, he knew that he should soon have a ship, and soon be on a station that would lead to everything he wanted. He had always been lucky; he knew he should be so still. Such confidence, powerful in its own warmth, and bewitching in the wit which often expressed it, must have been enough for Anne; but Lady Russell saw it very differently. His sanguine temper, and fearlessness of mind, operated very differently on her. She saw in it but an aggravation of the evil. It only added a dangerous character to

himself. He was brilliant, he was headstrong. Lady Russell had little taste of wit; and of anything approaching to imprudence a horror. She deprecated the connexion in every light.

Such opposition, as these feelings produced, was more than Anne could combat. Young and gentle as she was, it might yet have been possible to withstand her father's ill-will, though unsoftened by one kind word or look on the part of her sister; but Lady Russell, whom she had always loved and relied on, could not, with such steadiness of opinion, and such tenderness of manner, be continually advising her in vain. She was persuaded to believe the engagement a wrong thing—indiscreet, improper, hardly capable of success, and not deserving it. But it was not a merely selfish caution, under which she acted, in putting an end to it. Had she not imagined herself consulting his good, even more than her own, she could hardly have given him up. The belief of being prudent, and self-denying principally for *his* advantage, was her chief consolation, under the misery of a parting—a final parting; and every consolation was required, for she had to encounter all the additional pain of opinions, on his side, totally unconvinced and unbending, and of his feeling himself ill-used by so forced a relinquishment. He had left the country in consequence.

A few months had seen the beginning and the end of their acquaintance; but, not with a few months ended Anne's share of suffering from it. Her attachments and regrets had, for a long time, clouded every enjoyment of youth; and an early loss of bloom and spirits had been their lasting effect.

1

The passage primarily serves to

- A) depict a romantic involvement that causes significant discord.
- B) offer a critique of parents who are overly involved in their children's lives.
- C) demonstrate that common interests are needed for a relationship to succeed.
- D) describe a deepening relationship between two friends.

2

The statement in lines 10-11 ("but the ... fail") is best interpreted to mean that Anne and Captain Wentworth

- A) were extremely generous to one another in all their interactions.
- B) did not expect any opposition to their engagement.
- C) were very confident of having success in life.
- D) were so well matched that their attachment was inevitable.

3

As used in line 18, "exquisite" most nearly means

- A) intricate.
- B) intense.
- C) delicate.
- D) elegant.

4

Regarding Anne's relationship with Captain Wentworth, it can reasonably be inferred that Lady Russell had convinced herself that

- A) the couple did not know the true meaning of love.
- B) she had a compelling obligation to intervene.
- C) she was the only one who could influence Anne.
- D) Anne should marry someone raised in Somersetshire.

5

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

- A) Lines 36-40 ("Anne . . . dependance")
- B) Lines 40-43 ("It must . . . prevented")
- C) Lines 54-56 ("Lady . . . her")
- D) Lines 60-61 ("She . . . light")

6

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

- A) comprehended.
- B) envisioned.
- C) conceived.
- D) gained.

7

The sentence in lines 63-70 (“Young ... vain”) serves mainly to reveal that

- A) Anne held her sister’s opinions about romance in high regard.
- B) Lady Russell took advantage of her relationship with Anne.
- C) Anne was more influenced by Lady Russell than by her father.
- D) Lady Russell believed that Anne’s engagement was improper.

8

The passage indicates that Anne’s termination of her engagement to Captain Wentworth was the result of

- A) a decision based largely on her perception of his poorest interests.
- B) an acknowledgment of the force of her father’s disapproval.
- C) an awareness of her diminishing feelings for Captain Wentworth.
- D) an outcome that Captain Wentworth had not anticipated.

9

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

- A) Lines 62-63 (“Such . . . combat”)
- B) Lines 70-72 (“She . . . deserving it”)
- C) Lines 74-78 (“Had . . . consolation”)
- D) Lines 80-83 (“she . . . relinquishment”)

10

The final sentence of the passage (lines 87-90) can be seen as ironic primarily because of

- A) Lady Russell’s belief that Anne’s marriage to Captain Wentworth would rob her of her youthful vivacity.
- B) Anne’s sister’s unwillingness to support Anne’s engagement to Captain Wentworth.
- C) Captain Wentworth’s complete confidence that her would continue to be lucky and successful in life.
- D) Captain Wentworth’s belief that Anne’s father forced her to end their engagement.

**Questions 11–21 are based on the following passage and supplementary material.**

This passage is adapted from Julie Sedivy, “Your Speech Is Packed with Misunderstood, Unconscious Messages.” ©2015 by Nautilus.

Many scientists think that our cultural fixation with stamping out what they call “disfluencies” is deeply misguided. Saying *um* is no character flaw, *Line* but an organic feature of speech; far from distracting *5* listeners, there’s evidence that it focuses their attention in ways that enhance comprehension.

Disfluencies arise mainly because of the time pressures inherent in speaking. Speakers don’t pre-plan an entire sentence and then mentally press *10* “play” to begin unspooling it. If they did, they’d probably need to pause for several seconds between each sentence as they assembled it, and it’s doubtful that they could hold a long, complex sentence in working memory. Instead, speakers talk and think at *15* the same time, launching into speech with only a vague sense of how the sentence will unfold, taking it on faith that by the time they’ve finished uttering the earlier portions of the sentence, they’ll have worked out exactly what to say in the later portions. Mostly, *20* the timing works out, but occasionally it takes longer than expected to find the right phrase. Saying “*um*” is the speaker’s way of signaling that processing is ongoing, the verbal equivalent of a computer’s spinning circle. People sometimes have more *25* disfluencies while speaking in public, ironically, because they are trying hard not to misspeak.

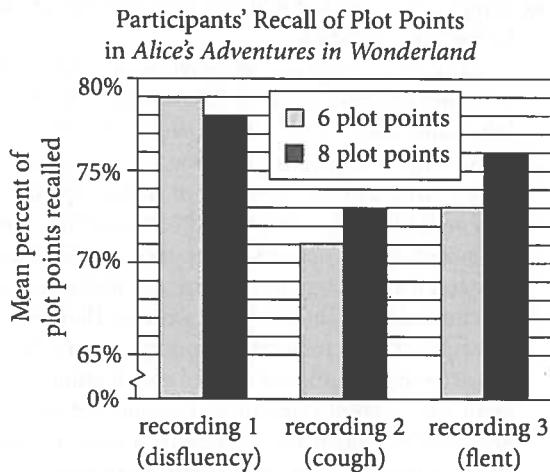
Since disfluencies show that a speaker is thinking carefully about what she is about to say, they provide useful information to listeners, cueing them to focus *30* attention on upcoming content that’s likely to be meaty. One famous example comes from the movie *Jurassic Park*. When Jeff Goldblum’s character says, “I’m, I’m simply saying that life, uh ... finds a way,” the disfluencies emphasize that he’s coming to grips *35* with something not easy to explain—an idea that turns out to be a key part of the movie.

**Experiments with *ums* or *uhs* spliced in or out** of speech show that when words are preceded by disfluencies, listeners recognize them faster and *40* remember them more accurately. In some cases, disfluencies allow listeners to make useful predictions about what they’re about to hear. In one study, for example, listeners correctly inferred that speakers’

stumbles meant that they were describing complicated conglomerations of shapes rather than simple single shapes.

Disfluencies can also improve our comprehension of longer pieces of content. Psychologists Scott Fraundorf and Duane Watson tinkered with *50* recordings of a speaker’s retellings of passages from *Alice’s Adventures in Wonderland* and compared how well listeners remembered versions that were purged of all disfluencies as opposed to ones that contained an average number of *ums* and *uhs* (about *55* two instances out of every 100 words). They found that hearers remembered plot points better after listening to the disfluent versions, with enhanced memory apparent even for plot points that weren’t preceded by a disfluency. Stripping a speech of *ums* and *uhs* appears to be doing listeners no favors.

Moreover, there’s reason to question the implicit assumption that disfluencies reveal a speaker’s lack of knowledge. In a study led by Kathryn Womack, experienced physicians and residents in training *65* looked at images of various dermatological conditions while talking their way to a diagnosis. Not surprisingly, the expert doctors were more accurate in their diagnoses than the residents. They also produced more complex sentences—and a *70* greater number of disfluencies, giving lie to the notion that disfluencies reflect a lack of control over one’s material. On the contrary, the study’s authors suggest that the seasoned doctors had more disfluent speech because they were sifting through a larger *75* body of knowledge and constructing more detailed explanations.

**Figure 1**

Adapted from Scott H. Fraundorf and Duane Watson, "The Disfluent Discourse: Effects of Filled Pauses on Recall," ©2011 by Elsevier Inc.

Participants heard one of three audio recordings: one in which disfluencies were inserted at 6 of 14 plot points, one in which coughs were inserted at the same 6 of 14 plot points, or one in which no interruptions were inserted. In all recordings, no interruptions were inserted at the other 8 plot points.

**Figure 2**

Characteristics of Spoken Diagnoses by Experienced Physicians and Residents in Training

Characteristic	Experienced physicians	Residents in training
Mean duration (seconds)	46.1	33.8
Mean number of words	85.7	50.9
Mean number of disfluencies	6.3	1.9
Mean number of disfluencies in a percentage of number of words	8.0	4.0

Adapted from "Disfluencies as Extra-Propositional Manners of Cognitive Processing," ©2012 by Association for International Linguistics.

11

A central purpose of the passage is to

- A) rectify a common misinterpretation of a communicative behavior.
- B) propose a solution to a persistent problem in interpersonal communication.
- C) present an argument about the social origins of a communicative strategy.
- D) promote an approach for improving communicative skills.

12

As used in line 4, "feature" most nearly means

- A) purpose.
- B) report.
- C) component.
- D) appearance.

13

Which choice best paraphrases the author's point in lines 8–10 ("Speakers ... unspooling it")?

- A) Speakers do not allow sufficient time for selecting words appropriately.
- B) Speakers do not construct complete sentences in their minds before uttering them.
- C) Speaking is similar to mechanical forms of information retrieval.
- D) Recording technologies unduly influence speech patterns.

14

As used in line 16, "sense" most nearly means

- A) experience.
- B) touch.
- C) significance.
- D) idea.

15

Which choice best supports the conclusion that disfluency may correlate with the social context in which speech occurs?

- A) Lines 14-19 (“Instead . . . later portions”)
- B) Lines 19-21 (“Mostly . . . phrase”)
- C) Lines 21-24 (“Saying . . . circle”)
- D) Lines 24-26 (“People . . . misspeak”)

16

Based on the passage, which choice best identifies one way that disfluency inadvertently assists communication?

- A) By signifying the speaker’s conscious focus on specific points, disfluency emphasizes which aspects of an utterance are apt to be significant.
- B) By moderating the pace at which the speaker introduces details, disfluency enhances listeners’ recall of a narrative as a whole.
- C) By recapturing the listener’s attention as it wanes over the course of a narrative, disfluency ensures general comprehension.
- D) By conveying the speaker’s relatability, disfluency renders an utterance more relevant to the listener than it would otherwise be.

17

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

- A) Lines 7-8 (“Disfluencies . . . speaking”)
- B) Lines 27-31 (“Since . . . meaty”)
- C) Lines 37-40 (“Experiments . . . accurately”)
- D) Lines 47-48 (“Disfluencies . . . content”)

18

Which statement describes an important difference between the design of Fraundorf and Watson’s study and that of Womack’s study?

- A) Fraundorf and Watson recruited many study subjects for their experiment, whereas Womack involved relatively few participants in her study.
- B) Fraundorf and Watson informed study subjects of the intended purpose of the experiment, whereas Womack purposely concealed the study’s aim from participants.
- C) Fraundorf and Watson manipulated disfluencies present in recorded speech, whereas Womack observed disfluencies occurring naturally in speech.
- D) Fraundorf and Watson used literary subject matter to study disfluency, whereas Womack manipulated disfluencies in scientific discourse to assess their effect on listeners.

19

According to figure 1, what was the mean percent of the 6 plot points recalled for recording 1?

- A) 73%
- B) 76%
- C) 78%
- D) 79%

20

The data in figure 2 indicate that in comparison with residents in training, experienced physicians

- A) hesitated for longer periods before announcing their diagnoses.
- B) spoke more words overall when formulating their diagnoses.
- C) used words of fewer syllables on average in their diagnoses.
- D) exhibited a greater variety of disfluencies in their diagnoses.

21

The data from figure 2 most clearly reinforce the passage's claim of a correlation between doctors' professional experience and

- A) the depth of knowledge that informs their diagnoses.
- B) their reliance on complex sentence structures in spoken diagnoses.
- C) the specificity and medical accuracy of their diagnoses.
- D) their use of disfluencies when expressing their diagnoses aloud.

**Questions 22-31 are based on the following passages.**

Passage 1 is adapted from Brian Switek, "The Origin of a Little Tyrant." ©2011 by Smithsonian Magazine. Passage 2 is adapted from Michael Balter, "Top Predator Wannabe is Just Another *T. rex*." ©2015 by American Association for the Advancement of Science.

**Passage 1**

In 1988 paleontologists Robert Bakker, Phil Currie and Michael Williams hypothesized that a small tyrannosaur skull (which had been found by Line paleontologist Charles Gilmore in Montana in the 5 1940s) belonged to a unique genus of small tyrannosaur which shared the environment preserved in Montana's Lance and Hell Creek formations with *Tyrannosaurus*. The primary line of evidence was the fusion of the skull bones. As 10 animals age, the various bones that make up their skulls fuse along sutures, and the degree to which the bones have fused can sometimes be used to roughly determine age. Since all the skull bones in the Gilmore skull appeared to be fused, Bakker and 15 colleagues stated, the tyrannosaur must have been a small adult and therefore distinct from the bigger, bulkier *Tyrannosaurus rex*. Appropriately, they called the hypothesized animal *Nanotyrannus*.

Here's where things get tricky, though. The 20 timing of when sutures between skull bones fuse in dinosaurs varies among individuals and may not be a good indicator of growth stage. And in a 1999 study of growth changes in tyrannosaurid skulls, paleontologist Thomas Carr found that none of the 25 bone fusions claimed by Gilmore or Bakker and colleagues were actually visible. This discovery, in addition to typical characteristics of immature animals such as large, round orbits (eye sockets) and the texture of the bone, identified the skull as a 30 juvenile tyrannosaurid, most likely a young *Tyrannosaurus rex*. Given that tyrannosaurids were so variable and underwent such dramatic changes from small, gracile juveniles into bulky, deep-skulled adults, it is little wonder that the debate remains with 35 us.

Nevertheless, hints and rumors abound that "Nanotyrannus" may make a comeback. Aside from rumors of yet-unpublished specimens, in 2010 Larry Witmer and Ryan Ridgely published a new analysis 40 of the skull Gilmore had found, often called the

"Cleveland skull" since it is now kept at the Cleveland Museum of Natural History. Their analysis were inconclusive—pending the study and publication of other tyrannosaur specimens that will 45 provide a greater context by which to compare the Cleveland skull—but they noted that the skull might have some unique features which could be used to argue that it was different from *Tyrannosaurus rex*.

#### Passage 2

In 2001, another skull and partial skeleton similar 50 to that of the claimed *Nanotyrannus* were found in Montana. Nicknamed "Jane," it was better preserved than the earlier 1940s specimen, and many researchers concluded it was a juvenile based on the shape of its teeth and other skeletal features. Indeed, 55 a few former *Nanotyrannus* advocates changed their minds based on the new skull. But others continued to argue that it was a separate species.

In 2015, Thomas Carr presented a new analysis of Jane's skull and skeleton, based on a three- 60 dimensional computer reconstruction of the skull which filled in missing segments and allowed him to analyze the features in more detail. His team examined microscopic "growth rings" in Jane's calf bone, which accumulate per year of life. The team 65 found nine such rings in the bone and space for two more, leading them to conclude that Jane was indeed a juvenile, about 11 years old when she died. Moreover, close examination of the skeleton revealed that it was still undergoing "remodeling" typical of 70 very fast growing bone. Although younger and older specimens of *T. rex* are known, Jane filled an important gap in researchers' knowledge of the growth pattern of tyrannosaurs, Carr said. "She was just about to, or had already entered, the rapid phase 75 of growth" typical of very large carnivorous dinosaurs.

In addition, Carr argued, a comparison of Jane with the 1940s *Nanotyrannus* skull—made possible if both are considered juveniles—kills the idea that the 80 original *Nanotyrannus* skull has unique features that *T. rex* does not. "Jane was heralded by some as the second coming of *Nanotyrannus*," Carr said. But according to his analysis, the two skulls share a number of features once thought to be unique to 85 *Nanotyrannus*, including a hole in a small jaw bone and a long and low snout. Rather than being

diagnostic of a separate species, Carr concluded, such features actually characterize juvenile tyrannosaurs.

22

As used in line 16, "distinct" most nearly means

- A) noble.
- B) different.
- C) obvious.
- D) unusual.

23

It can most reasonably be inferred from Passage 1 that the method of determining a dinosaur's approximate age based on the degree of fusion of its skull bones produces results that are

- A) somewhat uncertain and subject to refutation.
- B) more reliable than those of other available methods.
- C) exact and indisputable.
- D) typically of little value.

24

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

- A) Lines 1-8 ("In 1988 . . . *Tyrannosaurus*")
- B) Lines 8-9 ("The primary . . . bones")
- C) Lines 19-22 ("The timing . . . stage")
- D) Lines 31-35 ("Given . . . us")

25

As used in line 32, "variable" most nearly means

- A) adaptable.
- B) diverse.
- C) unspecified.
- D) fickle.

26

Passage 2 indicates that compared with the specimen found by Gilmore in the 1940s, the remains of the dinosaur nicknamed Jane found in 2001 are

- A) in a more complete state.
- B) from a different geological era.
- C) more difficult to classify.
- D) from a different continent.

27

Which choice from Passage 2 best supports the idea that a ten-year-old individual from a species of large tyrannosaur is unlikely to be fully mature?

- A) Lines 58–62 (“In 2015 . . . detail”)
- B) Lines 62–64 (“His . . . life”)
- C) Lines 64–67 (“The team . . . died”)
- D) Lines 70–73 (“Although . . . said”)

28

Which factor, if true, would most undermine Carr’s argument in the last paragraph of Passage 2?

- A) Identical skull structure evident in the Cleveland skull and the skull of “Jane”
- B) Presence of small holes in the jaw bones of other tyrannosaurs
- C) Analysis identifying the Cleveland skull and Jane as juvenile tyrannosaurs
- D) Discovery of a small adult tyrannosaur other than Nanotyrannus with a long and low snout

29

The primary purpose of both passages is to

- A) resolve conclusively a long-standing paleontological debate.
- B) catalog evidence from multiple studies that verifies the discovery of *Nanotyrannus*.
- C) celebrate the work of prominent paleontologist Thomas Carr.
- D) report the interpretations that have been made of some paleontological finds.

30

Taken together, the passages most directly support which conclusion?

- A) Based on the tyrannosaurid remains that have been discovered to date, the existence of *Nanotyrannus* has not been established.
- B) A unique genus of small tyrannosaurid, such as *Nanotyrannus*, could not have shared a habitat with a tyrannosaurid as large as *T. rex*.
- C) If more skeletal remains of dinosaurs are discovered in Montana, they will almost certainly be identified as *T. rex*.
- D) Given the extremely variable growth patterns seen in tyrannosaurid remains, there must have been a small-sized tyrannosaurid that coexisted with *T. rex*.

31

In both passages, Carr’s findings serve to

- A) support earlier hypotheses about the behavior of both juvenile and adult *T. rex* individuals.
- B) emphasize the importance of comparative study of growth rings across dinosaur species.
- C) dispute conclusions previously drawn by some scientists.
- D) criticize a few research studies for careless methodology.

**Questions 32–41 are based on the following passage.**

This passage is adapted from a letter dated June 17, 1861, from John Ross (Koo-wi-s-gu-wi) to Brigadier General Benjamin McCullough. Ross was principal chief of the Cherokee Nation, located in what was then known as Indian Territory (now part of Oklahoma). McCullough's command of Confederate forces included both Arkansas and the adjacent Indian Territory during the US Civil War.

I have the honor to acknowledge by the first return mail the receipt of your communication dated at Fort Smith, Ark. The 12th instant, informing me  
 Line that you have been sent by the Government of the  
 5 Confederate States of America to take command of the district embracing the Indian Territory; and to guard it from invasion by the people of the North.

For the expression of your friendship be pleased to accept my heartfelt thanks and the assurance that I  
 10 cherish none other than a similar sentiment for yourself and people; am also gratified to be informed that you will not interfere with any of our rights and wishes unless circumstances compel you to do so, nor violate or molest our neutrality without good  
 15 cause.

In regard to the pending conflict between the United States and the Confederate States I have already signified my purpose to take no part in it whatever, and have admonished the Cherokee people  
 20 to pursue the same course. The determination to that course was the result of consideration of law and policy, and seeing no reason to doubt its propriety, I shall adhere to it in good faith, and hope that the Cherokee people will not fail to follow my example. I  
 25 have not been able to see any reason why the Cherokee Nation should take any other course, for it seems to me to be dictated by their treaties and sanctioned by wisdom and humanity. It ought not give ground for complaint to either side, and should  
 30 cause our rights to be respected by both. Our country and institutions are our own. However small the one or humble the others, they are as sacred and valuable to us as are those of your own populous and wealthy State to yourself and your people. We have done  
 35 nothing to bring about the conflict in which you are engaged with your own people, and I am unwilling that my people shall become its victims. I am determined to do no act that shall furnish any pretext to either of the contending parties to overrun our

40 country and destroy our rights. If we are destined to be overwhelmed, it shall not be through any agency of mine. The United States are pledged not to disturb us in our rights, nor can we suppose for a moment that your Government will do it, as the avowed  
 45 principle upon which it is struggling for an acknowledged existence is the rights of the States and freedom from outside interference.

The Cherokee people and Government have given every assurance in their power of their sympathy and  
 50 friendship for the people of Arkansas and of other Confederate States, unless it be in not voluntarily assuming an attitude of hostility toward the Government of the United States, with whom their treaties exist and from whom they are not  
 55 experiencing any new burdens or exactions. That I cannot advise them to do, and hope that their good faith in adhering to the requirements of their treaties and of their friendship for all the whites will be manifested by strict observance of the neutrality  
 60 enjoined.

Your demand that those people of the nation who are in favor of joining the Confederacy be allowed to organize into military companies as home guards for the purpose of defending themselves in case of  
 65 invasion from the North is most respectfully declined. I cannot give my consent to any such organization for very obvious reasons:

1st. It would be a palpable violation of my position as a neutral.  
 70 2d. It will place in our midst organized companies not authorized by our laws, but in violation of treaty, and who would soon become efficient instruments in stirring up domestic strife and creating internal difficulties among the Cherokee people.  
 75 As in this connection you have misapprehended a remark which I made in conversation at our interview some eight or ten days ago, I hope you will allow me to repeat what I did say. I informed you that I had taken a neutral position and would  
 80 maintain it honestly, but that in case of a foreign invasion old as I am I would assist in repelling it. I have not signified any purpose as to an invasion of our soil and interference with our rights from the United or Confederate States, because I have  
 85 apprehended none and cannot give my consent to any.

32

- The first paragraph serves mainly to
- A) confirm receipt of McCullough's letter and summarize its content.
  - B) introduce Ross to McCullough and acknowledge McCullough's news.
  - C) apologize to McCullough for responding so belatedly to his letter.
  - D) request permission to make the news in McCullough's letter public.

33

- Ross indicates that he has urged the Cherokee people to
- A) amend their legal code to enforce neutrality more effectively.
  - B) adopt his own neutral stance toward the conflict.
  - C) compare his policy of neutrality with similar policies elsewhere.
  - D) punish Cherokee individuals who publicly take sides.

34

- Which choice provides the best evidence to support the idea that Ross views the Civil War as a problem largely removed from himself and his people?
- A) Lines 20-24 ("The determination . . . example")
  - B) Lines 34-37 ("We have . . . victims")
  - C) Lines 55-60 ("That I . . . enjoined")
  - D) Lines 78-81 ("I informed . . . repelling it")

35

- Ross most directly implies that the affection that people feel for their nation does not vary with the
- A) success of their nation in military engagements.
  - B) degree of integrity displayed by their national leaders.
  - C) geographical size of or number of people in their nation.
  - D) length of time their nation has existed.

36

- Ross suggests that the current political situation has placed the Cherokee Nation in the predicament of
- A) maintaining Confederate military companies even as it lacks real authority over them.
  - B) balancing its obligations to the US government with its goodwill toward the people of the Confederacy.
  - C) choosing between its pacifist principles and the practical necessity of military engagement.
  - D) acknowledging certain contradictions inherent in the structure of its government.

37

- Which choice provides the best evidence for the answer to the previous question?
- A) Lines 30-34 ("Our . . . people")
  - B) Lines 40-42 ("If we . . . mine")
  - C) Lines 48-55 ("The Cherokee . . . exactions")
  - D) Lines 61-66 ("Your . . . declined")

38

As used in line 52, “assuming” most nearly means

- A) adopting.
- B) pretending.
- C) borrowing.
- D) presuming.

39

In lines 61-66, the use of the words “demand” and “respectfully declined” enables Ross to

- A) soften his refusal of McCullough’s proposal by indirectly hinting at his own ambivalence regarding the subject under discussion.
- B) underscore the impersonal nature of his relationship with McCullough by employing a harsh tone.
- C) attempt to forestall McCullough’s displeasure with him by distancing himself from his own decision.
- D) reproach McCullough for his overbearing manner by displaying the opposite quality of graciousness.

40

Ross makes the claim that the formation of Confederate-allied militias would harm the Cherokee Nation by

- A) producing divisions within Cherokee society
- B) forcing the adoption of new treaties.
- C) inhibiting the growth of trade.
- D) depleting the government’s financial reserve

41

In lines 75-78, “misapprehended” and “I hope you will allow” are used to give Ross’s comments a type of

- A) affectionate courtesy.
- B) respectful disagreement.
- C) reluctant sympathy.
- D) scornful dismissal.

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

This passage is adapted from Douglas J. Emlen, *Animal Weapons: The Evolution of Battle*. ©2014 by Douglas J. Emlen.

Three-spined sticklebacks swim in shallow waters along the coasts of Europe and North America. These finger-sized fish rely on both sharp spines and *line armor* to protect them from predators. Rigid spines project along their back and from their pelvis, and a row of bony plates adorns their flanks.

As with all evolutionary tales, the stickleback story begins with variation. Some sticklebacks invest more in defensive weaponry than others, resulting in 10 fish-to-fish differences in the length of pelvic spines and in the size and number of body-armor plates. Not surprisingly, this variation in weapon size influences fish survival. Long spines make sticklebacks difficult to swallow, and armor plates 15 protect sticklebacks whenever predatory fish make the mistake of trying to bite them. Almost 90 percent of attacks on sticklebacks fail. But before spitting them out, predators chew sticklebacks rather harshly. A stickleback's armor plates act like shields, reducing 20 the extent of injuries from these bites.

While most sticklebacks live in the ocean where predators are common, some inhabit freshwater lakes, and here their evolutionary story is different. Ocean levels fluctuate greatly over time, and during 25 periods of high water fish spill into inland reservoirs, where they end up trapped as the water recedes. Inland fish experience very different patterns of selection from their marine ancestors, and in lake after lake, their weapons have changed as populations 30 adapted to their new locales.

Fossils provide a road map of this weapon evolution. In fact, so many stickleback fossils have been preserved that they provide an almost unparalleled paleontological record of change in 35 weapon size through time, as layer upon layer of fish corpses piled into the mud at the bottoms of lakes.

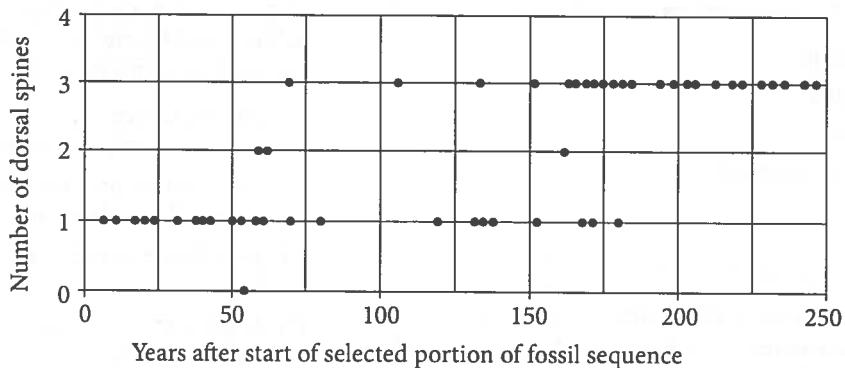
Michael Bell, a biologist at Stony Brook University, studies this temporal progression of fish in a Nevada lake bed, where he and his colleagues reconstructed 40 approximately one hundred thousand years of stickleback evolution in 250-year slices.

In the first eighty thousand years of their one-hundred-thousand-year window, Nevada lake

sticklebacks had almost no protective weapons (only 45 one dorsal spine, rudimentary pelvic spines, and very few lateral plates). But then, eighty-four thousand years into the time sequence, this type of stickleback was replaced entirely by armored sticklebacks, meaning three long dorsal spines and full pelvic 50 spines. Bell suspects that marine fish flooded into the lake around this time, because both forms co-occurred for about one hundred years before the early fish type disappeared. Remarkably, over the following thirteen thousand years, the defensive 55 structures in this new fish regressed: in graded steps through time, the spines got shorter and shorter, until by the end of this period the new sticklebacks resembled the earlier form that they'd replaced. Lake-bound fish lost their weapons.

60 Today, sticklebacks in many lakes lack defensive weapons. Dolph Schlüter and his students at the University of British Columbia found that lake habitats have far fewer predators than marine habitats, and this appears to relax the pattern of 65 natural selection for larger plates and longer spines. With fewer predators, lake fish benefit less from large weapons than marine fish. Armor also costs more in lakes than it does in the ocean. Low freshwater concentrations of the ions necessary for bone growth 70 mean that fish pay a higher price for mineralizing bony plates in lakes. Unarmed sticklebacks are larger as juveniles and begin breeding sooner than their armed counterparts. In freshwater, it appears, the costs of long spines and large plates are steeper than 75 the benefits they provide.

Occurrence of Dorsal Spines in Stickleback Fossils Found in Nevada Lake Bed



Adapted from Michael A. Bell, Matthew P. Travis, and D. Max Blouw, "Inferring Natural Selection in a Fossil Threespine Stickleback." ©2006 by The Paleontological Society.

42

- Which choice best states a main idea of the passage?
- Sticklebacks have evolved certain physical features to make them more effective predators.
  - Some bodies of water are significantly more dangerous for sticklebacks than other bodies of water.
  - Stickleback evolution in freshwater lakes tends to proceed differently from that in marine areas.
  - Sticklebacks have developed a wide array of defensive mechanisms over the past one hundred thousand years.

43

- Which choice best supports the idea that scientists can gain insight into a particular aspect of evolutionary change by studying stickleback fossils?
- Lines 8-11 ("Some . . . plates")
  - Lines 24-26 ("Ocean . . . recedes")
  - Lines 27-30 ("Inland . . . locales")
  - Lines 32-36 ("In fact . . . lakes")

44

- According to the passage, stickleback armor plates serve to
- prevent damage to the stickleback from a predator's teeth.
  - make sticklebacks difficult to swallow.
  - help sticklebacks be more aggressive predators.
  - allow sticklebacks to survive in freshwater environments.

45

- As used in line 20, "extent" most nearly means
- duration.
  - degree.
  - length.
  - area.

46

- As used in line 22, “common” most nearly means
- A) largely inferior.
  - B) equally shared.
  - C) generally plain.
  - D) frequently encountered.

47

The passage best supports which conclusion about sticklebacks that entered the Nevada lake during periods of high water?

- A) Since the conditions of freshwater were different from those of salt water, the sticklebacks evolved with more elaborate armor.
- B) Though they were plentiful at the beginning of the time period Bell studied, the sticklebacks gradually declined in number.
- C) In the absence of predators, the sticklebacks passed on fewer armor traits to their offspring.
- D) Since predators preferred to prey on armored sticklebacks, the sticklebacks without armor flourished.

48

- The statement “Lake-bound fish lost their weapons” (line 59) mainly serves to
- A) criticize a study discussed in the paragraph.
  - B) provide an example in support of a claim made in the paragraph.
  - C) summarize a process described in detail in the paragraph.
  - D) emphasize the importance of a study discussed paragraph.

49

As presented in the passage, the research of Schluter and his students implies that in freshwater environments, it is better for sticklebacks to

- A) allocate scarce resources to basic skeletal formation rather than armor.
- B) use armor to prey on other fish rather than defend themselves from predators.
- C) grow longer spines than sticklebacks in ocean habitats.
- D) begin reproducing later than they would in ocean environments.

50

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

- A) Lines 60-61 (“Today . . . weapons”)
- B) Lines 61-65 (“Dolph . . . spines”)
- C) Lines 68-71 (“Low . . . lakes”)
- D) Lines 71-73 (“Unarmed . . . counterparts”)

51

According to the graph, during which two time periods after the start of the selected portion of the fossil sequence did the number of dorsal spines in stickleback fossils remain most consistent?

- A) Between 0-50 and between 50-100
- B) Between 0-50 and between 100-150
- C) Between 0-50 and between 150-200
- D) Between 0-50 and between 200-250

52

Which statement about the fossils of sticklebacks found in the Nevada lake bed is best supported by the graph?

- A) Fossils from year 200 of the selected fossil sequence were more plentiful than fossils from year 50.
- B) Fossils were more likely to have a large number of dorsal spines later in the selected fossil sequence.
- C) Most fossils found in the Nevada lake bed during the selected fossil sequence had two dorsal spines.
- D) Fossils with no dorsal spines were most common around year 150 of the selected fossil sequence.

---

**STOP**

---

## 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.

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  
and supplementary material.

### Draw It Out

When a situation requires concentration, many people begin to doodle, decorating the margins of 1 they're papers with swirls, stars, stick figures, and 2 also decorating with paisleys during meetings, lectures, or classes. Though many might consider doodling a distraction that inhibits focus and learning, research has shown that it may in fact facilitate the retention of information

1

- A) NO CHANGE
- B) their
- C) there
- D) one's

2

- A) NO CHANGE
- B) with paisleys
- C) paisleys
- D) they also draw paisleys

In 2009, psychologist Jackie Andrade at the University of Plymouth sought to **3** determine how doodling affects concentration. She recruited 40 participants who had just completed another study and were likely to be fatigued and unfocused. The participants were asked to listen to a telephone message that, amid superfluous details, named the guests who would attend a fictitious birthday party. Informed that they would not be asked to remember any details later, **4** asking the participants to write down the names of guests was nonetheless done. Half of the participants were encouraged to doodle while they listened to the message. To prevent them from feeling self-conscious about the quality of their drawing, they were provided with paper featuring preprinted shapes that they were asked to shade with pencil. The remaining participants, who acted as a control group, **5** was each given a lined sheet of paper and asked to jot down only guest names.

3

- A) NO CHANGE
- B) designate
- C) arbitrate
- D) ordain

4

- A) NO CHANGE
- B) the names of guests were nonetheless to be written down by the participants.
- C) the participants were nonetheless asked to write down the names of guests
- D) writing down the names of guests was asked of the participants nonetheless

5

- A) NO CHANGE
- B) was each being
- C) were each
- D) has each been

**6** An experienced researcher, Andrade collected the lists and then informed the participants that this was in fact a memory test: she would assess how well they remembered the message by calculating a “memory score”, a value equal to the number of pieces of information they recalled correctly minus any “false alarms” (misremembered information). She asked them about the names of the 8 party guests and 8 incidental place names. For the names and places, those in the control group, on average, received memory scores of **1** 4.0 and 1.8, respectively. Those in the doodling group performed much better, with memory scores of 5.1 and 2.4, respectively. **8** In fact, the groups had the same number of false alarms in their recall of place names, a strong indicator that doodling helped participants retain information, even details they had not made an effort to remember.

Recall of Details in Memory Task

Type of information	Control group*	Doodling group*	Percent difference
Names	correct	4.3	5.3
	false	0.4	0.3
	memory score	4.0	5.1
Places	correct	2.1	2.6
	false	0.3	0.3
	memory score	1.8	2.4
Names and Places	total memory score	5.8	7.5

The numbers are rounded to the nearest 0.1.

Adapted from Jackie Andrade, "What Does Doodling Do?" ©2009 by

**6** Which choice provides the most effective transition from the previous paragraph to this one?

- A) NO CHANGE
- B) At the message's conclusion,
- C) Studying cognitive processes,
- D) Inspiring further research of doodling,

**7** Which choice provides accurate information from the table?

- A) NO CHANGE
- B) 0 and 0.3,
- C) 24% and -25%
- D) 04 and 0.3,

**8** Which choice uses information from the table to support the point made later in the sentence?

- A) NO CHANGE
- B) The doodling group was able to remember more names than they did places,
- C) The control group had 25 percent more false alarms in their recall of guest names than the doodling group did.
- D) Overall, the doodling group had a total memory score 29 percent higher than that of the control group,

9 Nevertheless, Andrade speculates that doodling helps prevent people from daydreaming or falling asleep during tedious activities, but she tempers this conclusion by recommending further 10 study: to pinpoint the more precise causes and impact of free-form doodling on information recall. Andrade notes that since doodling is a visual task, it may be most useful when performed in conjunction with a nonvisual task so the activities do not compete for the brain's attention. But for situations in which protracted listening is called for, doodling appears to be a 11 fairly effortless way to maintain one's focus.

9

- A) NO CHANGE
- B) At the same time,
- C) On the other hand,
- D) DELETE the underlined portion,

10

- A) NO CHANGE
- B) study,
- C) study
- D) study;

11

Which choice best maintains the style and tone of the passage as a whole?

- A) NO CHANGE
- B) totally easy
- C) barely effortful
- D) super simple

Questions 12–22 are based on the following passage.

**Stanley Whitney: Color as Subject**

Abstract artist Stanley Whitney paints grids: square canvases saturated with stacked blocks of vivid colors.

Each block in each **12** grid, is a different size, texture, and hue. The thick grid lines are mostly, but not perfectly, straight—structured but not rigid. Paintings of grids may sound stark or austere, yet Whitney’s work is compelling, even transcendent. *New Yorker* magazine art critic Peter Schjeldahl, in his review of *Dance the Orange*, Whitney’s 2015 exhibit at Harlem’s Studio Museum, wrote of the paintings’ “flustering magnetism.” In her *New York Times* review of the exhibit, Roberta Smith called Whitney’s work “opulently interactive and engaging.” The colors draw the viewer in.

12

- A) NO CHANGE
- B) grid is a different size, texture, and
- C) grid is a different, size, texture and,
- D) grid is, a different size texture, and

Whitney became fascinated with color as a young boy in Philadelphia, and working with color is the [13] specified project of his life. He studied art in Kansas City and New York City during a time when minimalism—a less-is-more style exemplified by simple shapes and one-dimensional colors—was prominent. Whitney's approach to color reflects his embrace of minimalist principles [14] "It's also more of a challenge to make the paintings flow in a square, to get a good rhythm," Whitney said on the occasion of his 2013 exhibit *Other Colors I Forget*. Whitney's colors are textural, which is one way his work departs from conventional minimalism. Using techniques like glazing, layering, and dripping, Whitney achieves a sense of depth and movement. Some panels seem to ripple, some swirl, and some are smooth and still. Yet color as adornment or symbol is anathema to Whitney. The colors themselves are the subject of his paintings.

13

- A) NO CHANGE
- B) delineating
- C) determined
- D) defining

14

Which quotation from Whitney's 2013 interview with Benjamin Barron of the blog *Opening Ceremony* best supports the main idea of the paragraph?

- A) NO CHANGE
- B) "New York is so full of energy and the diversity of people is incredible. It's a tough, international city, which keeps the work at a cutting edge,"
- C) "I always had the color but I needed to figure out how to get color in the right scale and space, so the color didn't just stay decorative,"
- D) "Music is Afro-American culture, so music was always there. It's a major part of me and has always been big in my family and my life from early on,"

Color as subject doesn't mean that Whitney's works exist in a vacuum. [15] The paintings have received acclaim from critics and art lovers around the world. He recounts seeing ten thousand shades of orange on a trip to [16] India, several have found their way into his paintings. [17] On the other hand, many of the paintings' titles, such as *James Brown Sacrifice to Apollo* (2008) and *My Tina Turner* (2013), allude to music, which Whitney [18] cites for essential to him and to the African American community in which he was raised.

15

At this point the writer wants a sentence that expands on the previous sentence and introduces the information in the sentence that follows. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) The paintings are often inspired by the colors Whitney encounters in his travels.
- C) Whitney spends part of the year in Parma, Italy, and part of the year in New York City.
- D) Whitney is passionate about music as well as painting.

16

- A) NO CHANGE
- B) India; of which several
- C) India, several of them
- D) India, several of which

17

- A) NO CHANGE
- B) As a result,
- C) Additional,
- D) In short,

18

- A) NO CHANGE
- B) cites as
- C) sites for
- D) sites as

Whitney places himself **19** by the tradition to fellow African American painters Thompson and Alma Thomas, and he has advocated for more galleries to exhibit their work. He **20** is on to the fact that, since abstract art isn't overtly political, abstraction is sometimes considered to be at **21** odds with traditional expectations of African American artists. Whitney, **22** finally, does aim to provoke thought and reflection "With my work," he said in a 2008 interview, "I want people to ask difficult questions."

**19**

- A) NO CHANGE
- B) in the tradition of
- C) to the tradition by
- D) of the tradition in

**20**

- A) NO CHANGE
- B) gets
- C) acknowledges
- D) allows for the truth of the fact

**21**

- A) NO CHANGE
- B) odds—with traditional expectations—
- C) odds with traditional expectations,
- D) odds: with traditional expectations

**22**

- A) NO CHANGE
- B) therefore,
- C) in other word,
- D) however,

Questions 23–33 are based on the following passage.

**The Flavor Defense**

During a period of time about 90 million years ago, Brassicales—an order of flowering plants—began evolving chemical defenses against the caterpillars of Pierinae butterflies, which were devouring the plants Brassicales' defenses arose from the appearance of glucosinolates, which are synthesized from glucose (a carbohydrate) and amino acids (the building blocks of proteins). [23]

Researchers have determined that glucosinolates provide multiple health benefits to humans. When an insect bites a leaf, it tears the cell [24] membranes. This causes the glucosinolates to mix with enzymes. This starts a reaction that produces isothiocyanate, or mustard oil.

23

Which choice best maintains the focus of the Paragraph?

- A) NO CHANGE
- B) The Brassicales order includes over 4,000 species flowering plants.
- C) Many new kinds of plants, mammals, and birds appeared during this time, now called the Cretaceous period.
- D) Glucosinolates give plants a pungent flavor that signals to insects that the plant is toxic.

24

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

- A) membranes; this tearing causes the glucosinolates to mix with enzymes, and this starts
- B) membranes, initiating the following process: first, the glucosinolates mix with enzymes; then, what starts is
- C) membranes: that causes the glucosinolates to mix with enzymes and then starts
- D) membranes, causing the glucosinolates to mix with enzymes and starting

The insect that rips the leaf is greeted with this noxious compound. Because this protection made them **25** unbecoming as a food source, Brassicales plants flourished. But they had also started a battle of **26** coevolution.

25

- A) NO CHANGE
- B) untimely
- C) unsuitable
- D) unseemly

26

The writer is considering revising the underlined portion to the following

coevolution, a process in which adaptations in one species trigger adaptations in another, back and forth over time.

Should the writer make this revision?

- A) Yes, because it helps explain why Brassicales plants could not be a viable food source for Pierinae caterpillars.
- B) Yes, because it defines a scientific term that is central to the rest of the passage.
- C) No, because it fails to specify effective methods for the study of coevolutionary processes.
- D) No, because it weakens the point about isothiocyanate made earlier in the paragraph.

Within 10 million years (a very brief period in the history of Earth), the Brassicales' chemical defense had been breached. Pierinae caterpillars evolved a counteradaptation, a certain protein that detoxifies mustard oil by breaking it down into inactive compounds. Now that the deadly defense was digestible, the caterpillars 27 will eat glucosinolate-containing plants. Instead of deterring the insects, glucosinolates attracted them, helping the Pierinae identify a food source only they could enjoy. 28 Previously inedible, Brassicales plants became a favorite food among the caterpillars.

Over the next 50 million years, this process kept replaying itself. The 29 plants' chemical defenses evolved, with new glucosinolates made from different amino acids; the Pierinae in turn synthesized new proteins that broke down the harmful compounds. In response to the changing environmental pressures, the adaptations proliferated. Many different species of plants arose, each featuring different types and varying concentrations of glucosinolates. The diversification of plants also resulted in a corresponding diversification of 30 insects, they developed adaptations to each species of plant.

27

- A) NO CHANGE
- B) eat
- C) had eaten
- D) could eat

28

Which choice provides the most effective conclusion to the paragraph?

- A) NO CHANGE
- B) The butterflies that develop from Pierinae caterpillars have come to be known as whites due to their prevailing physical appearance.
- C) Within another 15 million years, most dinosaur species would face extinction.
- D) Caterpillars have strong jaws and teeth that allow them to chew coarse leaves.

29

- A) NO CHANGE
- B) plant's chemical defenses'
- C) plants chemical defenses
- D) plants' chemical defense's

30

- A) NO CHANGE
- B) insects that developed
- C) insects; developing
- D) insects developed

This [31] process, known as speciation eventually resulted in the mustard and cabbage family, a branch of Brassicales plants that arose about 32 million years ago and now feature a wide variety of glucosinolate compounds. We know the resulting plants as mustard greens, radishes, horseradish, and wasabi—foods that are [32] enjoyed, however, for their distinctive and spicy flavors and [33] these chemicals are toxic to insects but not to humans. It seems that people, many of whom enjoy the flavorful by-products, are the real winners in the battle between cabbage and caterpillar.

31

- A) NO CHANGE
- B) process: known as speciation,
- C) process, known as speciation,
- D) process known as speciation—

32

- A) NO CHANGE
- B) enjoyed
- C) enjoyed, in the meantime,
- D) enjoyed, that is to say,

33

- A) NO CHANGE
- B) their
- C) whose
- D) which

Questions 34–44 are based on the following passage.

**3-D Printing: Just What the Doctor Ordered**

As medical costs in the United States continue to rise, health-care providers are looking to new technologies to save money. One innovative tool that is generating a lot of interest is the 3-D printer. These printers allow technicians to create customized three-dimensional medical [34] objects. These include replacement joints or prosthetic limbs and technicians can do it at a lower cost and with higher quality than in the past. Health-care professionals looking to provide affordable, high-quality care for patients [35] may be approached by representatives of 3-D printing companies.

34

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

- A) objects, including replacement joints or prosthetic limbs, technicians can do it
- B) objects, which they can do with replacement joints or prosthetic limbs
- C) objects, such as replacement joints or prosthetic limbs,
- D) objects like replacement joints and prosthetic limbs are made

35

Which choice best sets up the information that follows in the rest of the passage?

- A) NO CHANGE
- B) can see improvements across a wide range of new technologies, including 3-D printing.
- C) are unsure whether advances in 3-D printing will matter much in the long run.
- D) would be wise to invest in 3-D printing technology and encourage its use.

3-D printers deliver a combination of customization and efficiency [36] that conventional manufacturing methods cannot match. The traditional process for fabricating a medical object composed of several different elements is to mold the elements individually and then [37] piecing them together in a factory. [38] In contrast, a 3-D printer uses a computerized blueprint to create customized objects by precisely spraying thin layers of a gel or powder into whatever shape is needed. For example, a laboratory can use a patient's computed tomography (CT) scan as a model to create an exact replica of a hip joint to be used as a replacement, and a doctor can produce a 3-D-printed hearing aid shell that [39] is practically invisible.

36

- A) NO CHANGE
- B) and which
- C) to which
- D) of which

37

- A) NO CHANGE
- B) piece
- C) they piece
- D) is to piece

38

- A) NO CHANGE
- B) At the same time,
- C) Additionally,
- D) In other words,

39

Which choice makes the example of the hearing aid shell most consistent with the previous example in the sentence?

- A) NO CHANGE
- B) dramatically improves a patient's hearing.
- C) can replace all previous hearing aids.
- D) perfectly fits a patient's ear.

Because 3-D printing bypasses the manufacturing process, objects made with 3-D printers are typically cheaper than **40** the traditional way. A customized robotic prosthetic arm can be made by a 3-D printer for about **41** \$200: which is tens of thousands of dollars less than the cost of a manufactured arm of the same type. This production method saves not only money but also time. A standard dental crown can take days or weeks to be made in a lab, and the patient needs to visit the dentist on multiple occasions. With 3-D printing, a dentist can immediately produce a crown in the office **42** that same day using a scan of the patient's tooth.

40

- A) NO CHANGE
- B) it was done traditionally.
- C) it was done before.
- D) those made in the traditional way.

41

- A) NO CHANGE
- B) \$200—
- C) \$200;
- D) \$200 which is

42

- A) NO CHANGE
- B) right then
- C) on the spot
- D) DELETE the underlined portion.

The research, equipment, and training needed to implement 3-D printing in a health-care facility require significant up-front costs. **43** Moreover, several dozen medical centers in the United States already use 3-D printers, and they can lead the way in demonstrating just how worthwhile the investment can be. As Anthony **44** Atala, director of the Wake Forest Institute for Regenerative Medicine, says, “3-D printing has the potential to revolutionize medicine.” Health-care providers should strive to take full advantage of this exciting new technology.

43

- A) NO CHANGE
- B) Nonetheless,
- C) As a result,
- D) Meanwhile,

44

- A) NO CHANGE
- B) Atala, director of the Wake Forest Institute for Regenerative Medicine, says
- C) Atala director of the Wake Forest Institute for Regenerative Medicine says,
- D) Atala, director of the Wake Forest Institute for Regenerative Medicine says



## Math Test – No Calculator

**25 MINUTES, 20 QUESTIONS**

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

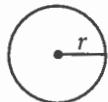
**DIRECTIONS**

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

**NOTES**

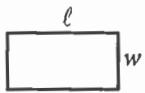
1. The use of a calculator is **not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function  $f$  is the set of all real numbers  $x$ 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

**REFERENCE**

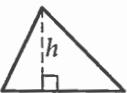


$$A = \pi r^2$$

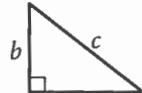
$$C = 2\pi r$$



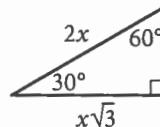
$$A = lw$$



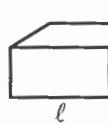
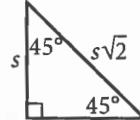
$$A = \frac{1}{2}bh$$



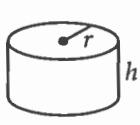
$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = lwh$$



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



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



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



$$V = \frac{1}{3}lwh$$

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

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

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



1

$$2x + 7 = 15$$

What is the solution to the equation above?

- A) 3
- B) 4
- C) 6
- D) 11

2

During a game of basketball, Jenna scored a total of 16 points. She earned either 2 points or 3 points each time she scored a basket. If  $a$  represents the number of 2-point baskets she made and  $b$  represents the number of 3-point baskets she made, which of the following equations best represents the relationship between  $a$  and  $b$ ?

- A)  $2a + 3b = 16$
- B)  $3a + 2b = 16$
- C)  $a + b = 2 + 3$
- D)  $a + b = 16$

3

If  $ax + 3 = 4x + 3$  for all values of  $x$ , where  $a$  is a constant, what is the value of  $a$ ?

- A) 0
- B) 3
- C) 4
- D) 7

4

$$f(x) = x - 1$$

For the function  $f$  defined by the equation shown, which of the following is the value of  $f(6)$ ?

- A) -6
- B) -5
- C) 5
- D) 7

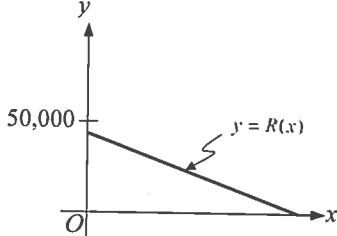


5

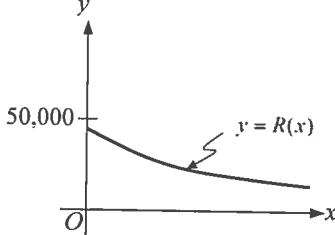
$$R(x) = 45,000(1.02)^x$$

A marketer predicts that the revenue  $R(x)$ , in dollars, for a product can be modeled by the function defined above,  $x$  months after the product's release. Which of the following could represent the graph of the function  $R$  in the  $xy$ -plane?

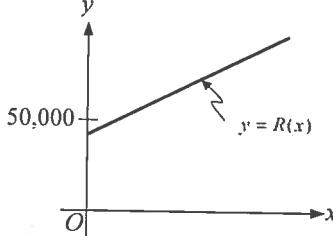
A)



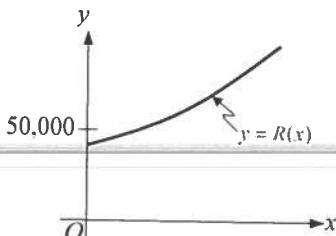
B)



C)



D)



6

Which of the following number lines represent solution set of  $2x - 1 > 3$ ?

A)

B)

C)

D)



7

A company designs different sizes of models of the Parthenon, an ancient temple in Athens, Greece.

Each model has a rectangular base. For all sizes of the models, the length of the base is  $\frac{9}{4}$  the base's width. If the width of the base of a model is  $w$  centimeters, which of the following functions could represent the area  $A(w)$ , in square centimeters, of the base of the model?

- A)  $A(w) = \frac{4}{9}w^2$
- B)  $A(w) = \frac{9}{4}w^2$
- C)  $A(w) = \frac{4}{9}w^2 + w$
- D)  $A(w) = \frac{9}{4}w^2 + w$

8

$x$	$f(x)$
-73	184
0	-35
27	-116

Some values of the linear function  $f$  are given in the table above. Which of the following equations defines  $f$ ?

- A)  $f(x) = 3x - 35$
- B)  $f(x) = \frac{1}{3}x - 35$
- C)  $f(x) = -\frac{1}{3}x - 35$
- D)  $f(x) = -3x - 35$

9

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

- A)  $2x^4 + x^3 - 3x^2 - x + 1$
- B)  $2x^4 + x^3 - 3x^2 + 3x - 1$
- C)  $2x^4 + x^3 - x^2 + x - 1$
- D)  $2x^4 + 3x^3 - x^2 - 3x - 1$



10

The kinetic energy, in joules, of an object with mass 5 kilograms traveling at a speed of  $v$  meters per second(m/s) is given by the function  $K$ , where  $K(v) = \frac{5}{2}v^2$ . Which of the following is the best interpretation of  $K(10) = 250$  in this context?

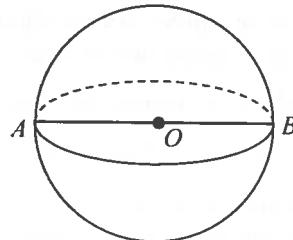
- A) The object traveling at 10 m/s has a kinetic energy of 250 joules.
- B) The object traveling at 100 m/s has a kinetic energy of 250 joules.
- C) The object traveling at 250 m/s has a kinetic energy of 10 joules.
- D) The object traveling at 625 m/s has a kinetic energy of 10 joules.

11

Which of the following is equivalent to  $\frac{x-2}{3x-6}$ , where  $x \neq 2$ ?

- A) 0
- B)  $\frac{1}{3}$
- C)  $\frac{2}{3}$
- D)  $\frac{7}{12}$

12



The sphere shown has center  $O$  and diameter  $\overline{AB}$ . The length  $\overline{AB}$  is 6. What is the volume of the sphere?

- A)  $12\pi$
- B)  $27\pi$
- C)  $36\pi$
- D)  $288\pi$

13

In triangle  $ABC$ , point  $D$  is the midpoint of segment  $AB$  and point  $E$  is the midpoint of segment  $BC$ . If  $DB = 6$  and  $DE = 11$  what is the length of segment  $AC$ ?

- A) 12
- B) 17
- C) 20
- D) 22

**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.
- Mixed numbers such as  $3\frac{1}{2}$  must be gridded as 3.5 or  $\frac{7}{2}$ . (If  is entered into the grid, it will be interpreted as  $\frac{31}{2}$ , not  $3\frac{1}{2}$ .)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write answer →  
in boxes.

Grid in result.

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

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

Fraction line

Answer: 2.5

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

Decimal point

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

2		3
0		0
1		1
2		2
3		3
4		4
5		5
6		6
7		7

.	6	6	6
0		0	0
1		1	1
2		2	2
3		3	3
4		4	4
5		5	5
6		6	6
7		7	7

.	6	6	7
0		0	0
1		1	1
2		2	2
3		3	3
4		4	4
5		5	5
6		6	6
7		7	7

Answer: 201 – either position is correct

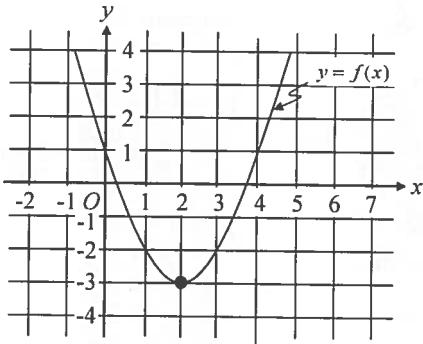
2		0		1
0		0		0
1		1		1
2		2		2
3		3		3

2		0		1
0		0		0
1		1		1
2		2		2
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.



14

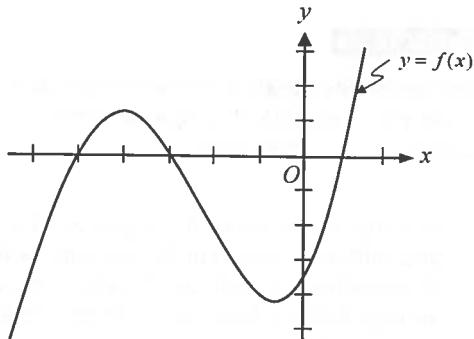


The graph of the quadratic function  $f$  is shown in the  $xy$ -plane above. Which of the following is (are) true?

- I.  $f(0) = f(1)$
- II.  $f(0) = f(4)$

- A) I only
- B) II only
- C) I and II
- D) Neither I nor II

15



The graph of the function  $f$  is shown in the  $xy$ -plane above. Which of the following could define  $f$ ?

- A)  $f(x) = \frac{1}{4}(x+5)(x+3)(x-1)$
- B)  $f(x) = -\frac{1}{4}(x+5)(x+3)(x-1)$
- C)  $f(x) = \frac{1}{4}(x-5)(x-3)(x+1)$
- D)  $f(x) = -\frac{1}{4}(x-5)(x-3)(x+1)$



16

$$\begin{aligned}y &= x(x - 2) \\y &= x - 2\end{aligned}$$

If  $(x, y)$  is a solution to the given system of equations, what is a possible value of  $x$ ?

17

At a market, apples cost \$1.00 per pound and carrots cost \$0.80 per pound. The total cost of apples and carrots Sally purchased from the market was \$4.90. If she purchased 3 pounds of carrots, how many pounds of apples did she purchase?

18

$$\begin{aligned}x + 2y &= 17 \\5x - y &= 8\end{aligned}$$

If  $(x, y)$  is the solution to the given system of equations, what is the value of  $x$ ?

19

If  $\sqrt{3x} = 12$ , what is the value of  $x$ ?

20

The measure of angle  $B$  is  $\frac{2}{5}\pi$  radians. If the degree measure of angle  $B$  is  $x^\circ$ , what is the value of  $x$ ?

**STOP****Do not turn to any other section.**



## Math Test – Calculator

**55 MINUTES, 38 QUESTIONS**

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

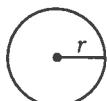
**DIRECTIONS**

For questions 1–30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding 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.

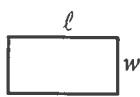
**NOTES**

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

**REFERENCE**



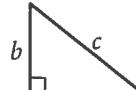
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



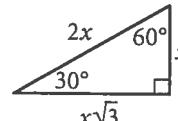
$$A = \ell w$$



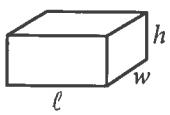
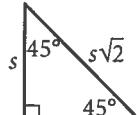
$$A = \frac{1}{2}bh$$



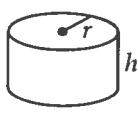
$$c^2 = a^2 + b^2$$



Special Right Triangles



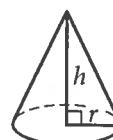
$$V = \ell wh$$



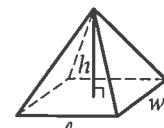
$$V = \pi r^2 h$$



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



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



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

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

Blueberries are shipped in crates whose volume is measured in pecks. A full crate holds 3 pecks of blueberries. How many gallons of blueberries are in a full crate? (1 peck = 2 gallons)

- A) 1
- B) 2
- C) 3
- D) 6

2

An object moves at a rate of  $x$  feet per hour. If the object moves 26 feet in 5 hours, what is the value of  $x$ ?

- A) 0.2
- B) 5.2
- C) 31
- D) 130

3

A town fair charges \$5 admission for residents and \$10 for nonresidents. The total cost for a group of  $r$  residents and  $n$  nonresidents to be admitted to the fair is \$120. Which of the following equations models the situation?

- A)  $5r + 10n = 120$
- B)  $10r + 5n = 120$
- C)  $15r + 15n = 120$
- D)  $15r + 20n = 120$

4

The function  $f$  is defined by  $f(x) = 2x + 3$ . What is the value of  $f(-2)$ ?

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



Questions 5 and 6 refer to the following information.

Coupon 1

\$10 off a total purchase of \$25 or more

Coupon 2

25% off a total purchase of any amount

Note: Use either coupon, but not both

A department store gave the two coupons above to each customer entering the store on a particular day.

6

Tasha, an employee at the store, gets an additional 10% discount off the final price of an item after all other discounts are applied. How much did Tasha pay for a television with an original price of \$600 when she presented her employee identification together with coupon 2?

- A) \$210
- B) \$390
- C) \$405
- D) \$565

5

Josie purchased items that had a total price of \$150 and presented coupon 2 with her purchase. How much did Josie pay for her purchase?

- A) \$112.50
- B) \$113.50
- C) \$125.00
- D) \$135.00

7

Leonardo da Vinci's *Vitruvian Man* drawing was created using ancient Roman ideals of human proportion. In the drawing, the length of the man's upper arm is exactly  $\frac{1}{8}$  of his height. If a man has the same proportions as the *Vitruvian Man* and a height of 72 inches, what is the length, in inches, of the man's upper arm?

- A) 4.5
- B) 7.2
- C) 8.0
- D) 9.0



8

A snack bag that contains only raisins and peanuts has no more than 970 calories. Each ounce of raisins has 85 calories, and each ounce of peanuts has 160 calories. If the snack bag contains a minimum of 5ounces of peanuts, what is the maximum weight of raisins, in ounces, the bag could contain?

- A) 1
- B) 2
- C) 3
- D) 4

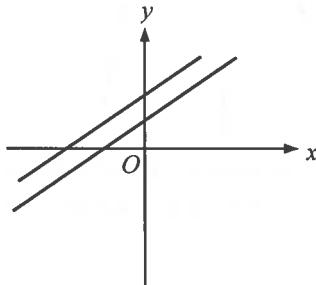
9

$$y = ax + b$$

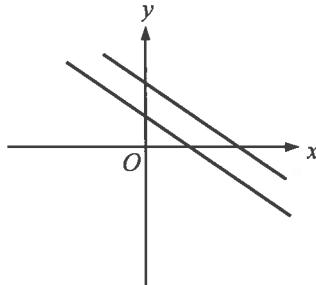
$$y = ax + 2b$$

In the system of equations above,  $a$  and  $b$  are positive constants. Which of the following could be the graph in the  $xy$ -plane?

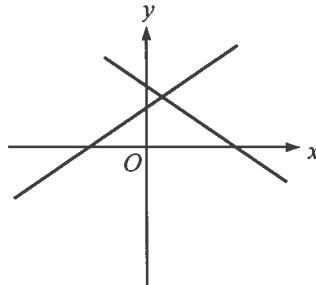
A)



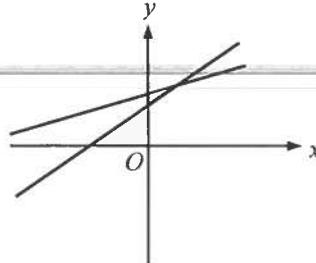
B)



C)

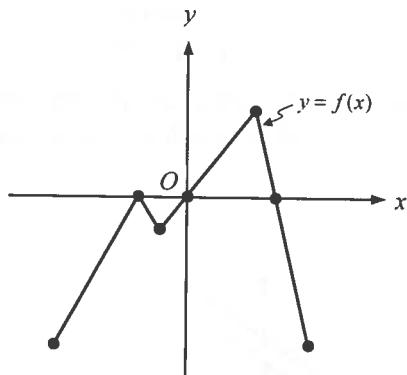


D)





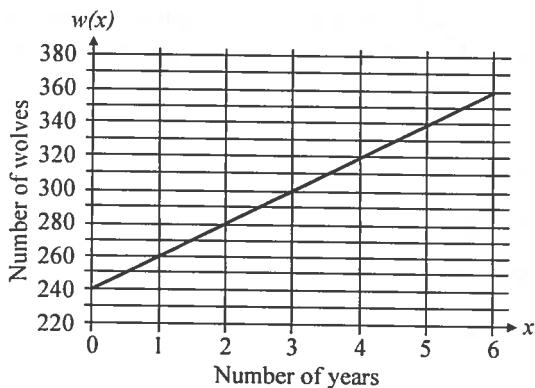
10



The complete graph of the function  $f$  is shown in the  $xy$ -plane above. For how many values of  $x$  does  $f(x) = 0$ ?

- A) One
- B) Two
- C) Three
- D) More than three

Questions 11 and 12 refer to the following information.



At the end of each year from 2005 to 2010, researchers collected data on the wolf and moose populations in a certain ecosystem. The graph above models the number of wolves,  $w(x)$ , in the ecosystem  $x$  years after 2005. The function  $m(x) = 1,155 - 55x$ , where  $0 \leq x \leq 6$ , models the number of moose,  $m(x)$ , in the ecosystem  $x$  years after 2005.

11

According to the graph, what is the average annual increase in the number of wolves in the ecosystem between 2005 and 2010?

- A) 120
- B) 25
- C) 20
- D) 10



12

According to the model given, what was the number of moose in the ecosystem in 2008?

- A) 715
- B) 990
- C) 1,103
- D) 3,300

13

The number of feet that a car travels on a wet road from the time the driver applies the brakes until the car stops can be modeled by the function  $d$ , defined by  $d(v) = 0.1v^2$ , where  $v$  is the speed of the car, in miles per hour, when the brakes are applied. Which of the following is the best interpretation of the equation  $d(40) = 160$ ?

- A) After the brakes are applied, the car travels 160 feet in 40 seconds before it stops.
- B) After the brakes are applied, the car travels .40 feet in 160 seconds before it stops.
- C) If the speed of the car is 40 miles per hour when the brakes are applied, the car travels 160 feet before it stops.
- D) If the speed of the car is 160 miles per hour when the brakes are applied, the car travels 40 feet before it stops.

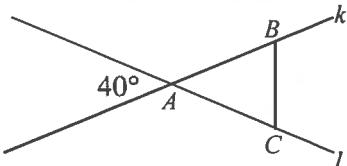


15

If  $x - 5 = 5 - x$ , what is the value of  $x - 5$ ?

- A) -10
- B) -5
- C) 0
- D) 5

16



In the figure above,  $AB = AC$ . What is the measure of  $\angle ABC$ ?

- A)  $40^\circ$
- B)  $50^\circ$
- C)  $70^\circ$
- D)  $80^\circ$

17

A data set with 51 values has a least value of 20 and a greatest value of 40. The data set is to be updated with a 25nd value of 100. Which of the following statistics of the data set will NOT necessarily increase after the data set is updated?

- A) The median
- B) The mean
- C) The standard deviation
- D) The range

18

In the complex number system, which of the following is equivalent to  $\frac{i^8}{i^4}$ ? (Note:  $i = \sqrt{-1}$ )

- A)  $-\sqrt{-1}$
- B)  $\sqrt{-1}$
- C) -1
- D) 1

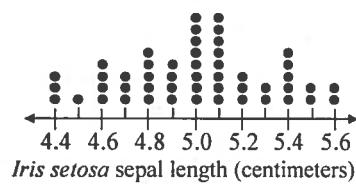
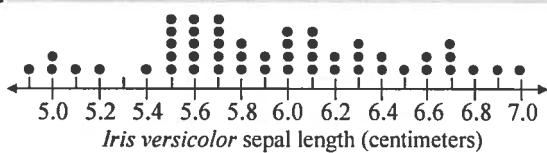


19

A town committee is planning a survey to find out whether town residents are satisfied with recent renovations performed on one of the local parks. Which of the following methods of collecting data for the survey may introduce bias?

- I. Sending a survey to all town residents living within 1 mile of the park
  - II. Sending a survey to a random sample of town residents living within the town borders
- A) Neither  
B) I only  
C) II only  
D) I and II

20

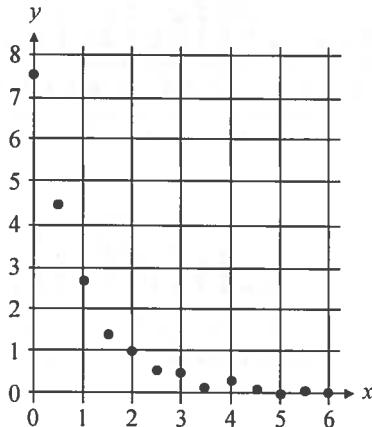


Each dot plot above shows the length, in centimeters, of 50 sepals from a particular species of iris flower. Which of the following is true about the data represented?

- A) The standard deviation of the *Iris versicolor* sepal length is greater than that of the *Iris setosa* sepal length.
- B) The standard deviation of the *Iris setosa* sepal length is greater than that of the *Iris versicolor* sepal length.
- C) The standard deviation of the *Iris versicolor* sepal length is equal to that of the *Iris setosa* sepal length.
- D) The standard deviation cannot be determined for either the *Iris versicolor* sepal length or the *Iris setosa* sepal length.



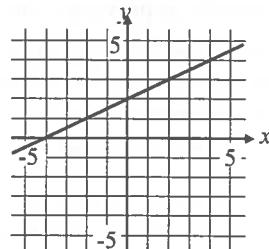
21



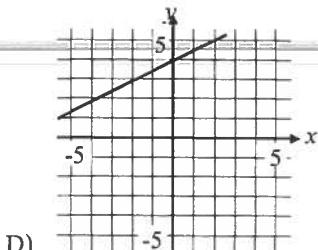
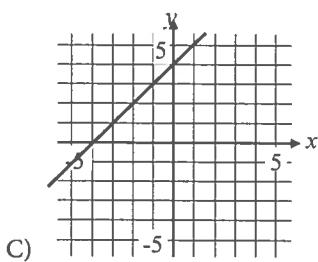
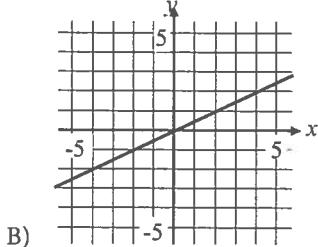
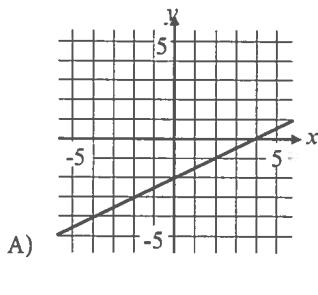
The scatterplot for a set of data is shown in the  $xy$ -plane above. Of the following exponential equations, which best models the data?

- A)  $y = 3(7)^{-x}$
- B)  $y = 3(7)^x$
- C)  $y = 7(3)^{-x}$
- D)  $y = 7(3)^x$

22



The graph of  $y = f(x)$  is shown in the  $xy$ -plane above. Which of the following is the graph of  $y = f(x) + 2$ ?





23

A company purchased a piece of equipment for \$40,000. Each year after the year of purchase, the value of the equipment is estimated to be 10% less than its value the previous year. Which of the following is closest to the estimated value of the equipment 4 years after it was purchased?

- A) \$2,000
- B) \$8,000
- C) \$24,000
- D) \$26,000

24

Which of the following expressions is equivalent to  $16(2)^{3x}$ ?

- A)  $2^{(12x)}$
- B)  $2^{(3x+4)}$
- C)  $4^{(2x+3)}$
- D)  $32^{(3x)}$

25

A high school student council surveyed students to determine interest in an after-school computer coding course. 100 students were selected at random from all students in the school. 47% expressed interest in the course. Based on the margin of error, the student council expects that between 41% and 53% of all students would express interest in the course. What is the margin of error?

- A) 47%
- B) 12%
- C) 6%
- D) 0%



26

$$x^2 + 7 = 25 - 7x$$

The solutions of the equation above are  $r$  and  $s$ . What is the value of  $r + s$ ?

- A) -11
- B) -7
- C) 7
- D) 11

27

$$3x + 2y = 5$$

$$6x + ny = 12$$

In the system of equations above,  $n$  is a constant. If the system has no solutions, what is the value of  $n$ ?

- A) 2
- B) 4
- C) 6
- D) 12

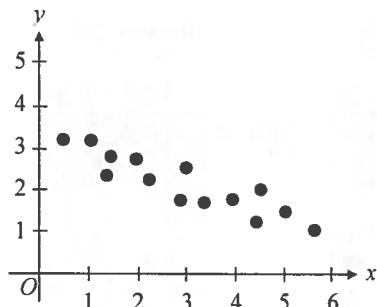
28

At a certain company, the employees are either managers or nonmanagers. In addition, the employees work in either marketing or sales. The probability of randomly selecting an employee who is a manager is 0.2. The probability of randomly selecting an employee who works in marketing and who is a nonmanager is 0.3. If there are 50 employees at the company, how many are nonmanagers who work in sales?

- A) 10
- B) 15
- C) 25
- D) 40



29



Which of the following is true about the slope  $m$  of a line of best fit (not shown) for the data in the scatterplot above?

- A)  $-1 < m < 0$
- B)  $0 < m < 1$
- C)  $m < -1$
- D)  $1 < m$

30

$x$	$h(x)$
2	$m$
4	$p$
6	$m$

The table above shows values of the function  $h$  for some values of  $x$ , where  $m$  and  $p$  are constants and  $m > p > 0$ . If  $h(x) = a(x - 4)^2 + k$ , where  $a$  and  $k$  are positive constants, which of the following must be true?

- A)  $m = a$
- B)  $m = k$
- C)  $p = a$
- D)  $p = k$

**DIRECTIONS**

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

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the 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.
- Mixed numbers** such as  $3\frac{1}{2}$  must be gridded as 3.5 or  $\frac{7}{2}$ . (If is entered into the grid, it will be interpreted as  $\frac{31}{2}$ , not  $3\frac{1}{2}$ .)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write answer in boxes.

7	/	1	1	2
---	---	---	---	---

Grid in result.

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

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

← Fraction line

Answer: 2.5

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

← Decimal point

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

2	/	3
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7

.	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	6	6	6
7	7	7	7

.	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	6	6
7	7	7	7

Answer: 201 – either position is correct

2	0	1
0	0	0
1	1	1
2	2	2

2	0	1
0	0	0
1	1	1
2	2	2

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

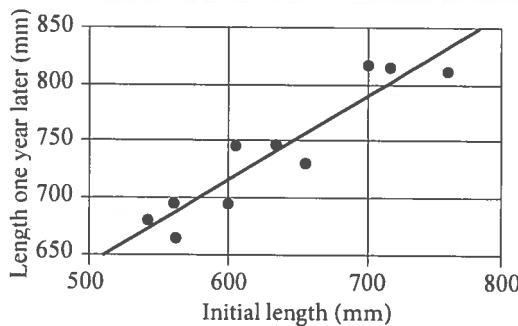


31

Company	Dimples per golf ball
A	300
B	425
C	475
D	400

The table above shows the number of dimples on golf balls from each of four companies. One golf ball is selected from each company. What is the mean number of dimples for the 4 golf balls?

31



The scatterplot above shows the initial length, in millimeters (mm), and the length one year later, in millimeters, for ten albacore fish, as well as a line of best fit for these data. For how many fish was the length one year later greater than predicted by the line of best fit?

33

What is the radius of the circle in the  $xy$ -plane with equation  $x^2 + y^2 = 25$ ?

34

$$2px - 8 = 32 - px$$

Based on the equation above, what is the value of  $px - \frac{8}{3}$ ?

35

In the  $xy$ -plane, the graph of  $3x - 4y = 20$  intersects the  $x$ -axis at  $(c, 0)$ . What is the value of  $c$ ?

36

$$y = 2x(x+4)$$

$$3x + y + 15 = 0$$

If  $(x, y)$  is a solution to the system of equations above, what is one possible value of  $|x + y|$ ?



38

**Questions 37 and 38 refer to the following information.**

Employees at the PQM Corporation

Specialist level	Salary grade			Total
	A	B	C	
I	10	1	0	11
II	6	10	8	24
III	0	6	15	21
Total	16	17	23	56

The table above shows the number of employees in the PQM Corporation who are at various specialist levels and salary grades. Employees who are in salary grade A are paid at a lower rate than those who are in salary grade B, and employees who are in salary grade B are paid at a lower rate than those who are in salary grade C.

It was announced that on January 1, 25% of the employees who are in salary grade A would be moved to salary grade B. Of the employees who are level I specialists salary grade A, 30% will be part of the move from salary grade A to salary grade B. If no other salary adjustments are to be made, how many employees who are level II specialists will be in salary grade B after January 1?

37

What fraction of employees who are level II specialists are in either salary grade B or C?

**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**

YOUR NAME (PRINT) .....

LAST

FIRST

MI

TEST CENTER .....

NUMBER

NAME OF TEST CENTER

ROOM NUMBER

# The SAT

## GENERAL DIRECTIONS

- You may work on only one section at a time.
- If you finish a section before time is called, check your work on that section. You may NOT turn to any other section.

## MARKING ANSWERS

- Be sure to mark your answer sheet properly.  
COMPLETE MARK     EXAMPLES OF INCOMPLETE MARKS
- You must use a No. 2 pencil.
- Carefully mark only one answer for each question.
- Make sure you fill the entire circle darkly and completely.
- Do not make any stray marks on your answer sheet.
- If you erase, do so completely. Incomplete erasures may be scored as intended answers.
- Use only the answer spaces that correspond to the question numbers.

## USING YOUR TEST BOOK

- You may use the test book for scratch work, but you will not receive credit for anything that you write in your test book.
- After time has been called, you may not transfer answers from your test book to your answer sheet or fill in circles.
- You may not fold or remove pages or portions of a page from this book, or take the book or answer sheet from the testing room.

## SCORING

- For each correct answer, you receive one point.
- You do not lose points for wrong answers; therefore, you should try to answer every question even if you are not sure of the correct answer.

## IMPORTANT

The codes below are unique to your test book.  
Copy them on your answer sheet in boxes 8 and 9 and fill in the corresponding circles exactly as shown.

9	TEST ID (Copy from back of test book.)						

8	FORM CODE (Copy and grid as on back of test book.)						
(A)	(A)	(A)	(A)	(0)	(0)	(0)	
(B)	(B)	(B)	(B)	(1)	(1)	(1)	
(C)	(C)	(C)	(C)	(2)	(2)	(2)	
(D)	(D)	(D)	(D)	(3)	(3)	(3)	
(E)	(E)	(E)	(E)	(4)	(4)	(4)	
(F)	(F)	(F)	(F)	(5)	(5)	(5)	
(G)	(G)	(G)	(G)	(6)	(6)	(6)	
(H)	(H)	(H)	(H)	(7)	(7)	(7)	
(I)	(I)	(I)	(I)	(8)	(8)	(8)	
(J)	(J)	(J)	(J)	(9)	(9)	(9)	
(K)	(K)	(K)	(K)				
(L)	(L)	(L)	(L)				
(M)	(M)	(M)	(M)				
(N)	(N)	(N)	(N)				
(O)	(O)	(O)	(O)				
(P)	(P)	(P)	(P)				
(Q)	(Q)	(Q)	(Q)				
(R)	(R)	(R)	(R)				
(S)	(S)	(S)	(S)				
(T)	(T)	(T)	(T)				
(U)	(U)	(U)	(U)				
(V)	(V)	(V)	(V)				
(W)	(W)	(W)	(W)				
(X)	(X)	(X)	(X)				
(Y)	(Y)	(Y)	(Y)				
(Z)	(Z)	(Z)	(Z)				

Follow this link for more information on scoring your practice test:  
[www.sat.org/scoring](http://www.sat.org/scoring)

# 2018年6月北美——参考答案

## ANSWER KEY

### Reading Test Answers

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

### Writing and Language Test Answers

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

READING TEST  
RAW SCORE  
(NUMBER OF  
CORRECT ANSWERS)

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

### Math Test – No Calculator Answers

1 B	11 B
2 A	12 C
3 C	13 D
4 C	14 B
5 D	15 A
6 C	16 1
7 B	17 2.5
8 D	18 3
9 B	19 48
10 A	20 72

### Math Test – Calculator Answers

1 D	11 C	21 C	31 400
2 B	12 B	22 D	32 6
3 A	13 C	23 D	33 5
4 B	14 D	24 B	34 32/3
5 A	15 C	25 C	35 20/3
6 C	16 C	26 B	36 8.5, 9, 10, 10.5
7 D	17 A	27 B	37 10 or 8
8 B	18 D	28 C	38 11
9 B	19 D	29 A	
10 C	20 A	30 D	

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

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