

**OCTOBER 3, 2020  
INTERNATIONAL**

# The SAT®

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# Test Book

## IMPORTANT REMINDERS

**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 Haruki Murakami, *1Q84*. ©2009 by Haruki Murakami. Translation by Jay Rubin and Philip Gabriel. ©2011 by Haruki Murakami. Tengo, a writer, has just completed a project of editing another author's book, *Air Chrysalis*, for his publisher Komatsu.

Line 5      Tengo had spent ten days reworking *Air Chrysalis* before handing it over to Komatsu as a newly finished work, following which he was visited by a string of calm, tranquil days. He taught three days a week. The rest of his time he spent doing housework, taking walks, and writing his own novel. April passed like this. The cherry blossoms scattered, new buds appeared on the trees, the magnolias reached full bloom, and the seasons moved along in stages. The days flowed by smoothly, regularly, uneventfully. This was the life that Tengo most wanted, each week linking automatically and seamlessly with the next.

15      Amid all the sameness, however, one change became evident. A good change. Tengo was aware that, as he went on writing his novel, a new wellspring was forming inside him. Not that its water was gushing forth: it was more like a tiny spring among the rocks. The flow may have been limited, but it was continuous, welling up drop by drop. He was in no hurry. He felt no pressure. All he had to do was wait patiently for the water to collect in the rocky basin until he could scoop it up. Then he would sit at his desk, turning what he had scooped into words, and the story would advance quite naturally.

25      The concentrated work of rewriting *Air Chrysalis* might have dislodged a rock that had been blocking his wellspring until now. Tengo had no idea why that should be so, but he had a definite sense that a heavy lid had finally come off. He felt as though his body had become lighter, that he had emerged from a cramped space and could now stretch his arms and legs freely. *Air Chrysalis* had probably stimulated something that had been deep inside him all along.

30      Tengo sensed, too, that something very like desire was growing inside him. This was the first time in his life he had ever experienced such a feeling. All through high school and college, his judo coach and older teammates would often say to him, "You have the talent and the strength, and you practice enough, but you just don't have the desire." They were probably right. He lacked that drive to win at all costs, which is why he would often make it to the semifinals and the finals but lose the all-important championship match. He exhibited these tendencies in everything, not just judo. He was more placid than determined. It was the same with his fiction. He could write with some style and make up reasonably interesting stories, but his work lacked the strength to grab the reader by the throat. Something was missing. And so he would always make it to the short list but never take the new writers' prize, as Komatsu had said.

35      After he finished rewriting *Air Chrysalis*, however, Tengo was truly chagrined for the first time in his life. While engaged in the rewrite, he had been totally absorbed in the process, moving his hands without thinking. Once he had completed the work and

handed it to Komatsu, however, Tengo was assaulted by a profound sense of powerlessness. Once the powerlessness began to abate, a kind of rage surged up from deep inside him. The rage was directed at Tengo himself. *I used another person's story to create a rewrite that amounts to a literary fraud, and I did it with far more passion than I bring to my own work.*

Isn't a writer someone who finds the story hidden inside and uses the proper words to express it? Aren't you ashamed of yourself? You should be able to write something as good as Air Chrysalis if you make up your mind to do it. Isn't that true?

But he had to prove it to himself.

Tengo decided to discard the manuscript he had written thus far and start a brand-new story from scratch. He closed his eyes and, for a long time, listened closely to the dripping of the little spring inside him. Eventually the words began to come naturally to him. Little by little, taking all the time he needed, he began to form them into sentences.

1

Which statement best summarizes the passage?

- A) Praise for a character's novel causes the character to stop rewriting others' work.
- B) A character realizes the importance of writing about his childhood memories.
- C) Comparisons between a character's novel and a rival's work result in the character's feelings of envy.
- D) A character becomes newly inspired to write himself while editing another author's manuscript.

2

According to the passage, which characteristic does Tengo greatly value in his life?

- A) Immersion in nature
- B) Predictability of events
- C) Time to pursue new interests
- D) Involvement in multiple careers

3

The image of the wellspring introduced in the second paragraph (lines 13-24) has the main effect of

- A) representing Tengo's awakening creativity and motivation.
- B) implying that Tengo finds inspiration in the outdoors.
- C) reinforcing the solitary nature of Tengo's writing process.
- D) suggesting the success of Tengo's experimental writing style.

4

The passage suggests that Tengo's judo coach and teammates saw him as

- A) inferior in talent but eager to compete.
- B) hardworking but lacking determination to excel.
- C) capable but arrogant toward his rivals.
- D) nervous but willing to work long hours.

5

It can reasonably be inferred from the passage that the narrator believes that the best fiction should possess which quality?

- A) A main character who accurately reflects real life
- B) A mode of writing that stands apart for its innovation
- C) A powerful ability to connect with its audience
- D) A plot that mirrors the author's experiences

6

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

- A) Lines 45-46 ("He was . . . fiction")
- B) Lines 46-49 ("He could . . . throat")
- C) Lines 49-52 ("Something . . . said")
- D) Lines 53-55 ("After . . . life")

7

The narrator's use of italics in lines 62-69 ("*I used . . . true*") mainly serves to

- A) emphasize the narrator's exasperation with Tengo's shortcomings.
- B) indicate Tengo's disagreement with Komatsu's editing suggestions.
- C) highlight an emotional monologue excerpted from Tengo's manuscript.
- D) detail Tengo's thought process leading him to an important revelation.

8

As used in line 66, "proper" most nearly means

- A) respectable.
- B) suitable.
- C) formal.
- D) legitimate.

9

It can reasonably be inferred from the passage that after Tengo completes the *Air Chrysalis* manuscript, he ultimately views that project to have been

- A) frustrating, because he recognizes that he has invested too little energy in his own writing.
- B) inspiring, because he enjoys experimenting with its featured style in his own writing.
- C) disturbing, because he prefers to spend his time developing ideas for his own writing.
- D) rewarding, because he receives more praise for his editing than for his own writing.

10

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

- A) Lines 55-57 ("While . . . thinking")
- B) Lines 57-59 ("Once . . . powerlessness")
- C) Lines 61-64 ("The rage . . . work")
- D) Lines 65-66 ("*Isn't . . . express it*")

**Questions 11-20 are based on the following passage and supplementary material.**

This passage is adapted from Michael Rosenwald, "Print Is Dead. Long Live Print." ©2016 by Columbia Journalism Review.

Two decades have passed since newspapers launched websites, and yet here we are. Big city papers have gone under, thousands of journalists  
 Line have lost their jobs, and the idea that digital news will  
 5 eventually become a decent business feels like a rumor. The reality is this: No app, no streamlined website, no "vertical integration," no social network has come close to matching the success of print in revenue or readership. And the most crucial  
 10 assumption publishers have made about readers, particularly millennials—that they prefer the immediacy of digital—now seems questionable, too.

I wish I were being hyperbolic, but Iris Chyi, a University of Texas associate professor and new  
 15 media researcher, has been collecting facts to support these assertions. While pursuing her PhD in the late 1990s, Chyi conducted audience research for the *Austin American-Statesman*. But looking at reader metrics nearly a decade later, it became clear to Chyi  
 20 that online penetration and engagement weren't growing. This got her wondering whether newspapers were pursuing a future that would never come.

Chyi began conducting surveys and collecting  
 25 readership data, analyzing it all in academic papers and a recent book titled, *Trial and Error: U.S. Newspapers' Digital Struggles Toward Inferiority*. She has come to believe that the digital shift has been a disaster for media organizations, and that there is  
 30 no evidence online news will ever be economically or culturally viable. "They have killed print, their core product, with all of their focus online," Chyi told me in an interview.

In her book, Chyi writes that "the (supposedly  
 35 dying) print edition still outperforms the (supposedly hopeful) digital product by almost every standard, be it readership, engagement, advertising revenue," and especially willingness to actually pay for the product. In a paper published earlier this year, Chyi examined  
 40 data collected by Scarborough, a market research firm, for the 51 largest US newspapers, finding that the print edition reaches 28 percent of circulation areas, while the digital version reaches just 10 percent.

Publishers argue that print readers are just getting older while younger readers move further away from even considering print, but Pew surveys and Chyi's analysis of the Scarborough data show that considerable interest in print still persists, even among young readers. Pew reports that print-only is still the most common way of reading news, with more than half of readers last year opting for ink on their hands every day. The percentage who only read news via a computer? Five percent in 2014 . . . and in 2015? Also 5 percent.

Chyi's findings show that among 18- to 24-year-old news readers, 19.9 percent had read the print edition of a newspaper during the past week. Less than 8 percent read it digitally.

Chyi has been making this argument for several years, but when I spoke to her this past summer she told me that few people in the industry were paying attention, including media reporters. Now they are. Jack Shafer, a sharp media critic at Politico, highlighted her research in an October column on the enduring value of print, but missed the larger context—that her numbers don't exist in a vacuum. Print is rebounding or stabilizing in other areas of daily life. Sales of print books have risen every year since 2013, while e-books have leveled off and in some genres declined. Yet as book publishers double down on print—even raising the price of e-books to make paper more attractive—the cost of printed newspapers is going up, not down. Publishers are watering down the lemonade and asking for more quarters. You don't have to be an economist to see this won't end well.

Mean Print and Online Reach of 51 Newspapers in the United States by Age, 2015

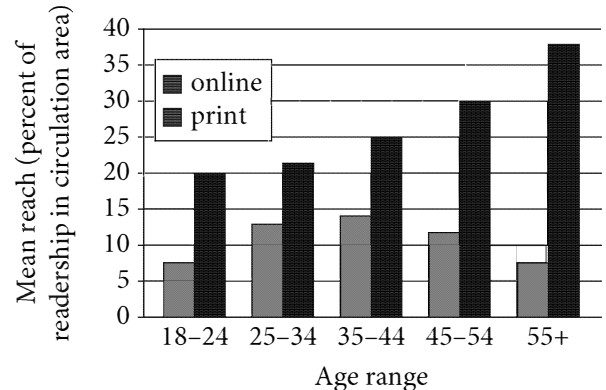


Figure adapted from Hsiang Iris Chyi and Ori Tenenboim, "Reality Check: Multiplatform Newspaper Readership in the United States, 2007–2015." ©2016 by Informa UK Limited.

11

The first paragraph of the passage mainly serves to

- A) introduce the two sides of an ongoing debate about the future of online newspapers.
- B) establish a conflict between past expectations about online newspapers and current circumstances.
- C) describe a commonly held belief about the changing nature of online newspaper publishing.
- D) summarize the challenges facing online newspapers in the contemporary marketplace.

12

As used in line 5, "decent" most nearly means

- A) honorable.
- B) satisfactory.
- C) considerate.
- D) tasteful.

13

The passage most strongly suggests that readers' decisions about whether to consume news on paper or online are

- A) typically regarded by publishers as too subjective to draw generalizations about.
- B) broadly consistent with publishers' expectations about which segments of the population prefer which format.
- C) primarily motivated by factors other than differences in the speed with which the two formats relay news.
- D) largely based on differences in the physical experience of consuming news across the two formats.

14

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

- A) Lines 2-6 ("Big city . . . rumor")
- B) Lines 6-9 ("The reality . . . readership")
- C) Lines 9-12 ("And the . . . too")
- D) Lines 13-16 ("I wish . . . assertions")

15

Based on the passage, which statement best describes the author's attitude toward Chyi's research?

- A) He is impressed by the logical complexity of Chyi's arguments.
- B) He applauds Chyi's willingness to dispute other scholars' conclusions.
- C) He admires the creative way in which Chyi collected a wide variety of data.
- D) He appreciates that Chyi's conclusions are based on extensive empirical evidence.

16

As used in line 36, "standard" most nearly means

- A) measure.
- B) requirement.
- C) exemplar.
- D) convention.

17

The main purpose of the fifth paragraph (lines 44-54) is to

- A) concede that publishers are right to be worried about trends among young readers.
- B) explain what led publishers to overestimate the popularity of online news sources.
- C) suggest that newspaper readership is not changing in the way publishers claim.
- D) demonstrate how publishers' decisions have driven away print readers.



18

Which statement about readership by age group is best supported by the data presented in the graph?

- A) Online readership increased by age group up to a certain point, then decreased by age group.
- B) Print readership increased by age group up to a certain point, then remained flat for subsequent age groups.
- C) Online readership decreased by age group, whereas print readership increased by age group.
- D) Print readership increased by age group, whereas online readership showed no marked change by age group.

19

Which choice best supports the idea that the author regards Chyi's findings about newspapers as consistent with a broad cultural trend?

- A) Lines 44-49 ("Publishers . . . readers")
- B) Lines 49-52 ("Pew . . . day")
- C) Lines 59-62 ("Chyi . . . are")
- D) Lines 67-70 ("Print . . . declined")

20

According to the graph, the mean reach of point newspapers in 2015 for people between the ages of 45 and 54 was approximately

- A) 12 percent.
- B) 20 percent.
- C) 30 percent.
- D) 38 percent.

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

This passage is adapted from Erika Ebsworth-Goold, "A Simple Sniff: Nanoparticle Research Tested in Locusts Focuses on New Drug-Delivery Method." ©2017 by Washington University in St. Louis.

Delivering life-saving drugs directly to the brain in a safe and effective way is a challenge for medical providers. One key reason: the blood-brain barrier, which protects the brain from tissue-specific drug delivery. Methods such as an injection or a pill aren't as precise or immediate as doctors might prefer, and ensuring delivery right to the brain often requires invasive, risky techniques.

A team of engineers from Washington University in St. Louis has developed a new nanoparticle generation-delivery method that could someday vastly improve drug delivery to the brain, making it as simple as a sniff.

"This would be a nanoparticle nasal spray, and the delivery system could allow a therapeutic dose of medicine to reach the brain within 30 minutes to one hour," said Ramesh Raliya, research scientist at the School of Engineering & Applied Science.

"The blood-brain barrier protects the brain from foreign substances in the blood that may injure the brain," Raliya said. "But when we need to deliver something there, getting through that barrier is difficult and invasive. Our non-invasive technique can deliver drugs via nanoparticles, so there's less risk and better response times."

The novel approach is based on aerosol science and engineering principles that allow the generation of monodisperse nanoparticles, which can deposit on upper regions of the nasal cavity via diffusion.

Working with Assistant Vice Chancellor Pratim Biswas, Raliya developed an aerosol consisting of gold nanoparticles of controlled size, shape and surface charge. The nanoparticles were tagged with fluorescent markers, allowing the researchers to track their movement.

Next, Raliya and biomedical engineering postdoctoral fellow Debajit Saha exposed locusts' antennae to the aerosol, and observed the nanoparticles travel from the antennas up through the olfactory nerves. Due to their tiny size, the nanoparticles passed through the blood-brain barrier, reaching the brain and suffusing it in a matter of minutes.

The team tested the concept in locusts because the blood-brain barriers in the insects and humans have anatomical similarities, and the researchers consider going through the nasal regions to neural pathways as the optimal way to access the brain.

"The shortest and possibly the easiest path to the brain is through your nose," said Barani Raman, associate professor of biomedical engineering. "Your nose, the olfactory bulb and then olfactory cortex: two relays and you've reached the cortex. The same is true for invertebrate olfactory circuitry, although the latter is a relatively simpler system, with supraesophageal ganglion instead of an olfactory bulb and cortex."

To determine whether or not the foreign nanoparticles disrupted normal brain function, Saha examined the physiological response of olfactory neurons in the locusts before and after the nanoparticle delivery. Several hours after the nanoparticle uptake, no noticeable change in the electrophysiological responses was detected.

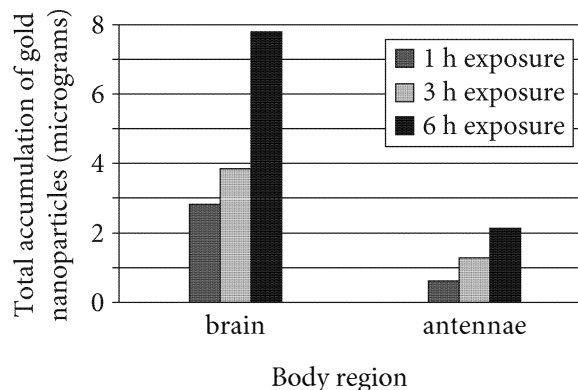
"This is only a beginning of a cool set of studies that can be performed to make nanoparticle-based drug delivery approaches more principled," Raman said.

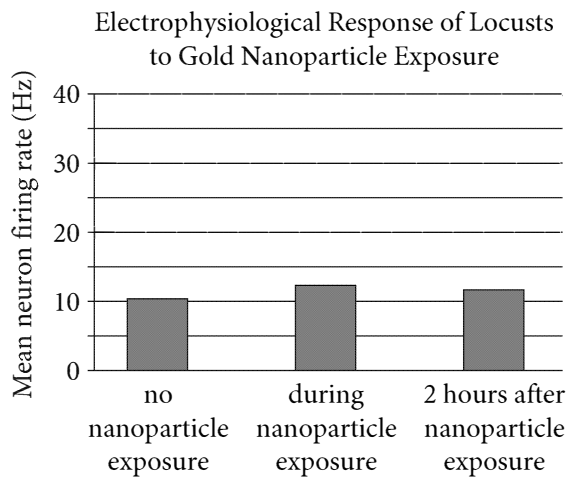
The next phase of research involves fusing the gold nanoparticles with various medicines, and using ultrasound to target a more precise dose to specific areas of the brain.

"We want [targeted drug] delivery within the brain using this non-invasive approach," Raliya said.

**Figure 1**

Gold Nanoparticle Accumulation in Locust Body Regions Following Aerosol Exposure



**Figure 2**

Figures adapted from Ramesh Raliya et al., "Non-Invasive Aerosol Delivery and Transport of Gold Nanoparticles to the Brain." ©2017 by Ramesh Raliya et al.

21

Which choice best describes the main idea of the passage?

- A) Recent research involving locusts has revealed a surprising similarity between human and insect responses to nanoparticles.
- B) A team of researchers is testing several different approaches to solving a specific challenge facing medical providers.
- C) The use of a nanoparticle aerosol spray has the potential to change doctors' ability to treat a wide variety of conditions.
- D) A team of researchers has developed a technique that may improve doctors' ability to administer certain medications.

22

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

- A) marginally.
- B) speedily.
- C) visibly.
- D) greatly.

23

As used in line 26, "approach" most nearly means

- A) method.
- B) passage.
- C) recipe.
- D) angle.

24

Information in the passage most strongly suggests that one reason the researchers focused their study on locusts was that both humans and locusts have

- A) similar structures that protect the brain from foreign substances.
- B) very little distance separating their noses from their brains.
- C) olfactory circuitry consisting of an olfactory bulb and cortex.
- D) unusual physiological responses to the presence of nanoparticles.

25

Which of the following statements about Raliya's research study can most reasonably be inferred from the passage?

- A) The study aimed to devise a delivery system that could administer medicine at a consistent rate over a long period of time.
- B) The researchers tested a method for delivering medicine without it first passing through the blood-brain barrier.
- C) The study was the first to show that nanoparticles could be used safely in an experimental situation.
- D) The researchers were not able to monitor the movement of the nanoparticles unless the particles were specially marked.

26

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

- A) Lines 14-18 (“This . . . Science”)
- B) Lines 23-25 (“Our . . . times”)
- C) Lines 26-29 (“The novel . . . diffusion”)
- D) Lines 33-35 (“The nanoparticles . . . movement”)

27

Information in the passage most strongly suggests that aerosolized nanoparticle delivery systems

- A) require more research before they can be widely used.
- B) will not be effective until researchers can further reduce the particle size.
- C) are more difficult to study than other delivery systems.
- D) hold potential to improve drug delivery to areas outside the brain.

28

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

- A) Lines 40-43 (“Due . . . minutes”)
- B) Lines 52-53 (“Your . . . the cortex”)
- C) Lines 65-68 (“This . . . said”)
- D) Lines 73-74 (“We . . . said”)

29

According to figure 1, the greatest accumulation of gold nanoparticles was measured in the locusts’

- A) brains after 1 hour of aerosol exposure.
- B) brains after 6 hours of aerosol exposure.
- C) antennae after 1 hour of aerosol exposure.
- D) antennae after 6 hours of aerosol exposure.

30

The mean neuron firing rate for all three conditions depicted in figure 2 was between

- A) 0 and 5 Hz.
- B) 5 and 10 Hz.
- C) 10 and 15 Hz.
- D) 15 and 20 Hz.

31

What information discussed in the passage is best represented by figure 2?

- A) The information in lines 30-33 (“Working . . . charge”)
- B) The information in lines 36-40 (“Next . . . nerves”)
- C) The information in lines 62-64 (“Several . . . detected”)
- D) The information in lines 69-72 (“The next . . . of the brain”)

**Questions 32-42 are based on the following passages.**

Passage 1 is adapted from Henry Knox, "A Plan for the General Arrangement of the Militia of the United States," presented to Congress in 1790. Passage 2 is adapted from Wilson Nicholas's comments in a 1788 session of the Virginia state convention on the adoption of the US Constitution. Both passages discuss volunteer militias and standing armies, or permanent forces of professional soldiers.

**Passage 1**

[W]hoever seriously and candidly estimates the power of discipline and the tendency of military habits will be constrained to confess, that whatever  
 Line may be the efficacy of a standing Army in War, it  
 5 cannot in peace be considered as friendly to the rights of human nature. . . .

A small Corps of well disciplined and well informed Artillerists and Engineers, and a Legion for the protection of the frontiers, and the Magazines  
 10 and Arsenals, are all the Military establishment which may be required for the present use of the United States, the privates of the Corps to be enlisted for a certain period and after the expiration of which to return to the mass of the Citizens.

15 An energetic National Militia is to be regarded as the *capital security* of a free republic, and not a standing Army forming a distinct class in the community.

It is the introduction and diffusion of vice and  
 20 corruption of manners into the mass of the people that render a standing army necessary. It is when public spirit is despised, and avarice, indolence, and [excessive refinement] of manners, predominate and prevent the establishment of institutions, which  
 25 would elevate the minds of the youth in the paths of virtue and honor, that a standing Army is formed and rivetted forever.

While the human character remains unchanged, and societies and Governments of considerable  
 30 extent are formed, a principle ever ready to execute the laws and defend the State must constantly exist. Without this vital principle, the Government would be invaded or overturned and trampled upon by the bold and ambitious. No community can be long held  
 35 together unless its arrangements are adequate to its probable exigencies.

If it should be decided to reject a standing Army for the military branch of the Government of the United States as possessing too fierce an aspect, and  
 40 being hostile to the principles of liberty it will follow that a well constituted Militia ought to be established.

**Passage 2**

[T]he great object of government, in every country, is security and public defence. I suppose, therefore, that what we ought to attend to here, is,  
 45 what is the best mode of enabling the general government to protect us. One of three ways must be pursued for this purpose. We must either empower [elected officials] to employ, and rely altogether on, a standing army; or depend altogether on militia; or  
 50 else we must enable them to use the one or the other of these two ways, as may be found most expedient. . . . If a standing army were alone to be employed, such an army must be kept up in time of peace as would be sufficient in war. The dangers of  
 55 such an army are so striking that every man would oppose the adoption of this government, had it been proposed by it as the only mode of defence. Would it be safe to depend on militia alone, without the agency of regular forces, even in time of war?  
 60 Were we to be invaded by a powerful, disciplined army, should we be safe with militia? Could men unacquainted with the hardships, and unskilled in the discipline of war—men only inured to the peaceable occupations of domestic life—encounter  
 65 with success the most [skillful] veterans, inured to the fatigues and toils of campaigns? Although some people are pleased with the theory of reliance on militia, as the sole defence of a nation, yet I think it will be found, in practice, to be by no means  
 70 adequate. Its inadequacy is proved by the experience of other nations. But were it fully adequate, it would be unequal. If war be supported by militia, it is by personal service. The poor man does as much as the rich. Is this just? What is the consequence when war  
 75 is carried on by regular troops? They are paid by taxes raised from the people, according to their property; and then the rich man pays an adequate share.

. . . As these two ways are ineligible, let us  
 80 consider the third method. Does this Constitution put this on a proper footing? It enables Congress to raise an army when necessary, or to call forth the militia when necessary. What will be the consequence of their having these two powers? Till  
 85 there be a necessity for an army to be raised, militia

will do. And when an army will be raised, the militia will still be employed, which will render a less numerous army sufficient. By these means, there will be a sufficient defence for the country, without  
90 having a standing army altogether, or oppressing the people.

32

In Passage 1, the second paragraph (lines 7-14) serves mainly to

- A) explain how military personnel can transition to civilian life.
- B) identify a contradiction inherent in current military policy.
- C) offer a brief sketch of how the nation's military can best be organized.
- D) distinguish the duties of officers from those of lower-ranking soldiers.

33

In Passage 1, Knox states his belief that a standing army poses a risk to

- A) people's rights during times of peace.
- B) proper habits among the military.
- C) recruitment for a national militia.
- D) patriotic sentiments among the public.

34

In lines 1-3 of Passage 1, the phrases “seriously and candidly” and “constrained to confess” have the main effect of

- A) emphasizing Knox's suggestion that certain individuals have failed to meet high ethical standards.
- B) highlighting Knox's objection to the level of animosity expressed in recent public debates.
- C) reinforcing Knox's criticism of attempts to suppress the free discussion of a controversial subject.
- D) underscoring Knox's implication that a certain viewpoint is not supported by an honest assessment of the facts.

35

The primary purpose of Passage 2 is to

- A) urge that a course of action not be undertaken until a consensus on it has been reached.
- B) endorse a particular approach on the condition that certain improvements are made to it.
- C) reconcile opposing viewpoints by considering the points of agreement between them.
- D) argue against two policies and recommend another policy that includes aspects of the two.

36

In Passage 2, Nicholas asserts that national defense is an objective that

- A) is irreconcilable with the objective of world peace.
- B) is of similar importance to all countries.
- C) diverts resources from other, more important objectives.
- D) has received insufficient public support.



37

As used in lines 47, “purpose” most nearly means

- A) resolve.
- B) goal.
- C) meaning.
- D) role.

38

In Passage 2, Nicholas argues that an army is superior to a militia in that

- A) armies have been in use for centuries, whereas militias are a recent development.
- B) an army is more readily combined with other types of military forces than a militia is.
- C) enemies are less likely to attack a nation protected by an army than one protected by a militia.
- D) the cost of an army is distributed more fairly among citizens than the cost of a militia is.

39

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

- A) Lines 43-52 (“I suppose . . . expedient”)
- B) Lines 57-59 (“Would . . . war”)
- C) Lines 66-72 (“Although . . . unequal”)
- D) Lines 72-78 (“If war . . . share”)

40

Based on the passages, which choice best describes Knox’s and Nicholas’s shared view on military preparedness?

- A) It is a central responsibility of the national government.
- B) It depends on the participation of all able-bodied citizens.
- C) It is at odds with the basic principles of democratic governance.
- D) It renders the separation of civilian and military authority impossible.

41

Based on Passage 2, Nicholas would most likely offer which criticism of Knox’s recommendations regarding a national militia in Passage 1?

- A) The Constitution forbids the establishment of a national military force that is composed exclusively of a militia.
- B) A militia would require the service of so many people that recruiting sufficient numbers for an army would subsequently be difficult.
- C) Relying almost exclusively on a militia would leave the United States vulnerable to nations whose military consists of seasoned troops.
- D) The expense of maintaining a militia would prevent the nation from undertaking important nonmilitary ventures.

42

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

- A) Lines 52-57 (“If a . . . defence”)
- B) Lines 60-66 (“Were . . . campaigns”)
- C) Lines 79-83 (“As these . . . militia when necessary”)
- D) Lines 83-91 (“What . . . people”)

**Questions 43-52 are based on the following passage.**

This passage is adapted from Lee Billings, “Astronomers Spy Shadowy Plumes around Europa.” ©2016 by Scientific American, a division of Nature America, Inc.

Astronomers using the Hubble Space Telescope have found new evidence that a subsurface ocean within Jupiter’s icy moon Europa may be intermittently venting plumes of water vapor into outer space. The finding suggests Europa’s ocean, thought to be buried beneath perhaps 100 kilometers of ice, may be more amenable to life—and accessible to curious astrobiologists—than previously believed.

“If there are plumes emerging from Europa, it is significant,” says study lead William Sparks, an astronomer at the Space Telescope Science Institute in Baltimore, Maryland. “Because it means we may be able to explore that ocean for organic chemistry or even signs of life without having to drill through unknown miles of ice.”

Using Hubble’s Space Telescope Imaging Spectrograph (STIS), Sparks and his team observed Europa 10 times between late 2013 and early 2015 as it crossed the face of Jupiter. Watching in ultraviolet light, in which Europa’s icy surface appears very dark, they looked for shadows of the plumes backlit against Jupiter’s bright, smooth cloudscapes. Three times, painstaking analysis and image processing unveiled what looked like ultraviolet shadows soaring over the southern edge of Europa’s silhouette. If they were plumes, they would contain an estimated few million kilograms of material and reach about 200 kilometers above Europa’s surface.

This is not the first time scientists have spied plumes on Europa. Lorenz Roth, an astronomer now at the Royal Institute of Technology in Stockholm, led a team of researchers who glimpsed what could be a single similarly sized and located plume in 2012. Those findings, reported in *Science* in 2013, also used Hubble’s STIS instrument. But instead of glimpsing shadows, the findings recorded the ultraviolet emission near Europa’s south pole of what could have been hydrogen and oxygen—exactly what would be produced by a plume of water vapor dissociating into its constituent atomic elements as it is bombarded by particles trapped in Jupiter’s powerful magnetic field.

Afterward, however, the putative plumes observed by Roth’s team vanished, failing to manifest in archival data or in every new search by other

telescopes—until now. Perhaps, some thought, the plumes only appeared when Europa reached the farthest edge of its orbit, where the collective gravitational tugs of Jupiter and its other moons could flex and “tidally heat” Europa’s interior, opening fissures and melting ice to vent water into space. Or maybe it was a one-time event produced by an unseen asteroid or comet hitting Europa’s surface. Less-charitable skeptics speculated instead that plume-hungry scientists were just succumbing to pareidolia, the human mind’s tendency to find patterns in chaos and project significance onto meaningless noise.

With the new detections reported by Sparks’s team, the “tidal heating” hypothesis seems weaker than before—the possible plumes they spotted do not seem to occur when Europa’s tidal heating should be strongest. This means that, if the plumes do exist, they now lack an obvious source of heating that could also explain their observed dimensions and mysterious intermittency. Similarly, because Sparks’s team has witnessed the plumes apparently recurring, the “one-time impact” idea loses its luster, too. While these hypotheses fall to the wayside, the broader idea that the plumes are somehow simply illusory remains firmly in contention. Both detections lie at the edge of statistical significance and come from the same instrument upon the same telescope, albeit one that is arguably more used and deeply understood than any other observatory in history.

“This is exactly as likely as the last detections,” says Britney Schmidt, a planetary scientist at the Georgia Institute of Technology who was not involved with the research. “Both results showed statistically significant signals, at about the same level. So I’m fairly neutral. I think we should expect plume-type behavior. What I don’t know is whether these are sensitive enough detections to really knock that out for good.”

Sparks fully acknowledges that his team’s results remain frustratingly hazy. “These observations are at the limit of what Hubble can do,” he says. “We’re not aware of any instrumental artifacts that could cause these features, and they are statistically significant, but we remain cautious. . . . We do not claim to have proven the existence of plumes, but rather to have contributed evidence that such activity may be present.”



43

According to Sparks in the passage, the existence of plumes of vapor on Europa would be important because such plumes

- A) might suggest the presence of previously undetected subsurface oceans on Europa.
- B) would demonstrate Europa's uniqueness compared to Jupiter's other moons.
- C) would prove that some form of life exists on Europa.
- D) might make studying the composition of Europa's ocean easier than anticipated.

44

The main purpose of the passage is to

- A) assess the suitability of Hubble's STIS for the detection of plumes on Europa.
- B) discuss whether provisional claims about the detection of plumes on Europa are valid.
- C) illustrate how a team of scientists used new technology to challenge earlier research about the detection of plumes on Europa.
- D) convey astrobiologists' growing interest in the impact the detection of plumes on Europa will have on their field.

45

Which choice provides the best evidence that researchers struggled to corroborate the initial observation of plumes on Europa?

- A) Lines 5-8 ("The finding . . . believed")
- B) Lines 26-28 ("If they . . . surface")
- C) Lines 43-46 ("Afterward . . . now")
- D) Lines 59-63 ("With . . . strongest")

46

Lines 46-53 ("Perhaps . . . surface") primarily serve to

- A) offer possible explanations for why Europa's plumes had not materialized again after they were initially reported.
- B) provide evidence for the claim that data supporting the presence of plumes on Europa were faulty.
- C) argue that tidal heating could not have generated plumes of the magnitude of those observed on Europa.
- D) refute the claim by Roth that plumes on Europa could be recorded by measuring ultraviolet emissions.

47

The last sentence of the fifth paragraph (lines 54-58) serves to

- A) introduce the idea that scientists sometimes form their conclusions on the basis of unconscious reactions they have to their observations.
- B) emphasize the claim that truths established within a scientific discipline are tentative until validated by the methods of other disciplines.
- C) propose the argument that scientific truths are more stable when they result from both direct observation and mathematical analysis.
- D) defend the assertion that the success of scientific enterprise depends on scientists building on the work of those who precede them.

48

Based on the passage, which hypothetical discovery would most strongly support Sparks and his team's potential identification of plumes on Europa?

- A) Evidence of a recent major asteroid impact on Europa's surface is discovered through more advanced imaging techniques.
- B) A phenomenon other than tidal heating is found to heat Europa's interior with a frequency corresponding to that of the plumes' manifestations.
- C) The effect of Jupiter's magnetic field on its moons is determined to be weaker than originally thought.
- D) Tidal heating is demonstrated to account for the occurrence of plumes on other moons and planets.

49

As used in line 84, "sensitive" most nearly means

- A) secretive.
- B) offensive.
- C) vulnerable.
- D) precise.

50

As used in line 86, "acknowledges" most nearly means

- A) favors.
- B) notices.
- C) concedes.
- D) answers.

51

It can reasonably be inferred from the passage that to improve the accuracy of its findings, Sparks's team would most likely need to

- A) consider a greater range of archival data when performing its analysis.
- B) incorporate Roth's observation techniques into its own approach to observing Europa's atmosphere.
- C) make more extensive use of mathematical modeling in addition to image processing.
- D) make further observations using instruments whose capabilities exceed those of available technology.

52

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

- A) Lines 71-76 ("Both . . . history")
- B) Lines 77-82 ("This is . . . level")
- C) Lines 87-91 ("These . . . cautious")
- D) Lines 91-94 ("We do . . . present")

**STOP**

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

# Writing and Language Test

35 MINUTES, 44 QUESTIONS

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

## DIRECTIONS

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

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

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

Questions 1-11 are based on the following passage.

### Restoration, Down to a Fine Art

Art restorers strive **1** in ensuring that beloved works of art **2** will last as long as possible. Art

1

- A) NO CHANGE
- B) to ensure
- C) so as to ensure
- D) ensuring

2

- A) NO CHANGE
- B) that are prized by many will last.
- C) will last through time and for as long as possible.
- D) will endure for as long as possible into the future.

restoration is the repair of artworks such as paintings that have been **3** damaged; be it by the passing of time, natural disasters, or human error. While restoration **4** attempts are sometimes unsuccessful, the effort can result in a rewarding career path for artists and art enthusiasts alike.

3

- A) NO CHANGE
- B) damaged. Be
- C) damaged be
- D) damaged—be

4

Which choice most effectively establish is one of the passage's main ideas?

- A) NO CHANGE
- B) requires specialized training,
- C) requires special attention to lighting conditions,
- D) efforts often involve borrowing tools from other industries,

Art restorers are experts in how canvas and other surfaces interact with paints and chemicals. Because restoration often involves risky methods such as the use of abrasive solvents, restorers must exercise the utmost precision when they subject valuable **5** works, and in many cases, very old ones—to such treatments. For example, Judith Watkins Tartt, a restorer who has worked on canvases by painters including Auguste Borget and Rembrandt Peale, must sometimes repair older oil paintings that have become discolored as the varnish used to finish them yellows overtime. To correct this issue, Tartt **6** meticulously removes the layer of varnish with just the right amount of solvent so as not to erase the paint or chemically burn the surface. **7** In preparation for such delicate work, restorers often take chemistry classes and study under master restorers, in addition to completing the usual coursework required for a fine arts degree. **8** Such training helps art restorers identify forgeries, an increasing problem in the world of fine art.

5

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

6

- A) NO CHANGE
- B) had meticulously removed
- C) would have meticulously removed
- D) will have meticulously removed

7

Which choice provides the most effective transition from the previous sentence to the information that follows in this sentence?

- A) NO CHANGE
- B) Even though such work may not erase all signs of damage,
- C) As the market for restored artworks continues to grow,
- D) Since restoring modern artworks also presents certain obstacles,

8

Which choice provides the most effective conclusion to the paragraph?

- A) NO CHANGE
- B) Furthermore, artworks that appear outdoors in public settings pose a unique set of challenges for art restorers.
- C) Such training ensures that would-be restorers understand the processes on which the creation and preservation of artworks depend.
- D) Steve Tatti, who restores sculptures, notes that many of his clients are private collectors looking to raise the market value of artworks in their possession.

Professional restorer Tomoko Murakami restores all manner of paintings, but her expertise is in **9** thangkas; Tibetan Buddhist paintings on cotton or silk appliqués. At her studio near San Francisco, Murakami works on *thangkas* in addition to canvas paintings. She is adept at relatively straightforward tasks such as removing surface dirt, treating discoloration, and correcting the flaking of paint. She also addresses more difficult problems such as creases, warps, and even tears by patching the painting surface, a process that can take days. Murakami has restored paintings from **10** conspicuous museums across the United States, including the Asian Art Museum in San Francisco, the Honolulu Museum of Art, and the Cleveland Museum of Art. She holds several degrees—including a bachelor of fine arts in Japanese painting and a master of fine arts in printmaking—and also apprenticed for nine years under the tutelage of a Japanese master art restorer.

Like Murakami, many restorers **11** have extensive academic and professional credentials; others are employed by museums, libraries, galleries, and antique stores. Though the artistically inclined often consider becoming artists, those dedicated to the continuity of art may enjoy breathing new life into artworks as restorers.

9

- A) NO CHANGE
- B) *thangkas*; these
- C) *thangkas*.
- D) *thangkas*,

10

- A) NO CHANGE
- B) notorious
- C) prominent
- D) noticeable

11

Which choice establishes the most effective contrast with the claim that follows in the sentence?

- A) NO CHANGE
- B) enjoy their work despite its demands;
- C) work with a wide range of artistic media;
- D) operate on a freelance basis out of their own studios;

Questions 12-22 are based on the following passage.

### Everything Old Is New Again

**12** When a historic building has been sitting empty for years, it can seem easier to build a new structure than to rehabilitate the old one. Vacant historic buildings may contain **13** mold; faulty wiring and other costly damage. Nonetheless, communities can benefit from adapting such buildings to suit modern needs. As the rehabilitation of the Vogue Theatre in Manistee, Michigan, **14** argues, renovating historic buildings can be a source of community spirit and economic growth.

The Vogue Theatre was an outstanding feature of downtown Manistee when it was built in 1938. With its art deco features, including the exterior's striking vertical and horizontal lines and vibrant red sign, the theater stood out as a modern landmark against the city's predominantly Victorian architecture. By the time of its closing in 2006, **15** therefore, the theater had fallen into disrepair. Rather than see the building continue to deteriorate, the Downtown Development Authority of Manistee bought the Vogue in 2010.

12

Which choice most effectively sets up the discussion in the paragraph?

- A) NO CHANGE
- B) Renovating a historic building can be an excellent option for developers looking to save money.
- C) Many abandoned office buildings in US cities are once again attracting business tenants.
- D) Real estate developers who remodel older structures should seek to reduce environmental impact by using recycled materials.

13

- A) NO CHANGE
- B) mold, faulty wiring;
- C) mold faulty wiring,
- D) mold, faulty wiring,

14

- A) NO CHANGE
- B) contends,
- C) shows,
- D) portrays,

15

- A) NO CHANGE
- B) however,
- C) besides,
- D) likewise,



[1] the ensuing renovation project demonstrates how recuperating historic structures can engage and enliven a community. [2] A large fund-raising campaign in Manistee and its environs **16** raised money around the city and neighboring areas, which helped meet the costs of fixing the exterior and purchasing new furnishings and equipment for the interior. [3] More than three hundred volunteers assist in running the theater, and a video that plays before each film **17** showcases the community members who contributed to the renovation. [4] Additionally, because the theater's art deco style has been maintained, the building forms a vital link between the community and its past. **18**

16

- A) NO CHANGE
- B) wanted to cover the theater's repair costs by acquiring funds, and that
- C) asked interested parties from those areas to provide monetary support and
- D) DELETE the underlined portion.

17

- A) NO CHANGE
- B) showcase
- C) have showcased
- D) have been showcasing

18

The writer wants to add the following sentence to this paragraph.

The theater has since become a popular gathering place with a strong community feel.

The best placement for the sentence is

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

Having sold more than 60,000 tickets in 2016, the Vogue continues to be profitable and has also brought more tangible benefits to Manistee. The theater has become a unique destination that attracts area residents and tourists alike to historic downtown Manistee. Steven Brower, treasurer of the theater's board of directors, has identified a **19** ripple effect in the city's commercial development. Since the reopening, new restaurants and businesses have appeared **20** downtown many business owners attribute higher sales to the renovation.

**21** The renovation of private homes confronts homeowners with its own set of difficulties. Given the potentially high cost of renovation, community leaders must carefully evaluate to what extent **22** the building anchors the community's identity and heritage? For commercial properties such as the Vogue, they should also consider whether the property will offer a financial return. Not every old structure may merit the expense of rehabilitation, but there is often much to be gained by giving landmark buildings a fresh start.

19

- A) NO CHANGE
- B) rippled effect
- C) ripple affect
- D) rippled affect

20

- A) NO CHANGE
- B) downtown, and
- C) downtown,
- D) downtown, what's more,

21

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

- A) NO CHANGE
- B) Developers may benefit from seeking to have historic buildings declared national landmarks.
- C) Despite the benefits renovated historic buildings bring to communities, urban areas throughout the United States face a number of challenges.
- D) Making a historic building new again does not come without challenges, however.

22

- A) NO CHANGE
- B) does the building anchor the community's identity and heritage.
- C) the building anchors the community's identity and heritage.
- D) does the building anchor the community's identity and heritage?

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

### A Modern View of Ancient Seeds

How do you measure the width of the outer shell of a nearly 4,000-year-old seed without cutting the seed open and destroying it? **23** That—was the question facing archaeologists Charlene Murphy and Dorian Fuller in 2016. They were trying to track changes over time in the width of the seed coat of the horsegram, a species of bean that was grown in early agricultural societies in South Asia. To Murphy and Fuller, horsegram seed coat width was a clue to understanding the development of agriculture in the region.

Archaeologists have long been aware that as societies began to farm, the coats of the farmed **24** plants' seeds' would evolve to become thinner (because seeds with thin coats sprout more quickly, giving them **25** a benefit and advantage over thick-coated seeds in an agricultural environment). **26** They hoped that if they gathered samples of horsegram seeds from different time periods and measured the width of the seed coats, they would not only see the seed coats becoming thinner **27** and identify when the thinning occurred. They could then use this knowledge to help determine the time line of plant domestication. However, they didn't want to destroy any rare seed samples in the process.

23

- A) NO CHANGE
- B) That:
- C) That
- D) That,

24

- A) NO CHANGE
- B) plants seeds
- C) plant's seed's
- D) plants' seeds

25

- A) NO CHANGE
- B) an advantage
- C) an advantageous benefit
- D) a beneficial advantage

26

- A) NO CHANGE
- B) Agricultural societies
- C) Murphy and Fuller
- D) Both of them

27

- A) NO CHANGE
- B) but they identified
- C) but also be able to identify
- D) and they can also identify

[1] The archaeologists **28** will solve the problem by employing a high-tech tool: the synchrotron. [2] A synchrotron uses magnetic fields to accelerate electrons in a loop, generating extraordinarily powerful light that can serve a wide range of research applications.

[3] Murphy and Fuller **29** commandeered twelve samples of horsegram seeds, nine from the period 2000 to 1000 BCE and another three from the period 1 to 500 CE, and brought them to the United Kingdom's Diamond Light Source synchrotron. [4] They then used the light from the synchrotron to create a series of X-rays of the seeds. [5] With these images, the archaeologists could accurately (and harmlessly) determine the thickness of the horsegram seed coats. **30**

28

- A) NO CHANGE
- B) will have solved
- C) solved
- D) solve

29

- A) NO CHANGE
- B) selected
- C) cherry-picked
- D) nabbed

30

The writer wants to add the following sentence to this paragraph.

The X-rays were later combined to produce complete 3-D images of each seed's interior.

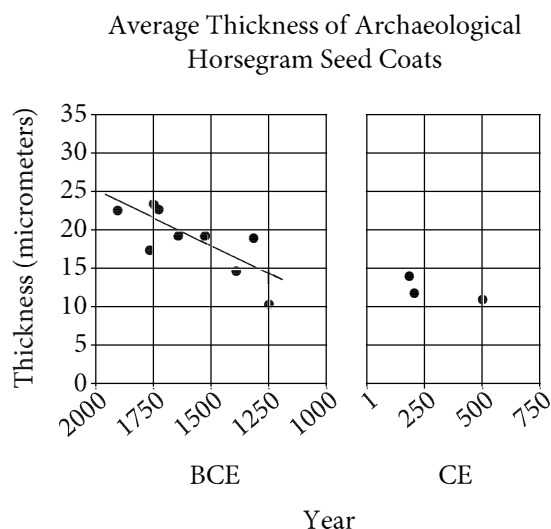
The best placement for this sentence is

- A) after sentence 2.
- B) after sentence 3.
- C) after sentence 4.
- D) after sentence 5.

As expected, Murphy and Fuller observed a gradual process of thinning in the coats. While the coats of seeds from the period before 1500 BCE were relatively thick (17 or more micrometers), they showed a general tendency to become thinner over that period, suggesting that

**31** almost no domestication was under way before 1500 BCE. Moreover, **32** two of the nine samples from the period 1500 to 1000 BCE had coat widths at or below 15 micrometers (similar to the coat widths of domesticated seeds from the period 1 to 500 CE), providing evidence of further agricultural development.

**33** Murphy and Fuller's study of horsegram seeds using the synchrotron illustrates the need for cheaper, more accessible imaging technology in scientific research.



Adapted from Charlene Murphy and Dorian Q. Fuller, "Seed Coat Thinning during Horsegram (*Macrotyloma uniflorum*) Domestication Documented through Synchrotron Tomography of Archaeological Seeds." ©2017 by Charlene Murphy and Dorian Q. Fuller. Source: *Scientific Reports* 7, no. 5369 (July 2017).

31

Which choice represents the most accurate conclusion that can be drawn from the information in the passage and the data in the graph?

- A) NO CHANGE
- B) very little domestication occurred after
- C) no domestication occurred after
- D) some domestication was under way before

32

Which choice provides accurate information from the graph?

- A) NO CHANGE
- B) all nine
- C) two of the three
- D) all three

33

The writer wants a conclusion that summarizes the main discussion of the passage. Which choice most effectively accomplishes this goal?

- A) NO CHANGE
- B) Murphy and Fuller had made an important discovery about the time line of horsegram domestication in South Asia while keeping the ancient seed samples intact.
- C) The findings of Murphy and Fuller's study shed light on the significance of today's horsegram, a common bean in India.
- D) Murphy and Fuller's method of studying the horsegram seeds may serve as a valuable example to archaeologists looking to study other aspects of ancient farming.

Questions 34-44 are based on following passage.

### Reading Distantly

Traditionally, literary and historical analyses of written texts have been done by scholars who closely read each work to assess **34** their content and then consider the work in relation to other works. Most analyses of Shakespeare's plays, for example, in making arguments about how the plays should be interpreted within their literary and historical contexts, refer to specific lines and characters. There is another way to read such texts, **35** though. Quantitatively. By digitizing a text and allowing scholars to see larger patterns in language and subject matter, the process of quantitative analysis can provide remarkable new insights into the study of literature.

34

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

35

- A) NO CHANGE
- B) though: quantitatively.
- C) though, quantitatively.
- D) though; quantitatively.

Many texts already have been or are being digitized for use on the Internet and in databases, and computer programs are being developed to add more specific information within each text. **36** Names of people and places can be tagged as such, as can poem line breaks, chapter breaks, and parts of speech. Texts can then be searched and mapped by key word, syntactic arrangement, or **37** searched and mapped by type of information. A quantitative analysis of *The Federalist Papers* helped scholars **38** who were sorting the texts by conjunction. The scholars determined that James Madison used the word “whilst” and Alexander Hamilton used the word “while”—a distinction that further allowed scholars to assign authorship to unsigned texts by the two men.

36

Which choice best supports the description of the computer programs mentioned in the previous sentence?

- A) NO CHANGE
- B) The National Endowment for the Humanities created the Office of Digital Humanities with the express purpose of funding endeavors such as these.
- C) Literary works have been digitized in online databases for decades now.
- D) In order to code the texts properly, users need to follow specific guidelines.

37

- A) NO CHANGE
- B) by searching and mapping the type
- C) by type
- D) type

38

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

- A) who were sorting the texts by conjunction; they determined
- B) sorting the texts by conjunction determine
- C) sorting the texts determine (when sorting them by conjunction)
- D) who were sorting the texts by conjunction, and the scholars determined

**39** The study of authors’ linguistic habits, or stylometry, does not always lead to indisputable conclusions. This kind of “distant reading,” a phrase coined by scholar Franco Moretti, can allow the mapping of the popularity of a certain term or phrase over time.

**40** Moretti founded the Stanford Literary Lab in 2010. Google’s Ngram Viewer **41** tool, for instance, shows that references in published works to “violin” have remained steady since 1920, while references to “theremin” have increased sharply since the mid-1990s. The main benefit of distant reading is that it does not require a reader to wade through thousands of texts searching for relevant information: it’s all there in a searchable database.

39

Which choice most effectively introduces the paragraph?

- A) NO CHANGE
- B) The work of standardizing texts with tags could create many new jobs in academia.
- C) If enough texts are digitized and augmented with standardized tags, scholars can also potentially uncover trends among works and over long periods.
- D) Digitizing texts allows for a centralized, searchable database of major works available to anyone with a computer and Internet access.

40

The writer is considering deleting the underlined sentence. Should the sentence be kept or deleted?

- A) Kept, because it explains the relevance of Moretti to the discussion.
- B) Kept, because it offers key facts about the development of distant reading.
- C) Deleted, because it distracts from the discussion of distant reading in the paragraph.
- D) Deleted, because it does not provide a thorough explanation of what services the Literary Lab provides to Stanford University students.

41

- A) NO CHANGE
- B) tool, for instance;
- C) tool—for instance,
- D) tool for instance:



Quantitative analysis will likely never be the sole method of scholars looking for meaning in texts. Massive quantities of time and resources are required to digitize and tag material; in addition, many have pointed **42** out, that the simple joys of picking up a physical book and reading are greatly **43** diminished when the words are reduced to mere data points. **44** In other words, there are many aspects of writing that humans are better at picking up on than computers are, such as word connotation and a writer's tone. When combined with traditional analyses, however, quantitative analysis can help open new doors in scholarship.

42

- A) NO CHANGE
- B) out that,
- C) out: that
- D) out that

43

- A) NO CHANGE
- B) disparaged
- C) mollified
- D) downsized

44

- A) NO CHANGE
- B) However,
- C) Therefore,
- D) Furthermore,

**STOP**

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



# Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

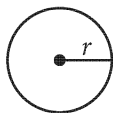
## DIRECTIONS

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

## NOTES

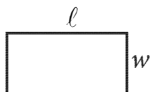
1. The use of a calculator is **not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

## REFERENCE

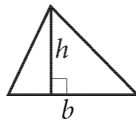


$$A = \pi r^2$$

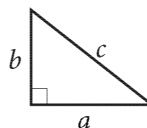
$$C = 2\pi r$$



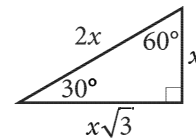
$$A = \ell w$$



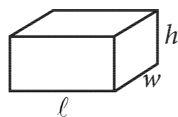
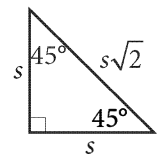
$$A = \frac{1}{2}bh$$



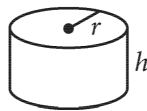
$$c^2 = a^2 + b^2$$



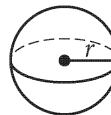
Special Right Triangles



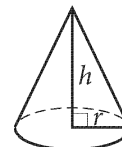
$$V = \ell wh$$



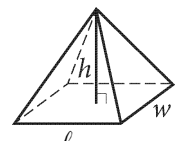
$$V = \pi r^2 h$$



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



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



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

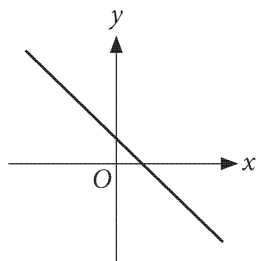
The number of degrees of arc in a circle is 360.

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

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



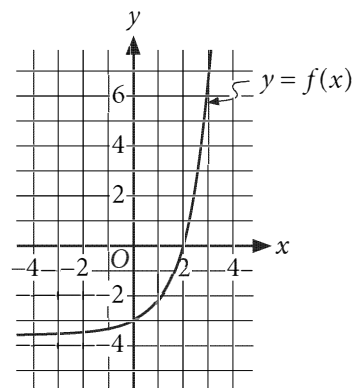
1



The line shown is the graph of an equation in the form  $y = mx + b$ , where  $m$  and  $b$  are constants. Which of the following statements about  $m$  and  $b$  is true?

- A) The values of  $m$  and  $b$  are both positive.
- B) The values of  $m$  and  $b$  are both negative.
- C) The values of  $m$  is negative and the value of  $b$  is positive.
- D) The values of  $m$  is positive and the value of  $b$  is negative.

2



The graph of  $y = f(x)$  is shown. What is the value of  $f(0)$  ?

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

3

One type of black sand is made up of the minerals magnetite and hematite. Magnetite is 72.4% iron and hematite is 69.9% iron, by mass. A sample of this black sand contains a total of 1,000 grams of iron. Which of the following equations represents the composition of iron in the sample, where  $x$  is the mass, in grams, of magnetite and  $y$  is the mass, in grams, of hematite?

- A)  $0.276x + 0.301y = 1,000$
- B)  $0.301x + 0.276y = 1,000$
- C)  $0.699x + 0.724y = 1,000$
- D)  $0.724x + 0.699y = 1,000$



4

The linear function  $g$  is defined by  $g(x) = \frac{1}{2}x + b$ , where  $b$  is a constant. If  $g(0) = 8$ , which of the following defines  $g$ ?

- A)  $g(x) = \frac{1}{2}x - 4$
- B)  $g(x) = \frac{1}{2}x + 4$
- C)  $g(x) = \frac{1}{2}x - 8$
- D)  $g(x) = \frac{1}{2}x + 8$

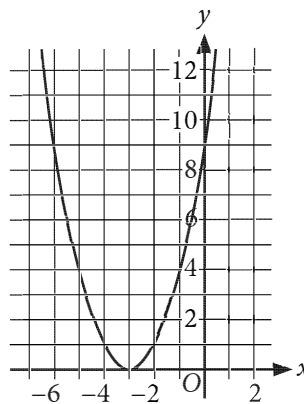
5

$x$	$f(x)$
0	5
1	15
2	45
3	135

For an exponential function  $f$ , the table shows several values of  $x$  and their corresponding values of  $f(x)$ . Which of the following could define  $f$ ?

- A)  $f(x) = 15^x$
- B)  $f(x) = 5(3^x)$
- C)  $f(x) = 5^{3x}$
- D)  $f(x) = 3^{5x}$

6



The graph of  $y = (x + k)^2$ , where  $k$  is a constant, is shown. What is the value of  $k$ ?

- A)  $-3$
- B)  $0$
- C)  $3$
- D)  $9$



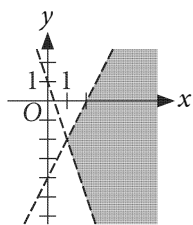
7

$$y < 2x - 4$$

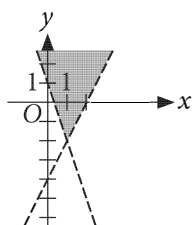
$$y > -3x + 1$$

Which of the following shaded regions represents all the solutions of the given system of inequalities?

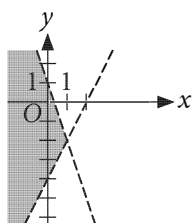
A)



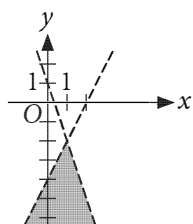
B)



C)



D)



8

Which linear equation has exactly one solution?

- A)  $4x + 8 = 2x$
- B)  $4x + 8 = 4x$
- C)  $4x + 8 = 2(2x + 4)$
- D)  $4x + 8 = 2(2x + 5)$

9

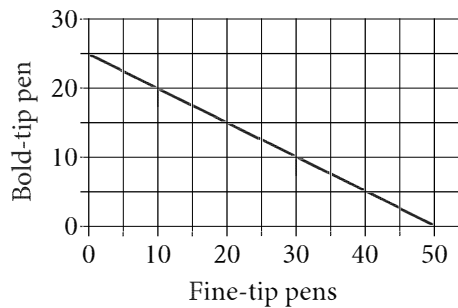
In triangle  $ABC$ , the measure of angle  $A$  is  $45^\circ$ . Which of the following additional pieces of information is(are) sufficient to prove that the measure of angle  $C$  is also  $45^\circ$ ?

- I. Angle  $B$  is a right angle.
- II. Sides  $AB$  and  $BC$  have the same length.

- A) I is sufficient, but II is not.
- B) II is sufficient, but I is not.
- C) I is sufficient, and II is sufficient.
- D) Neither I nor II is sufficient.



10



An office is buying fine-tip pens for \$1.00 each and bold-tip pens for \$2.00 each, including sales tax. The graph models the possible combinations of pens the office can buy. What is the total amount of money the office is spending on pens?

- A) \$100.00
- B) \$50.00
- C) \$25.00
- D) \$12.50

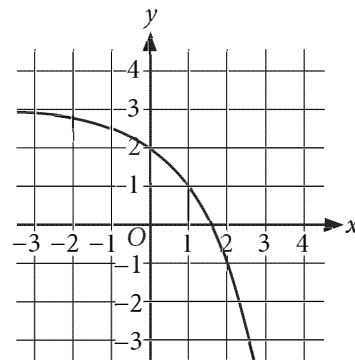
11

$$2x^2 - 5x + c = 0$$

In the equation above,  $c$  is a constant. If the equation has no real solutions, which of the following could be the value of  $c$ ?

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

12



What is an equation of the graph shown?

- A)  $y = -3^x + 3$
- B)  $y = -(0.5)^{-x} + 3$
- C)  $y = (0.5)^{-x} + 2$
- D)  $y = 2^x + 1$



13

Light intensity below the surface of a lake,  $P(x)$ , expressed as a percentage of the intensity at the surface, can be modeled with an exponential function, where  $x$  is the depth, in meters, below the surface. For every 5 meters the depth increases, the light intensity decreases by 60%. Which function best models this situation?

- A)  $P(x) = 100(0.4)^{\frac{x}{5}}$
- B)  $P(x) = 100(0.6)^{\frac{x}{5}}$
- C)  $P(x) = 100(1.4)^{\frac{x}{5}}$
- D)  $P(x) = 100(1.6)^{\frac{x}{5}}$

14

Circle A:  $x^2 + (y - 3)^2 = 4$

Circle B:  $x^2 + (y - 6)^2 = 4$

If the given equations are graphed in the  $xy$ -plane, what statement is true?

- A) The center of circle B is 3 units to the right of the center of circle A.
- B) The center of circle B is 3 units to the left of the center of circle A.
- C) The center of circle B is 3 units up from the center of circle A.
- D) The center of circle B is 6 units up from the center of circle A.

15

Which expression is equivalent to  $\sqrt[5]{x^3} \cdot \sqrt[5]{x}$ , where  $x > 0$ ?

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


**DIRECTIONS**

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

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

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

3	1	/	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

 is entered into the

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

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

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

Write answer in boxes. →

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

Grid in result. ←

Fraction line ←

Answer: 2.5

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

Decimal point ←

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

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

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

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

Answer: 201 – either position is correct

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

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

**NOTE:**

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





16

What is the solution to the equation  
 $2x + |x - 6| = 30$  ?

17

$$\begin{aligned} 2x + y &= 19 \\ 2x + 2y &= 26 \end{aligned}$$

In the given system of equations, what is the value  
of  $8x + 6y$  ?

18

$$20x = 200$$

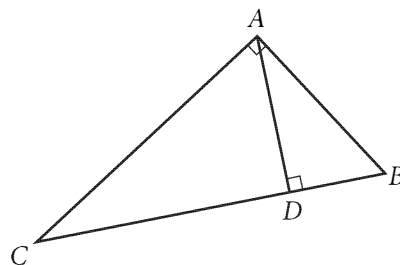
What is the solution to the given equation?

19

$$(x^3 + 2a) + (x^3 + 2b) = cx^3 + 12$$

In the equation above,  $a$ ,  $b$ , and  $c$  are constants. If  
the equation is true for all values of  $x$ , what is the  
value of  $a + b + c$  ?

20



In the figure,  $\overline{AD}$  and  $\overline{CB}$  intersect at point  $D$ ,  
 $AD = 8$ , and  $BD = 6$ . What is the value of  $\tan C$  ?

# STOP

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



# Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

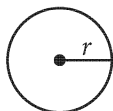
## DIRECTIONS

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

## NOTES

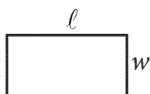
1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function  $f$  is the set of all real numbers  $x$  for which  $f(x)$  is a real number.

## REFERENCE

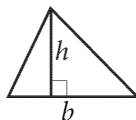


$$A = \pi r^2$$

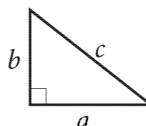
$$C = 2\pi r$$



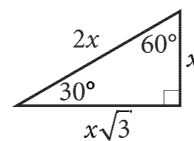
$$A = \ell w$$



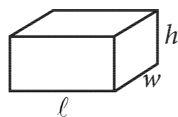
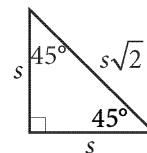
$$A = \frac{1}{2}bh$$



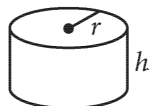
$$c^2 = a^2 + b^2$$



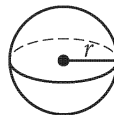
Special Right Triangles



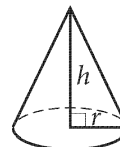
$$V = \ell wh$$



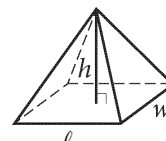
$$V = \pi r^2 h$$



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



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



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

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

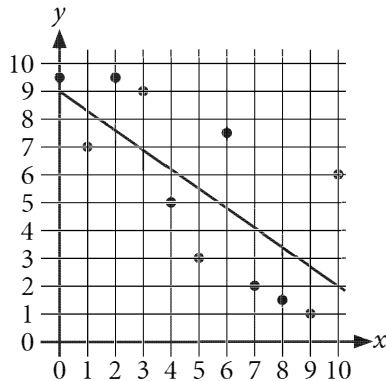
The number of radians of arc in a circle is  $2\pi$ .

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



1

The scatterplot shows the relationship between two variables,  $x$  and  $y$ . A line of best fit for the data is also shown.



Which data point  $(x, y)$  has the greatest distance between the  $y$ -value of the data point and the  $y$ -value predicted by the line of best fit?

- A)  $(2, 9.5)$
- B)  $(3, 9)$
- C)  $(6, 7.5)$
- D)  $(10, 6)$

2

What is the percent decrease from 100 to 90?

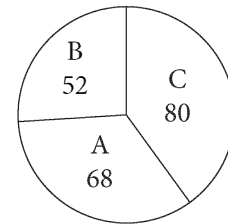
- A) 10%
- B) 20%
- C) 90%
- D) 100%

3

The equation  $y = 150x + 8,300$  models the 8-year projected growth of a school district, where  $x$  is the time, in years, after the 2016 school year and  $y$  is the total number of students in the district. Based on this model, how many students will be in the district 1 year after the 2016 school year?

- A) 8,150
- B) 8,300
- C) 8,450
- D) 9,800

4

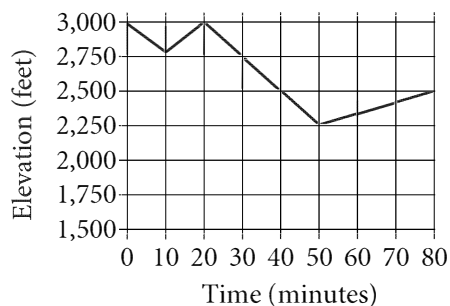


The circle graph shows the number of people who belong to group A, B, or C, where each person belongs to only one group. How many more people belong to group C than group B?

- A) 12
- B) 16
- C) 22
- D) 28



5



The graph shows the relationship between a hiker's elevation, in feet, at various points along a trail and the time, in minutes, since the hiker began the trail. What was the total time, in minutes, that the hiker's elevation was decreasing?

- A) 10
- B) 20
- C) 30
- D) 40

6

Demarius is enrolled in 17 credit hours in college this semester. The equation  $3x + 4y = 17$  represents this situation, where  $x$  is the number of three-credit-hour classes he is enrolled in and  $y$  is the number of four-credit-hour classes he is enrolled in. Demarius is enrolled in 3 three-credit-hour classes this semester. In how many four-credit-hour classes is he enrolled?

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

7

In 2016, Cambodia had a population of approximately 16,000,000 people and a population density of approximately 88 people per square kilometer. Which value is closest to the area, in square kilometers, of Cambodia?

- A) 88,000
- B) 160,000
- C) 182,000
- D) 14,080,000

8

	Area (square centimeters)
Triangle $PQR$	10
Triangle $STU$	40

The table gives the areas, in square centimeters, of triangle  $PQR$  and triangle  $STU$ . Triangle  $PQR$  is similar to triangle  $STU$ , where  $P$ ,  $Q$ , and  $R$  correspond to  $S$ ,  $T$ , and  $U$ , respectively. The length of  $\overline{QR}$  is 8 centimeters. What is the length, in centimeters, of  $\overline{TU}$ ?

- A) 2
- B) 4
- C) 8
- D) 16



9

The weight of a certain object on Earth is 450 newtons. The weight of the object on Mars is 37.7% of its weight on Earth. Which of the following is closest to the object's weight, in newtons, on Mars?

- A) 170
- B) 412
- C) 488
- D) 620

10

The resale value of a boat can be modeled by a decreasing exponential function of time. Which of the following scenarios could describe how the value of the boat changes over time?

- A) Each month, the value decreases by \$700.
- B) Each year, the value decreases by \$700.
- C) Each year, the value decreases by 7% of the prior year's value.
- D) Each year, the value decreases by 7% of the original value.

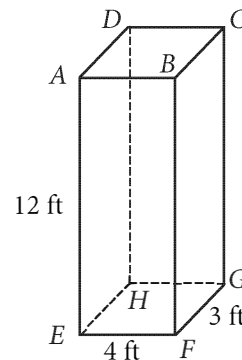
11

$$f(x) = x(x + 13)(x - 14)$$

In the  $xy$ -plane, at how many points does the graph of the given function  $f$  intersect the  $x$ -axis?

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

12



In the right rectangular prism shown, what is the length, in feet (ft), of diagonal  $AG$  (not shown) ?

- A) 5
- B)  $4\sqrt{10}$
- C) 13
- D) 19



13

Quail	Number of eggs per nest
A	2
B	7
C	9
D	11
E	13
F	14

The table shows the number of eggs laid per nest for 6 quails. The mean of the data shown in the table is  $x$ . If the data for Quail A is removed, the resulting mean is  $y$ . How does  $x$  compare to  $y$ ?

- A)  $x = y$
- B)  $x < y$
- C)  $x > y$
- D) There is not enough information to compare  $x$  and  $y$ .

14

$$2x - 3y = 7$$

$$-x + y = -3$$

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

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

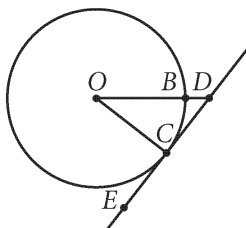
15

The length of a rectangle is  $x$  inches, and the width of the rectangle is 8 inches less than the length. The area of the rectangle is 48 square inches. What is the value of  $x$ ?

- A) 6
- B) 8
- C) 12
- D) 16



16



Point  $O$  is the center of the circle shown. Line segment  $ED$  is tangent to the circle at point  $C$ , and the measure of minor arc  $\widehat{BC}$  is  $40^\circ$ . What is the measure of angle  $CDO$ ?

- A)  $20^\circ$
- B)  $40^\circ$
- C)  $50^\circ$
- D)  $90^\circ$

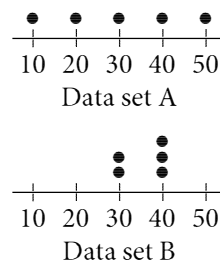
17

$$d(t) = 10(2)^{\frac{t}{20}}$$

The given function models the number of DNA fragments produced in a solution, where  $t$  represents the time, in minutes, and  $t \leq 800$ . Which of the following is the best interpretation of the number 10 in this context?

- A) There are 10 DNA fragments in the solution at  $t = 0$ .
- B) There are exactly 2 DNA fragments in the solution at  $t = 10$ .
- C) The number of DNA fragments in the solution increases by 10 every 2 minutes.
- D) There are 0 DNA fragments in the solution at  $t = 10$ .

18



Which of the given data sets has a greater standard deviation?

- A) Data set A
- B) Data set B
- C) The standard deviations of data set A and data set B are equal.
- D) There is not enough information to determine which data set has a greater standard deviation.





**Questions 19 and 20 refer to the following information.**

A small dance studio sells recital DVDs for \$15. The only cost to the studio for making the DVDs is the cost of blank DVDs. The studio purchases blank DVDs in quantities of 50 for \$43.

The studio also sells individual recital pictures for \$10 each and 3-picture packages for \$25 each.

19

The studio's profit from the sale of recital DVDs is the amount received from the sale of the DVDs minus the cost of the blank DVDs. If the studio makes and sells 250 DVDs, what is the profit from the DVD sales?

- A) \$3,535
- B) \$3,592
- C) \$3,621
- D) \$3,707

20

Marcia has \$200 to spend on one recital DVD for herself and some recital pictures for family members. Which of the following represents the constraint on the number of individual pictures,  $n$ , and the number of 3-picture packages,  $p$ , that Marcia can buy?

- A)  $185 \leq 25p - 10n$
- B)  $185 \leq 25p + 10n$
- C)  $185 \geq 25p - 10n$
- D)  $185 \geq 25p + 10n$

21

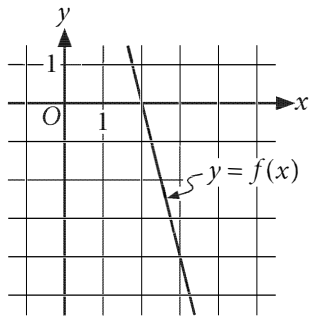
	One-digit	Two-digit	Total
Odd	3	13	16
Even	4	17	21
Total	7	30	37

A set of 37 positive integers is classified by the number of digits each integer has and whether the integer is odd or even. The table shows the counts for each category. One of the integers will be selected at random. What is the probability that the selected integer will be even, given that a two-digit integer is selected?

- A)  $\frac{17}{21}$
- B)  $\frac{21}{37}$
- C)  $\frac{17}{30}$
- D)  $\frac{17}{37}$



22



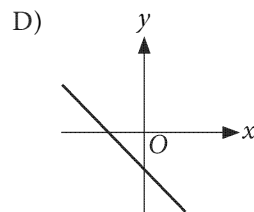
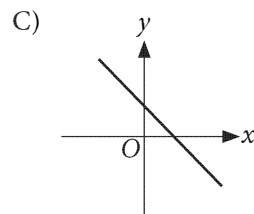
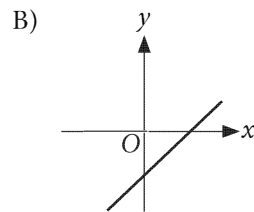
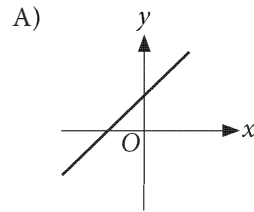
The graph of the linear function  $f$  is shown. Which of the following defines  $f$ ?

- A)  $f(x) = -4x + 2$
- B)  $f(x) = -4x + 8$
- C)  $f(x) = -\frac{1}{4}x + 2$
- D)  $f(x) = -\frac{1}{4}x + 8$

23

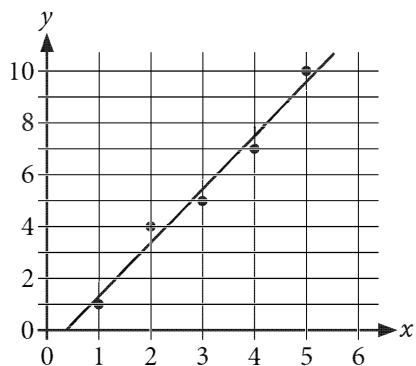
$$ax + by = 2$$

In the given equation,  $a$  and  $b$  are constants and  $a < 0 < b$ . Which of the following could represent the graph of the equation in the  $xy$ -plane?





24



Which of the following is an equation of the line of best fit shown?

- A)  $y = -2.1 + 0.9x$
- B)  $y = -0.9 + 2.1x$
- C)  $y = 0.9 - 2.1x$
- D)  $y = 2.1 - 0.9x$

25

Number of payments	Balance
3	\$1,050
7	\$450

Cara purchased furniture for \$1,500 at a store. The store offered her an interest-free payment plan that required her to pay the same amount to the store each month. The table shows the number of payments Cara made and the balance after those payments were made. Which of the following represents the balance  $b$ , in dollars, after a total of  $x$  payments were made?

- A)  $b = 150x - 1,500$
- B)  $b = 600x - 1,500$
- C)  $b = -150x + 1,500$
- D)  $b = -600x + 1,500$



26

The two quantities  $y$  and  $x$  are related such that  $y = 5$  when  $x = 1$ . When the value of  $x$  increases by 1, the value of  $y$  is multiplied by 3. Which of the following represents this relationship?

- A)  $y = 5x^3$
- B)  $y = 5(x-1)^3$
- C)  $y = 5(3)^x$
- D)  $y = 5(3)^{x-1}$

27

Which expression is equivalent to  $\sqrt[3]{100} \times \sqrt{10}$ ?

- A)  $\sqrt[6]{10}$
- B)  $\sqrt[6]{100}$
- C)  $\sqrt[6]{100,000}$
- D)  $\sqrt[6]{10,000,000}$

28

A cheetah runs at an average speed of 90 kilometers per hour. What is this speed in meters per second? (1 kilometer = 1,000 meters)

- A) 25
- B) 324
- C) 1,500
- D) 90,000

29

$$f(x) = 41x + 7,965$$

The function  $f$  gives the projected world population, in millions,  $x$  years after 2017. Which of the following gives the projected increase in the world population, in millions, each year after 2017?

- A)  $x$
- B)  $f(x)$
- C) 7,965
- D) 41

30

A bakery sold  $n$  muffins on Monday. The bakery sold 14% more muffins on Tuesday than on Monday. How many muffins were sold on Tuesday, in terms of  $n$ ?

- A)  $0.14n$
- B)  $1.14n$
- C)  $14n$
- D)  $114n$


**DIRECTIONS**

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

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

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

3	1	/	2

 is entered into the

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

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

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

Write answer in boxes. →

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

Grid in result. ←

← Fraction line

Answer: 2.5

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

← Decimal point

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

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

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

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

Answer: 201 – either position is correct

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

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

**NOTE:**

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



31

If  $8(x-1)^2 = 80(x-1)$ , what is a possible value of  $x-1$ ?

32

The ratio of 5 to  $h$  is equivalent to the ratio of 55 to  $bh$ , where  $b$  is a constant. What is the value of  $b$ ?

33

If  $7(x-2) + 5 = 26$ , what is the value of  $x+1$ ?

34

At a certain temperature, the specific heat of steam is 2.01 joules per gram degree Celsius. At this temperature, what is the specific heat of steam, to the nearest hundredth of a calorie per gram degree Celsius? (Use 1 joule = 0.239 calorie.)



Questions 35 and 36 refer to the following information.

7.97, 8.11, 8.07, 8.02, 8.08, 8.15, 8.14

In May 2017, seven water samples were collected from the Gulf of Maine. The list gives the pH value for each of the seven samples.

35

If one of the samples is selected at random, what is the probability of selecting a sample that has a pH value greater than 7? (Express your answer as a decimal or fraction, not as a percent.)

36

What is the median of the seven pH values?

37

$$x^2 - 5x + 3 = 0$$

The solutions to the equation above can be written in the form  $\frac{5 \pm \sqrt{k}}{2}$ , where  $k$  is a constant. What is the value of  $k$ ?

38

$$Ax - y = 3$$

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

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

**STOP**

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





# October 3, 2020 International

## Answer Key

### Reading Test Answers

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

READING TEST  
RAW SCORE  
(NUMBER OF  
CORRECT ANSWERS)

### Writing and Language Test Answers

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

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

### Math Test – No Calculator Answers

1 C	11 D
2 A	12 B
3 D	13 A
4 D	14 C
5 B	15 A
6 C	16 12
7 A	17 90
8 A	18 10
9 C	19 8
10 B	20 $3/4$ , .75

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

### Math Test – Calculator Answers

1 D	11 C	21 C	31 10, 0
2 A	12 C	22 B	32 11
3 C	13 B	23 A	33 6
4 D	14 B	24 B	34 .48
5 D	15 C	25 C	35 1, $7/7$
6 B	16 C	26 D	36 8.08
7 C	17 A	27 D	37 13
8 D	18 A	28 A	38 $1/2$ , .5
9 A	19 A	29 D	
10 C	20 D	30 B	

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