

DECEMBER 5, 2020
US

The SAT®

Test Book

IMPORTANT REMINDERS

1

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

2

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Test begins on the next page.

Reading Test

65 MINUTES, 52 QUESTIONS

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

DIRECTIONS

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

Questions 1-10 are based on the following passage.

This passage is adapted from Donia Bijan, *The Last Days of Café Leila*. ©2017 by Donia Bijan. Zod and his wife, Pari, help his parents, Nina and Yanik, manage the family restaurant in Tehran, Iran.

The weekly trips to the market energized Zod and he pulled the loaded trolleys into the courtyard, handing out parcels like trophies to the waiters who came to help him unload. “The first figs!” he hollered, as if the arrival of every fruit, every leafy green, every root, was something to celebrate. There were seasons for produce then and you couldn’t find tomatoes in December.

His mother was tired, and he took advantage of her fatigue and occasional absentmindedness to rework a recipe when she retreated upstairs to her sewing. In the afternoons, after sweeping the floor, in the hour before Pari came home from the conservatory, he would make an elaborate minaret of cold sandwiches, or rhubarb preserves spooned over yogurt, or a persimmon pudding layered with coarsely ground almond brittle.

With his eyes trained on the front gate, waiting for Pari to walk through with music books clutched to her chest, he set a garden table with a white cloth, silver, and china. She became his lab mouse, sniffing happily at the poached pears with peppercorns and cardamom before running through a labyrinth of delicately assembled snacks, while Zod ran like a colt from kitchen to table, fetching more and more

accoutrements for his dishes. This favorite time of day, between lunch and dinner, when time stood still for them could have been a period of courtship, the wooing of the belly below the heart, except they were already married.

Pari always volunteered to wash up but Zod wouldn’t hear of it, shooing her to Nina’s room, listening to their soft voices rising and falling through the open bedroom window. Alone, he circled the table to see what she had scraped clean and what was discarded, trusting her palate above all others. Just crumbs, stems from the halved pears, a radish, or half a spinach pie remained.

But how to translate this love over and over again, to make each dish appear fresh, like a first crush? True, he looked forward to serving this food to customers who had been raised at Yanik and Nina’s table, introducing them to these flavors slowly, like the rock ’n’ roll records he played for Pari. But he had to temper his desire to show off. He remained mindful of Nina’s resourcefulness, her no-nonsense soups and batters that were the spine of his repertoire. Without them he would have remained a clumsy amateur powered by ego. Zod’s mother said there was hope for him because he knew his limitations. He knew to follow her rules before breaking them, to remember what she had already discovered because, unlike her, he wasn’t born with inherent knowledge.

But Zod could still delight in foraging for the herbs and flowers and roots to flavor his soups and vinegars, to tuck bouquets of seasonings inside the cavities of whole whitefish and pigeons, and to save

tree trimmings and apple blossoms for roasting lamb,
60 even making piroshki dough from a sourdough
starter that he would combine with well water. All
these began as experiments, but he did not stray from
the basic rules.

By five o'clock most afternoons Yanik, waking
65 from his nap and looking for a cup of tea, would find
Zod alone at the kitchen sink washing dishes.

He stood at the entryway watching him, wondering
how this had happened. How did Zod close the gap
between what he wanted and what he had? He had

70 not simply acquiesced to a plan his parents had
proposed, but seemed to slip into it like a good shoe,
comfortably. Yanik allowed himself to conjure

grandchildren—four or five tiny versions of Zod and
Pari running through the yard, climbing trees,
75 scraping knees, and Nina doting on them—then

waved a hand to dispel the image. The ingredients
were there for a good life if Zod and Pari wanted to
live it, as long as Yanik didn't tempt fate, as if his
thoughts alone could bring down the house.

80 Zod carried a tray outside and they drank tea
through a sugar cube held delicately between their
two front teeth. Yanik often repeated what had
already been said in so many ways: "It takes courage,
son, to make this your life."

85 "Yes, I know, Baba jan," Zod would reply. "There
is nowhere else I would rather be." And after that the
only sound was the clatter of dice against the
backgammon board, until the sun dropped lower
down the sky, urging them back to work.

1

According to the passage, how does Zod behave after
his trip to the market?

- A) He shares with his family his surprise at finding unfamiliar new foods available in town.
- B) He discusses with the waiters how he plans to cook each fruit and vegetable that afternoon.
- C) He complains about having to bring all his purchases home by himself.
- D) He expresses his enthusiasm for the seasonal fruits and vegetables.

2

As used in line 18, "trained on" most nearly means

- A) aimed at.
- B) prepared for.
- C) familiar with.
- D) instructed by.

3

In context, the phrase "handing out parcels like
trophies" (line 3) serves mainly to

- A) suggest the reverence with which Zod treats food.
- B) emphasize how expensive certain types of produce are.
- C) convey how gently the waiters must handle the food.
- D) demonstrate the level of trust Zod has in the waiters.

4

The passage indicates that when cooking at the
restaurant Zod is careful to

- A) incorporate his innovative dishes into meals at the restaurant gradually.
- B) serve only those dishes that his mother has approved in advance.
- C) devote extra effort to preparing the dishes he knows are most popular.
- D) avoid creating dishes that his customers will be reluctant to try.

5

Based on the passage, Nina is most different from Zed in that she

- A) possesses a confidence that comes from her experience.
- B) had a more natural understanding of how to work with food when she began cooking.
- C) is wary of exploring her innate flair for creativity.
- D) has more easily formed meaningful relationships with customers at the restaurant.

6

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

- A) Lines 39-40 (“But . . . crush”)
- B) Lines 45-48 (“He remained . . . repertoire”)
- C) Lines 48-51 (“Without . . . limitations”)
- D) Lines 51-54 (“He knew . . . knowledge”)

7

In context, a main purpose of the sixth paragraph (lines 55-63) is to

- A) highlight how Zed struggles to reconcile his desire to pursue his own interests with his obligation to honor family traditions.
- B) introduce the idea that Zed becomes joyful when he succeeds in obtaining fresh produce to use in meals.
- C) offer vivid details to illustrate how Zed expands on the fundamental things he has learned in his cooking.
- D) clarify that Zed develops a scientific understanding of the ingredients he uses before he adds them to recipes.

8

Based on the passage, Yanik’s attitude when he considers Zed is best described as

- A) admiring, because Yanik recognizes that Zed has found contentment in his current circumstances.
- B) grateful, because Yanik understands that Zed wants to start his own business elsewhere but stays to help his family.
- C) regretful, because Yanik hoped Zed would follow a different career path than Yanik had.
- D) anxious, because Yanik does not believe that Zed will succeed in his new role.

9

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

- A) Lines 67-68 (“He stood . . . happened”)
- B) Lines 68-72 (“How . . . comfortably”)
- C) Lines 72-76 (“Yanik . . . image”)
- D) Lines 76-79 (“The ingredients . . . house”)

10

In the last paragraph, Zed’s comments serve mainly to

- A) reveal that Zed feels frustrated by the mundane activities that fill his days.
- B) reaffirm that Zed is choosing to commit to his place in the family and in the restaurant.
- C) demonstrate that Zed is proud to have a prominent role within his family.
- D) convey that Zed feels resigned to his life at home and in the restaurant.

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

This passage is adapted from Alexandra Michel, “The Science of Humor Is No Laughing Matter.” ©2017 by Association for Psychological Science.

Having trouble finishing a project on deadline? Well, put down that Red Bull and head over to YouTube. No joke—watching funny cat videos at work may not be such a bad thing after all. A study conducted by Australian National University management professors David Cheng and Lu Wang suggests that exposure to humorous stimuli may actually help people persevere in completing tedious tasks.

Cheng and Wang found that people who watched a funny video clip before a task spent approximately twice as long on a tiresome task compared with people who watched neutral or positive (but not funny) videos.

Prior research has found that humor can help facilitate recovery from stressful situations, even prolonging people’s tolerance for physical pain. In the business world, many successful organizations such as Zappos, Virgin, and Google deliberately build play areas into their workspaces and organize fun events to ameliorate the stressful nature of work, boost morale, and increase productivity.

Indeed, in a 2007 article published in *Current Directions in Psychological Science*, Roy F. Baumeister (Florida State University), Kathleen D. Vohs (University of Minnesota), and Dianne M. Tice (Florida State University) point to humor as a factor that can moderate or counteract the effects of mental depletion.

In line with this idea, Cheng and Wang hypothesized that humor may provide a respite from tedious situations in the workplace. This “mental break” might not only prevent work-related depletion, but also might facilitate the replenishment of mental resources, ultimately allowing people to persist longer on difficult tasks.

To test this theory, the researchers recruited 74 students studying in a business class to come into the lab, ostensibly for an experiment on perception.

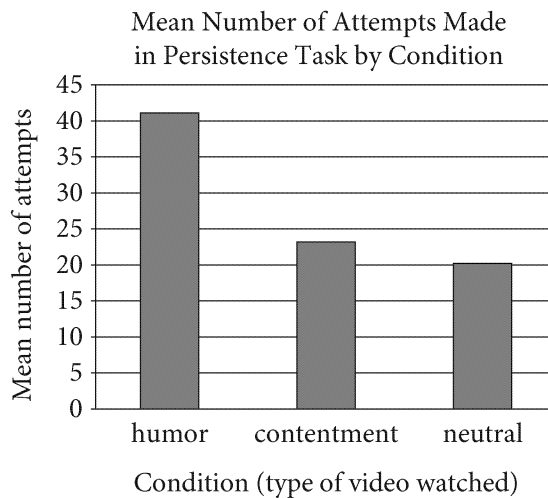
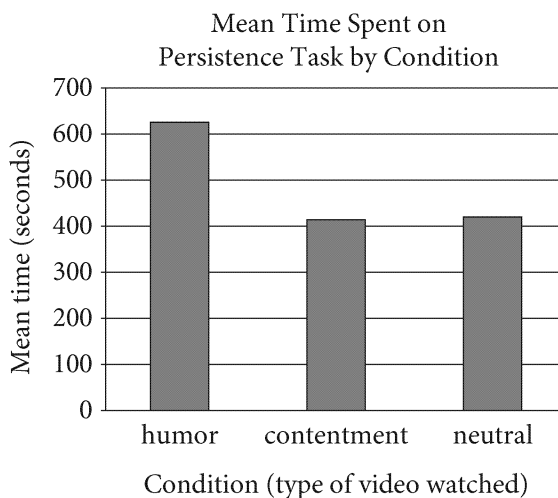
First, the students performed a mentally depleting task in which they had to cross out every instance of the letter “e” contained in two pages of text. The students then were randomly assigned to watch a video clip eliciting either humor, contentment, or neutral emotions.

For the humorous video, students watched a clip of the BBC comedy “Mr. Bean.” In the contentment condition, participants watched a scene with dolphins swimming in the ocean. The students in the neutral condition were treated to an 8-minute video about the management profession designed for students studying business. Immediately after watching the videos, participants reported their responses to a list of 16 discrete emotions (e.g., amusement, anger, disgust) using a 7-point scale.

Then the students completed a persistence task in which they played what amounted to an unwinnable game. The students were asked to guess the potential performance of employees based on provided profiles and were told that making 10 correct assessments in a row would lead to a win. However, the computer software was programmed such that it was nearly impossible to achieve 10 consecutive correct answers. Participants were allowed to quit the task at any time.

Students who watched the humorous “Mr. Bean” video clip ended up spending significantly more time working on the task, making twice as many predictions as the other two groups.

“Although humor has been found to help relieve stress and facilitate social relationships, the traditional view of task performance implies that individuals must concentrate all their effort on their endeavors and should avoid things such as humor that may distract them from the accomplishment of task goals,” Cheng and Wang conclude. “We suggest that humor is not only enjoyable but more importantly, energizing.”

Figure 1**Figure 2**

Source: Data from David Cheng and Lu Wang, "Examining the Energizing Effects of Humor: The Influence of Humor on Persistence Behavior." ©2014 by Springer Science+Business Media New York.

11

In the context of the passage, the sentence in lines 17-22 ("In the . . . productivity") mainly serves to

- A) demonstrate that employees at many successful corporations experience high levels of stress.
- B) provide examples of corporations that subscribe to a theory that certain emotions foster effective work.
- C) present a list of corporations that have allowed employees unusually high levels of freedom and flexibility.
- D) offer suggestions to corporations wishing to increase the overall productivity of their employees.

12

As used in line 21, "nature" most nearly means

- A) view.
- B) structure.
- C) character.
- D) description.

13

The main purpose of the passage is to

- A) discuss a research study whose results have potentially practical applications.
- B) promote a research project whose findings support a common assumption.
- C) present the benefits of a strategy for improving relationships within the workplace.
- D) describe the outcome of a debate about the merits of a business policy.

14

Which choice best supports the idea that Cheng and Wang’s study assumes that an activity does not have to be intellectually challenging to cause psychological fatigue?

- A) Lines 23-29 (“Indeed . . . depletion”)
- B) Lines 32-36 (“This . . . tasks”)
- C) Lines 37-39 (“To test . . . perception”)
- D) Lines 40-42 (“First . . . text”)

15

It can most reasonably be inferred that Cheng and Wang assumed that the participants in their study would

- A) have recently been exposed to games as a way to learn about challenging subjects.
- B) be unfamiliar with both online videos and current trends in humor.
- C) be able to master the game in the persistence task.
- D) find the type of comedy offered in “Mr. Bean” amusing.

16

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

- A) Lines 46-47 (“For the . . . Bean”)
- B) Lines 47-49 (“In the . . . ocean”)
- C) Lines 49-52 (“The students . . . business”)
- D) Lines 56-58 (“Then . . . game”)

17

As used in line 51, “designed” most nearly means

- A) illustrated.
- B) devised.
- C) decorated.
- D) performed.

18

According to figure 1, what was the approximate mean number of attempts made by participants in the neutral condition?

- A) 10
- B) 20
- C) 22.5
- D) 41

19

Taken together, figures 1 and 2 imply which statement about the study participants under the three different conditions?

- A) Participants under the contentment condition spent less time overall on the persistence task but the same amount of time per attempt than did participants under the other two conditions.
- B) Participants under the contentment condition came closer to making 10 correct predictions than did participants under the other two conditions.
- C) Participants under the humor condition spent more time on the persistence task and made more attempts than did participants under the other two conditions.
- D) Participants under the humor condition made approximately twice as many correct predictions than did participants under the other two conditions.

20

Which idea from the passage do the figures most directly support?

- A) Humor can help relieve people of stress and physical pain.
- B) Humor is associated with facilitating positive social relationships in the workplace.
- C) Single-minded attention to a task is not conducive to that task’s eventual completion.
- D) People are more likely to enjoy work when their employers regularly schedule fun events for staff.

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

This passage is adapted from Stanley Coren, “Train Too Much and a Dog Won’t Remember.” ©2017 by SC Psychological Enterprises Ltd.

Line Anna Kis at the Hungarian Academy of Sciences
in Budapest set out to explore how what happens
after a training session affects how well a dog
remembers what he has learned. Kis’s research team
5 began with the notion that, since it is during sleep
that memories are consolidated, perhaps the best
strategy would be to have a dog take a nap after a
training session. So they first had to establish that the
process of being trained actually affects what
10 happens during a dog’s sleep.

One group of dogs was given a very simple
learning task, namely to respond to a new command
label on a task which they had already mastered. The
researchers began with a group of pet dogs who had
15 already learned the basic tasks of sitting or lying
down when given a command in Hungarian. For the
purposes of this study they were next trained to
respond with these same actions when given the
command in English. The dogs were allowed to take
20 a nap for three hours, while their brain waves were
recorded. The electrical patterns in their brains were
compared to another group of dogs who simply
practiced the commands that they had already
learned in Hungarian (no new learning). What the
25 researchers found was that there were significant
differences between the electrical patterns in the
sleeping brains of the dogs who had learned
something new when compared to those who were
simply practicing already learned actions.
30 The researchers felt that what was causing the
difference in these brain activity patterns was that the
dogs who had been trained recently were
consolidating what they had been taught into a
long-term memory.

35 They went on to conduct a second experiment
with the expectation that dogs who are given a
chance to take a nap after a training session will have
a better memory of what they had learned when later
tested. Of course, to be fair, they needed to compare
40 the performance of dogs who were learning
something new and then sleeping afterwards to dogs
who were being trained in the intensive manner that
many competitive dog trainers use, namely teaching
the dog something in a training session, and then
45 moving on to teach the dog something else

immediately after. They also decided to see if simply
having a session of physical activity or perhaps
simply a relaxed play session after training would
affect their ability to remember what they had
50 learned.

The researchers originally expected that the dogs
which had the nap after the training session would
perform better when retested. In fact what the dogs
had been doing after the training session seemed to
55 make no difference when they were retested an hour
later—all seemed to be performing at about the same
level that they were when training ended.
However, recognizing that the effects of memory
consolidation often take a while to show up, the
60 investigative team sent the dogs home and then
brought them back approximately a week later for
another set of tests to see how much of their original
training they still remembered. That is when they got
a bit of a surprise.

65 The group which had had the nap after training
now actually performed better than it had when
tested immediately after their hour-long sleep.
Although this seemed to confirm their original
predictions the data additionally showed that both
70 the group that had had a walk after training and the
group of dogs who had played after training also
performed better than they had in their first retest.
These other two groups remembered the task at
about the same level of proficiency as the group
75 which took a nap. The only group which did not
show improvement over the interval was the group
whose initial training was followed by another
training session where they had to learn a new task.

Effect of Different Activities on Dogs’ Average Learning Performance

Activity	Test occasion		
	End of training (% correct trials)	One hour after training (% correct trials)	One week after training (% correct trials)
Nap	57.54	59.52	67.77
Walk	49.21	54.37	61.11
Learn	55.93	51.85	56.48
Play	48.99	43.94	63.13

Adapted from Anna Kis et al., “The Interrelated Effect of Sleep and Learning in Dogs (*Canis familiaris*); an EEG and Behavioural Study.” ©2017 by Anna Kis et al.

21

Which choice best describes the overall structure of the passage?

- A) The author provides background about a research team, summarizes experiments the team has conducted, and contrasts the team's conclusions with the views of other experts.
- B) The author states a scientific problem, examines a research team's hypothesis for addressing the problem, and outlines details of a solution.
- C) The author introduces a research team's hypothesis, describes experiments that test the hypothesis, and shares unexpected findings of the experiments.
- D) The author describes a particular behavior, presents a research team's hypothesis about how the behavior might be modified, and evaluates the effectiveness of the behavioral modification.

22

According to the passage, the purpose of the first experiment was to determine whether

- A) dogs' short-term learning processes while asleep are similar to their long-term learning processes.
- B) the way dogs learn commands in Hungarian is similar to the way they learn commands in English.
- C) physical activity in dogs affects their ability to remember new lessons.
- D) training produces changes in dogs' brain activity while they sleep.

23

As used in lines 12 and 18, "respond" most nearly means

- A) reply.
- B) return.
- C) revert.
- D) react.

24

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

- A) courtesy.
- B) class.
- C) approach.
- D) expression.

25

It can reasonably be inferred from the passage that the design of the second experiment conducted by Kis's team was informed by which consideration?

- A) The time frame in which behavior is modified following the formation of new memories
- B) The disagreement among scientists regarding what brain activity is typical in sleeping dogs
- C) The tendency of certain languages to be inherently more intelligible than other languages are
- D) The potential for retesting learned behavior to impede the consolidation of memories

26

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

- A) Lines 16-19 ("For the . . . English")
- B) Lines 30-34 ("The researchers . . . memory")
- C) Lines 51-53 ("The researchers . . . retested")
- D) Lines 58-63 ("However . . . remembered")

27

The parenthetical phrase in line 24 mainly serves to

- A) note an exception to a trend observed by the researchers.
- B) clarify an aspect of the experimental design.
- C) present a finding obtained by the researchers.
- D) define a scientific term used in the passage.

28

Based on the passage, what advice to professional dog trainers would be most conducive to their dogs' learning performance?

- A) Include a relaxed play session before engaging the dog in a training session.
- B) Teach the dog several new tasks in a single training session.
- C) Avoid exposing the dog to challenging and unfamiliar tasks after a training session.
- D) Have the dog take a nap prior to the beginning of the training session.

29

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

- A) Lines 24-29 (“What . . . actions”)
- B) Lines 39-46 (“Of course . . . after”)
- C) Lines 73-75 (“These . . . nap”)
- D) Lines 75-78 (“The only . . . task”)

30

According to the table, dogs in the “play” condition completed what percent of trials correctly one hour after training?

- A) 43.94%
- B) 48.99%
- C) 51.85%
- D) 63.13%

31

Which statement about dogs' average learning performance is best supported by the data in the table?

- A) One hour after the training session, dogs in the “walk” condition performed a larger percentage of trials correctly than did dogs in the “nap” condition.
- B) Dogs in the “play” condition had the lowest percent of correct trials at the end of training but not one week after training.
- C) The percent of correct trials by dogs in the “learn” condition was lower than that of dogs in the other conditions during each test occasion.
- D) At the end of the training session, each group of dogs completed more than half of the trials correctly.

Questions 32-42 are based on the following passage.

This passage is adapted from an 1879 speech attributed to Nez Perce Chief In-mut-too-yah-lat-lat, also known as Chief Joseph, during a visit to Washington, DC. In 1877, In-mut-too-yah-lat-lat negotiated a surrender with Nelson A. Miles of the US Army to end the Battle of Bear Paw.

At last I was granted permission to come to Washington. . . . I have shaken hands with a great many friends, but there are some things I want to know which no one seems able to explain. I cannot understand how the Government sends a man out to fight us, as it did General Miles, and then breaks his word.¹ Such a Government has something wrong about it. I cannot understand why so many chiefs are allowed to talk so many different ways, and promise so many different things. I have seen the Great Father Chief [the President], the Next Great Chief [the Secretary of the Interior], the Commissioner Chief, and the Law Chief, and many other law chiefs [Congressmen], and they all say they are my friends, and that I shall have justice, but while their mouths all talk right I do not understand why nothing is done for my people. I have heard talk and talk, but nothing is done. Good words do not last long unless they amount to something. Words do not pay for my dead people. They do not pay for my country now overrun by white men. They do not protect my father's grave. They do not pay for all my horses and cattle. Good words will not give me back my children. Good words will not make good the promise of your War Chief General Miles. Good words will not get my people a home where they can live in peace and take care of themselves. I am tired of talk that comes to nothing. It makes my heart sick when I remember all the good words and all the broken promises. There has been too much talking by men who had no right to talk. Too many misrepresentations have been made; too many misunderstandings have come up between the white men about the Indians. If the white man wants to live in peace with the Indian he can live in peace. There need be no trouble. Treat all men alike. Give them all the same laws. Give them all an even chance to live and grow. All men were made by the same Great Spirit Chief. They are all brothers. The earth is the mother of all people, and all people should have equal rights upon it. You might as well expect the rivers to run backward as that any man who was

born a free man should be contented when penned up and denied liberty to go where he pleases. If you tie a horse to a stake, do you expect he will grow fat? If you pen an Indian up on a small spot of earth, and compel him to stay there, he will not be contented, nor will he grow and prosper. I have asked some of the great white chiefs where they get their authority to say to the Indian that he shall stay in one place, while he sees the white men going where they please. They cannot tell me.

I only ask of the Government to be treated as all other men are treated. If I cannot go to my own home, let me have a home in some country where my people will not die so fast. I would like to go to Bitter Root Valley. There my people would be healthy. . . .

When I think of our condition my heart is heavy. I see men of my race treated as outlaws and driven from country to country, or shot down like animals.

I know that my race must change. We cannot hold our own with the white men as we are. We only ask an even chance to live as other men live. We ask to be recognized as men. We ask that the same law shall work alike on all men. If the Indian breaks the law, punish him by the law. If the white man breaks the law, punish him also.

Let me be a free man—free to travel, free to stop, free to work, free to trade where I choose, free to choose my own teachers, free to follow the religion of my fathers, free to think and talk and act for myself—and I will obey every law, or submit to the penalty.

Whenever the white man treats the Indian as they treat each other then we will have no more wars. We shall all be alike—brothers of one father and one mother, with one sky above us and one country around us, and one government for all. Then the Great Spirit Chief who rules above will smile upon this land, and send rain to wash out the bloody spots made by brothers' hands from the face of the earth. For this time the Indian race are waiting and praying. I hope that no more groans of wounded men and women will ever go to the ear of the Great Spirit Chief above, and that all people may be one people.

¹ In-mut-too-yah-lat-lat reported that Miles had promised that the Nez Perce could return to their own land.

32

The speaker's attitude toward his experiences with members of the US government is best characterized as

- A) apathetic.
- B) weary.
- C) remorseful.
- D) detached.

33

The speaker suggests that one obvious shortcoming of the US government is

- A) its unwillingness to reexamine policies once they have been established.
- B) the systemic inconsistency between its statements and actions.
- C) its inadequate consideration of the lasting consequences of its rulings.
- D) the lack of a clearly defined hierarchy of roles within its justice system.

34

Over the course of the passage, the speaker's main focus shifts from

- A) a critical appraisal of an ongoing situation to a statement of desire for an improved future state.
- B) an acknowledgment of the significance of a visit to a reflection on the events that led to it.
- C) an analysis of two opposing viewpoints to a reminder of the necessity for cooperation.
- D) a detailed account of a resolved conflict to a recommended course of action to avoid further conflicts.

35

The speaker's repeated use of the phrase "good words" in lines 18-30 primarily has which effect?

- A) It demonstrates that the speaker is approaching his audience openly and with kindness.
- B) It underscores a contrast in the way government officials talk to each other and the way they have talked to the speaker.
- C) It emphasizes that the speaker is confident he will persuade those listening to honor his requests.
- D) It makes clear that many people have expressed agreeable intentions toward the speaker.

36

Which choice provides the best evidence that the speaker views human rights as innate and universal because of all people's shared origin?

- A) Lines 36-37 ("Treat . . . laws")
- B) Lines 39-41 ("The earth . . . upon it")
- C) Lines 53-54 ("I only . . . treated")
- D) Lines 75-78 ("We shall . . . all")

37

In lines 41-44, the speaker uses the image of rivers running backward most likely in order to

- A) convey the sense of confusion caused by a recent incident.
- B) characterize the relationship between two groups of people.
- C) emphasize the unrealistic nature of a particular prospect.
- D) illustrate the connection between humans and their environment.

38

It can reasonably be inferred from the passage that the speaker believes an individual's ability to thrive is directly dependent on the

- A) individual's willingness to embrace societal changes.
- B) strength of the individual's sense of his or her cultural identity.
- C) individual's determination to overcome hardships.
- D) allowance of the individual's self-directing freedom.

39

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

- A) Lines 18-19 ("Good . . . something")
- B) Lines 46-48 ("If you pen . . . prosper")
- C) Line 61 ("I know . . . change")
- D) Lines 74-75 ("Whenever . . . wars")

40

According to the speaker, what is true of the great white chiefs who require Native Americans to remain in designated areas?

- A) They misunderstand the motivations behind requests for relocation.
- B) They are acting in opposition to the directives of the US government.
- C) They are unable to provide justification for the authority they exercise.
- D) They believe they are acting in the Native Americans' best interests.

41

As used in line 58, "condition" most nearly means

- A) qualification.
- B) provision.
- C) requirement.
- D) circumstance.

42

The speaker's primary assertion about laws is that they should be

- A) enforced such that all people are held equally accountable.
- B) designed to first ensure the protection of religious freedoms.
- C) written broadly so as to be applicable in a variety of situations.
- D) implemented only if they are backed by the majority of citizens.

Questions 43-52 are based on the following passages.

Passage 1 is adapted from Angelos Michaelides, "Slippery When Narrow." ©2016 by Macmillan Publishers Limited, part of Springer Nature. Passage 2 is adapted from Anne M. Stark, "Carbon Nanotubes Worth Their Salt." Published in 2017 by Lawrence Livermore National Laboratory.

Passage 1

To explore water flow through nanotubes, Eleonora Secchi and colleagues built nanoscale devices in which two reservoirs of water were separated by a water-tight membrane pierced by an individual nanotube. By raising the pressure on one reservoir, water flows through the nanotube to the other. The flow is incredibly small: about a femtolitre per second. To put this in perspective, 1 femtolitre is less than the amount of water in a single human red blood cell.

Given the minuscule amounts of water involved, the authors could not track the motion of water itself. Instead, they built on previously reported work by monitoring how the jets of water emerging from the nanotube displaced polystyrene nanoparticles suspended in the low-pressure water reservoir. Ignoring the differences in relative size, this is like counting the number of children sliding into a ball pit by watching the motion of the balls. The polystyrene nanoparticles were large enough to be seen with an optical microscope, and, by tracking their motion, ultrasensitive measurements of water flow through the tubes were possible. This sensitivity is the key methodological advance of the study.

Using this technique, the authors measured flow through carbon nanotubes that had different radii. The key metric commonly used to evaluate flow across surfaces and in confinement is known as slip length. Essentially, the larger the slip length, the more slippery the surface and the less friction is exerted on a fluid flowing across it. Slip lengths have been measured previously for water flow through aligned arrays of carbon nanotubes of different radii, but the values obtained differed by several orders of magnitude.

Secchi and co-workers' measurements of flow through individual nanotubes help to reconcile some of the previous measurements by revealing a strong dependence of slip length on nanotube radius. In

addition, the measurements confirm that carbon surfaces are indeed unusually slippery, allowing almost frictionless flow through the tubes with the smallest radius (approximately 15 nanometres).

Passage 2

Lawrence Livermore (LLNL) scientists, in collaboration with researchers at Northeastern University, have developed carbon nanotube pores that can exclude salt from seawater. The team also found that water permeability in carbon nanotubes (CNTs) with diameters smaller than a nanometer (0.8 nm) exceeds that of wider carbon nanotubes by an order of magnitude.

The nanotubes, hollow structures made of carbon atoms in a unique arrangement, are more than 50,000 times thinner than a human hair. The super smooth inner surface of the nanotube is responsible for their remarkably high water permeability, while the tiny pore size blocks larger salt ions.

Increasing demands for fresh water pose a global threat to sustainable development, resulting in water scarcity for 4 billion people. Current water purification technologies can benefit from the development of membranes with specialized pores that mimic highly efficient and water selective biological proteins.

"We found that carbon nanotubes with diameters smaller than a nanometer bear a key structural feature that enables enhanced transport. The narrow hydrophobic channel forces water to translocate in a single-file arrangement, a phenomenon similar to that found in the most efficient biological water transporters," said Ramya Tunuguntla, an LLNL postdoctoral researcher and co-author of the paper.

Computer simulations and experimental studies of water transport through CNTs with diameters larger than 1 nm showed enhanced water flow, but did not match the transport efficiency of biological proteins and did not separate salt efficiently, especially at higher salinities. The key breakthrough achieved by the LLNL team was to use smaller-diameter nanotubes that delivered the required boost in performance.

"These studies revealed the details of the water transport mechanism and showed that rational manipulation of these parameters can enhance pore efficiency," said Meni Wanunu, a physics professor at Northeastern University and co-author on the study.

“Carbon nanotubes are a unique platform for
90 studying molecular transport and nanofluidics,” said
Alex Noy, LLNL principal investigator on the CNT
project and a senior author on the paper. “Their
sub-nanometer size, atomically smooth surfaces and
similarity to cellular water transport channels make
95 them exceptionally suited for this purpose, and it is
very exciting to make a synthetic water channel that
performs better than nature’s own.”

43

Passage 1 indicates that compared to previous
researchers studying water flow through nanotubes,
Secchi and colleagues were able to

- A) construct smaller nanotubes.
- B) employ larger aligned arrays of nanotubes.
- C) obtain more precise measurements.
- D) publish in higher-quality scientific journals.

44

As used in line 38, “reconcile” most nearly means

- A) restoring friendships.
- B) resolving discrepancies.
- C) settling bitter arguments.
- D) accepting difficult circumstances.

45

Based on Passage 1, which choice accurately
expresses the general relationship that Secchi and
colleagues found between carbon nanotube radius
and slip length?

- A) As carbon nanotube radius decreased, slip length increased.
- B) As carbon nanotube radius increased, slip length increased.
- C) As carbon nanotube radius decreased, slip length decreased at first and then increased thereafter.
- D) As carbon nanotube radius increased, slip length decreased at first and then increased thereafter.

46

According to the information in Passage 2, assuming
that all other conditions were equivalent, the use
of a carbon nanotube of 2 nanometers in diameter
would produce which of the following sets of
results, relative to the use of a carbon nanotube of
0.8 nanometer in diameter, in a salt-separation
process?

- A) Enhanced transport efficiency and enhanced salt-separation efficiency
- B) Enhanced transport efficiency and reduced salt-separation efficiency
- C) Reduced transport efficiency and enhanced salt-separation efficiency
- D) Reduced transport efficiency and reduced salt-separation efficiency

47

As used in line 81, “delivered” most nearly means

- A) redeemed.
- B) yielded.
- C) uttered.
- D) entrusted.

48

Which choice from Passage 2 best supports the
conclusion that the LLNL researchers considered a
process used by living organisms as a benchmark for
evaluating their results?

- A) Lines 53-55 (“The nanotubes . . . hair”)
- B) Lines 59-61 (“Increasing . . . people”)
- C) Lines 74-79 (“Computer . . . salinities”)
- D) Lines 89-92 (“Carbon . . . paper”)

49

The assertion in the sixth paragraph of Passage 2 (lines 83-88) can best be understood to mean that a given change in the parameters Wanunu refers to will produce

- A) a proportionally larger alteration in pore efficiency.
- B) a proportionally smaller alteration in pore efficiency.
- C) an adverse alteration in pore efficiency.
- D) a predictable alteration in pore efficiency.

50

Information in the passages most strongly implies that Secchi and colleagues would attribute the “boost in performance” (line 82) observed by the LLNL researchers to

- A) improved visual detection methods.
- B) increased particle displacement.
- C) larger slip length.
- D) heightened water pressure.

51

Which choice from Passage 1 provides the best evidence for the answer to the previous question?

- A) Lines 5-7 (“By raising . . . other”)
- B) Lines 13-16 (“Instead . . . reservoir”)
- C) Lines 19-23 (“The polystyrene . . . possible”)
- D) Lines 30-32 (“Essentially . . . it”)

52

Based on the passages, which of the following outcomes occurred using some of the carbon nanotubes studied by the LLNL researchers but likely did not occur using the carbon nanotubes studies by Secchi and colleagues?

- A) The flowing water encountered little friction.
- B) The flowing water translocated in a single-file arrangement.
- C) The water flowed at an extremely slow rate.
- D) The water flowed as a consequence of differential pressure.

STOP

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

No Test Material On This Page

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.

Music is for the Birds

1 Many animals produce sounds that resemble human music. In the 1960s, Cornell researchers Katy and

1

Which choice most effectively sets up the examples in the next sentence?

- A) NO CHANGE
- B) The shyness of palm cockatoos makes them more challenging than other animals for scientists to study.
- C) Many animal species are surprisingly adept at using tools.
- D) All human cultures have been shown to produce music with a recognizable beat.

Roger **2** Payne, found that humpback whales create songs consisting of long, intricate sequences; similarly, researchers have observed chimpanzees producing signature rhythms with their hands or feet. To better understand the complexity of animal musicality, a group of scientists at the Australian National University recently examined another species known for its rhythmic **3** patterns: the Australian palm cockatoo.

2

- A) NO CHANGE
- B) Payne found
- C) Payne found,
- D) Payne found:

3

- A) NO CHANGE
- B) patterns; the
- C) patterns the
- D) patterns. The

[1] The birds actually fashion their own instruments in order to create these sounds. [2] They use their extremely strong beaks to break off and trim tree branches (to a length of approximately four inches) or shape seedpods to use as drumsticks. [3] Then, they begin performing. [4] The palm cockatoo is the only known nonhuman species that both constructs and plays an instrument. **4**

To confirm **5** their understanding of the evolution of music, scientists conducted a study of cockatoos' drumming. Over seven years, they recorded 131 percussion sequences from eighteen wild cockatoos in Kutini-Payamu (Iron Range) National Park in Australia. According to a 2017 article in *Science Advances*, **6** a sequence was defined as "continuous drumming," or tapping, "with less than [five seconds] between taps." The scientists measured the average

4

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

To attract female mates, male Australian palm cockatoos make repetitive drumming noises on tree limbs.

The best placement for the sentence is

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

5

Which choice provides the best introduction to the paragraph?

- A) NO CHANGE
- B) their hypothesis about cockatoos' mating practices, scientists observed the males' behavior in the presence of females.
- C) that cockatoos use tools to produce sound, scientists used cameras to collect high-quality video and audio recordings.
- D) that cockatoos' drumming qualifies as animal musicality, rather than random tapping on trees, the scientists conducted a study.

6

Which choice adds the most relevant detail to the information in the paragraph?

- A) NO CHANGE
- B) birds have been known to use songs for the purpose of "distinguishing between neighbors and strangers."
- C) Australian palm cockatoos "are a monogamous, slowly reproducing, nonflocking species that defends [its] breeding territories."
- D) on the island of New Guinea, "there are anecdotes of drumming by male palm cockatoos using their clenched foot."

temporal spacing between each tap in a sequence as well as the interval variance within each **7** sequence. The scientists' goal in conducting these measurements was to learn how consistent and patterned the beats were. These values were then statistically compared to those that would result if the cockatoos' tapping **8** could be purely random.

7

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

- A) sequence to learn how consistent and patterned the beats were.
- B) sequence to learn the answer to the question, how consistent and patterned were the beats?
- C) of the sequences; how consistent and patterned the beats were is what the scientists wanted to learn.
- D) of the sequences in an effort to learn how consistent the beats were as well as how patterned they were.

8

- A) NO CHANGE
- B) were
- C) is
- D) will be

Analyzing the data from the recordings, the scientists found strong evidence that the patterns were nonrandom: the tapping sequences were repetitious and showed significant spacing consistency. The rhythmic structures of the sequences for each cockatoo **9** also differed from cockatoo to cockatoo, with each bird displaying unique cadences. For example, some cockatoos tapped at relatively slow, unchanging rates, whereas others displayed faster rates with more variety. Some even intermixed slower rates with faster ones. The cockatoos thus appeared to demonstrate not only a specific context for performance, a persistent beat, and **10** to demonstrate repeating elements but also individualized styles of drumming. By studying the cockatoos' ability to create unique rhythms to attract a mate, scientists are hopeful that they can increase their understanding of the capacity for music—a characteristic that humans and nonhuman animals such as the palm cockatoo **11** shares.

9

- A) NO CHANGE
- B) also displayed a variety of structures,
- C) displayed distinctive variations among the cockatoos,
- D) were also highly distinctive,

10

- A) NO CHANGE
- B) elements were repeated
- C) a repetition of elements
- D) appearing to demonstrate repeating elements

11

- A) NO CHANGE
- B) share.
- C) has shared.
- D) is sharing.

Questions 12-22 are based on the following passage.

The Art of Writing

In China, calligraphy—the ancient practice of artistically writing Chinese characters—has long been revered as a supreme form of visual art. Chinese calligraphy also **12** serves the more practical purpose **13** in communicating language in a variety of scripts. While the commonly used standard script is composed of careful strokes and distinct characters, cursive script styles may **14** not be used by every calligrapher. Texts written in cursive styles often require a trained eye, such as that of a skilled calligrapher, to decipher. Contemporary artist Wang Dongling creates abstract calligraphic paintings that use these cursive scripts to push texts beyond the boundary of intelligibility.

12

- A) NO CHANGE
- B) serve
- C) are serving
- D) have served

13

- A) NO CHANGE
- B) to communicate
- C) of communicating
- D) for the communication of

14

Which choice established the most effective contrast to the description of standard script earlier in the sentence?

- A) NO CHANGE
- B) not be as widely understood.
- C) blend individual characters in a single brushstroke.
- D) have developed as a response to advances in brush design.

[1] Wang's paintings not only link together individual characters but also, in a major break with **15** established calligraphic approaches, overlap entire columns of text. [2] During a 2016 performance at the Victoria and Albert Museum in London, Wang created *Dao Ke Dao*, which involved painting sections of a classic philosophical text, the *Daode Jing*, on a large, transparent plastic canvas in front of a live audience. [3] Dr. Hongxing **16** Zhang expert calligrapher and senior curator of the museum, was able to read the script as Wang began to paint. [4] By the time Wang had completed the piece, however, Dr. Zhang's trained eye could no longer **17** anticipate the multilayered characters. **18**

15

- A) NO CHANGE
- B) tried-and-true
- C) trusty
- D) regular old

16

- A) NO CHANGE
- B) Zhang, expert calligrapher and senior curator of the museum,
- C) Zhang, expert calligrapher and senior curator of the museum
- D) Zhang, expert calligrapher and senior curator, of the museum;

17

- A) NO CHANGE
- B) regard
- C) foresee
- D) discern

18

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

Gradually, Wang covered the characters he had already painted with more text from the *Daode Jing*.

The best placement for the sentence is

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

To further explore calligraphy's aesthetic potential, Wang **19** sometimes draws on the traditions of action painting, whereby paint is randomly applied to a canvas. For a 2015 piece entitled *In the Realm of Zen*, Wang composed calligraphic paintings using white acrylic paint on eight immense clear sheets. Holding a model text written in standard script in one **20** hand; he used the other to reproduce the text in a sprawling cursive script on each sheet. Once dry, the sheets were hung one in front of the other from the gallery ceiling. When viewed from the front, the text of the entire series was visible through the clear layers, which made the characters appear to blend into a swirling white mass. Additionally, a reflective stainless-steel floor installed beneath the sheets made the writing appear to extend into the ground, further obscuring the individual characters.

21 Although they are recognizable as calligraphy to some extent, abstract works such as *Dao Ke Dao* and *In the Realm of Zen* ultimately disrupt easy readings of the texts **22** in that they are based. It is perhaps this abstract quality of Wang's work that has allowed global audiences to appreciate the artist's reinterpretation of the age-old craft. Freed from needing to be familiar with the language, viewers can appreciate Wang's works on many levels.

19

Which choice most effectively establishes the main topic of the paragraph?

- A) NO CHANGE
- B) sometimes uses photographic paper to capture his designs.
- C) has also been influenced by a number of contemporary trends in East Asian art.
- D) has also extended his paintings onto multiple canvases.

20

- A) NO CHANGE
- B) hand, and he
- C) hand. He
- D) hand, he

21

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

- A) NO CHANGE
- B) Though nonrepresentational works of art are often challenging,
- C) Even though Dr. Zhang had experienced some difficulty deciphering Wang's work,
- D) While Wang occasionally makes use of unusual props in his calligraphic art,

22

- A) NO CHANGE
- B) on which
- C) whichever
- D) that

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

Charity Can Be Good for Business

A primary goal of business is to make a profit, so companies might assume that charitable activities would **23** detract from there bottom lines. On the contrary, businesses can **24** crop many benefits from integrating charitable activities into their business plans. These efforts can include matching employee donations, providing employees time off to volunteer, and **25** including working directly with local nonprofits. Businesses should participate in charitable activities not only out of generosity but also because doing so can increase their customer base and employee productivity.

Charitable acts can serve as unique forms of advertising. Many businesses depend on personal relationships and word-of-mouth referrals to promote their goods and services, and engaging in charitable work strengthens a business's reputation and relationships within a community. **26** For example, the moving company Gentle **27** Giant in Massachusetts participated in a charitable project, with the medical nonprofit group Partners in Health to donate medical supplies after a natural disaster. Gentle Giant provided trucks and movers at no charge to collect donated items and transport them to Partners in Health, which distributed them to people in need. Gentle Giant's work helped build ties with local business leaders, who then recommended the company to people in need of movers, thereby spreading positive information about its services.

23

- A) NO CHANGE
- B) detract from their
- C) distract from there
- D) distract from their

24

- A) NO CHANGE
- B) reach
- C) reap
- D) cull

25

- A) NO CHANGE
- B) also to work
- C) work
- D) working

26

- A) NO CHANGE
- B) Meanwhile,
- C) Conversely,
- D) Furthermore,

27

- A) NO CHANGE
- B) Giant in Massachusetts, participated in a charitable project,
- C) Giant in Massachusetts participated in a charitable project
- D) Giant, in Massachusetts, participated in a charitable project,

28 Given its attractiveness to workers, charitable giving may even increase employee productivity. A 2012 study revealed productivity increases among certain groups of employees who were provided incentives for charitable giving. In the experiment, students at the University of Southampton, England, 29 are paid to enter data electronically. They were given a small base reward for each entry and later offered the chance to either earn additional bonuses for themselves or provide a donation to charity. While those who were initially highly productive showed mostly decreases in their productivity, the other workers had substantial

28

Which choice provides the best transition from the previous paragraph?

- A) NO CHANGE
- B) Even though it may come at some financial cost to companies,
- C) Though some companies can donate only volunteer work and not financial resources,
- D) In addition to fostering relationships,

29

- A) NO CHANGE
- B) were
- C) will be
- D) have been

productivity gains. Among all workers, the study showed productivity **30** gains of 17 percent to 34 percent based on the different reward structures, but the largest effect recorded in the study—a 73 percent increase in productivity—occurred when workers with low initial productivity were **31** given a bonus of 10 pence as a personal incentive.

Percent Change in Productivity for Different Incentives and Different Groups of Workers

Incentive per item*	All workers	Workers with low initial productivity	Workers with high initial productivity
2.5 pence, personal (baseline)	—	—	—
5 pence, personal	17%	35%	–3%
10 pence, personal	33%	59%	7%
2.5 pence, personal; 5 pence, charitable	19%	43%	–5%
2.5 pence, personal; 10 pence, charitable	17%	43%	–9%
10 pence total, charitable amount determined by worker	34%	73%	–1%

*In 2017, 10 pence was valued at approximately \$0.14 US.

Adapted from Mirco Tonin and Michael Vlassopoulos, "Social Incentives Matter: Evidence from an Online Real Effort Experiment." ©2012 by Institute for the Study of Labor.

30

Which choice provides accurate information from the table?

- A) NO CHANGE
- B) gains of 35 percent to 73
- C) losses of –9 percent to –7
- D) losses and gains of –3 percent to 35

31

Which choice provides an accurate interpretation of the data in the table?

- A) NO CHANGE
- B) given 2.5 pence as a personal incentive with the option to donate 5 pence.
- C) given 2.5 pence as a personal incentive with the option to donate 10 pence.
- D) allowed to choose how much of a 10-pence incentive to donate to charity.

Charitable activity can take many forms, and each company should decide how much makes sense for its budget, workforce, and time constraints. Whatever form the giving takes, companies should consider

32 approaches and ways to increase and expand it.

Because it can improve a company's image and motivate employees, **33** companies make good business sense when they give to charity.

32

- A) NO CHANGE
- B) ways to increase
- C) approaches and ways for increasing
- D) ways they can expand it, increasing

33

- A) NO CHANGE
- B) a company makes a savvy business decision by engaging in charity.
- C) charitable companies are just being practical.
- D) charity simply makes good business sense.

Questions 34-44 are based on the following passage.

The Camel Experiment

In the mid-1800s, the US government lacked detailed information about the American Southwest. Seeking ways for the army to scout this territory, **34** a conclusion was made by government officials that camels could be used as pack animals in the region's harsh climate and vast spaces. They reasoned that because camels were native to similarly arid environments, the animals could carry more gear and would require less water than horses and mules. In 1855, Congress approved a \$30,000 budget (more than \$800,000 in today's dollars) for the project, and the army's experimental camel program began.

35 The idea of importing camels to the United States for military purposes was first proposed by an army officer in 1836. Because the camels behaved differently from the pack animals Americans were accustomed **36** to, and the army officers also hired camel drivers. In Smyrna (what is today the Turkish city of İzmir) they met the man who would lead the camel training **37** program; Hadji Ali, an Ottoman citizen of Greek and Syrian heritage. After the officials had acquired about fifty more camels, they and the camel drivers set sail for Texas.

34

- A) NO CHANGE
- B) the conclusion of government officials was
- C) it was concluded by government officials
- D) government officials concluded

35

Which choice provides the best introduction to the topic of the paragraph?

- A) NO CHANGE
- B) US military officials traveled to cities in what was then the Ottoman Empire, procuring about three dozen camels as they went.
- C) Camels of several different breeds were acquired, including two-humped Bactrian camels and one-humped Arabian ones.
- D) The British Army had been using camels as pack animals in the Crimean War.

36

- A) NO CHANGE
- B) to,
- C) to;
- D) to, therefore,

37

- A) NO CHANGE
- B) program
- C) program:
- D) program.

When they arrived, Ali and his fellow drivers Mico Teodora and Yiorgos Caralambo began to train both the camels and the US soldiers who would work with them. Most of **38** them were not yet habituated to work, and Ali, who had **39** gained experience as a camel driver in the Ottoman military, was regarded by some as the only person who could control them. **40** The soldiers also needed to become accustomed to their new mounts. Ali taught them how to understand the camels; for example, he explained that they could tell whether camels were overworked based on the size and firmness of their humps.

38

- A) NO CHANGE
- B) those
- C) the drivers
- D) the camels

39

- A) NO CHANGE
- B) compiled
- C) assembled
- D) received

40

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

Ali would continue to work with the camels even after the army program had been discontinued.

Should the writer make this addition here?

- A) Yes, because it reinforces the paragraph's claim that Ali was skilled at working with camels.
- B) Yes, because it provides relevant context for the discussion of Ali and the soldiers later in the paragraph.
- C) No, because it contradicts the characterization of Ali elsewhere in the passage.
- D) No, because it interrupts the paragraph's description of how Ali trained the soldiers and camels.

The camels were employed on an 1857 mission to chart the shortest route from Fort Defiance in what is now Arizona to the Colorado River. **41** The terrain was diverse: Ali coaxed the camels into crossing the river in an orderly fashion while soldiers struggled to get the horses and mules to do the same. Despite this early success, however, the camel **42** experiments' days' were

41

Which choice best sets up the rest of the sentence?

- A) NO CHANGE
- B) The result was predictable:
- C) They performed admirably:
- D) Some of the soldiers were unimpressed:

42

- A) NO CHANGE
- B) experiment's days
- C) experiments days
- D) experiment's day's

numbered. **43** Escalating tensions between the North and South would eventually lead to the American Civil War. These escalating tensions left the US Congress with little interest in allocating funds to exploration, and the outbreak of the war brought the camel program to an end. Nonetheless, it had made its mark on the American Southwest. **44** Hadji Ali, whose original name was Filippou Teodora, changed his surname to “Tedro” when he became a naturalized citizen of the United States.

43

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

- A) Between North and South there were escalating tensions that would eventually lead to the American Civil War that
- B) Escalating tensions between North and South, the ones that would eventually lead to the American Civil War,
- C) The escalating tensions between North and South that would eventually lead to the American Civil War
- D) These escalating tensions between North and South, eventually leading to the American Civil War,

44

Which choice provides the most effective conclusion to the paragraph and the passage?

- A) NO CHANGE
- B) Camels that had escaped into the desert were sighted for decades afterward, and Hadji Ali, who worked as a mail carrier and prospector after his time in the army, became a legendary figure of the Wild West.
- C) Hadji Ali’s cousin Mimico “Mico” Teodora, who was also a camel driver, would lend his name to Mico Creek in Kerr County, Texas.
- D) Major General David E. Twiggs, who took over command of the army in the Southwest, found the camels to be unsuitable mounts for soldiers and decided that the animals should be sold.

STOP

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



Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

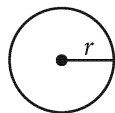
DIRECTIONS

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

NOTES

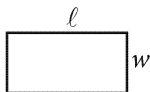
1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

REFERENCE

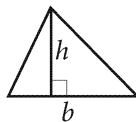


$$A = \pi r^2$$

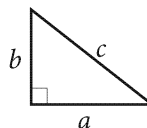
$$C = 2\pi r$$



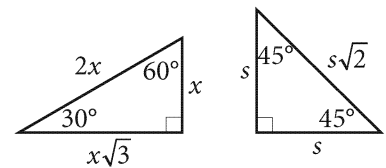
$$A = \ell w$$



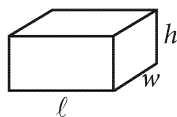
$$A = \frac{1}{2}bh$$



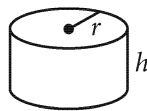
$$c^2 = a^2 + b^2$$



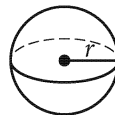
Special Right Triangles



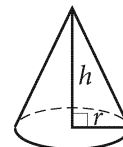
$$V = \ell wh$$



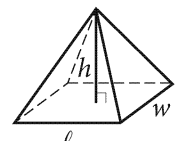
$$V = \pi r^2 h$$



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



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



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

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

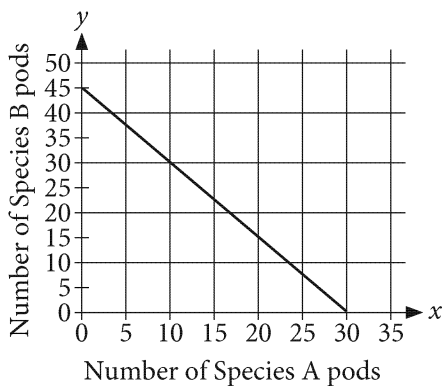
The number of radians of arc in a circle is 2π .

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



1

A farmer collected pods from two species of bean plant, Species A and Species B. Within each species, the number of seeds in each pod is the same. However, the pods from Species A contain a different number of seeds than the pods of Species B. The farmer collected a total of 90 seeds. The possible numbers of pods needed from each species to obtain 90 seeds are shown in the graph, where x is the number of Species A pods and y is the number of Species B pods.



Which of the following is the best interpretation using the y -intercept?

- A) Species B had 1 seed per pod.
- B) Species B had 2 seeds per pod.
- C) Species B had 3 seeds per pod.
- D) Species B had 4 seeds per pod.

2

$$5b = 20c$$

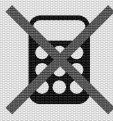
The given equation relates b and c . Which equation correctly gives b in terms of c ?

- A) $b = 4c$
- B) $b = 15c$
- C) $b = 25c$
- D) $b = 100c$

3

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

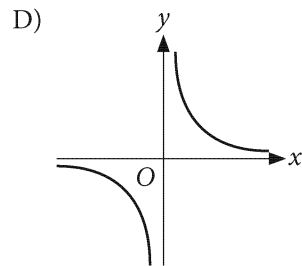
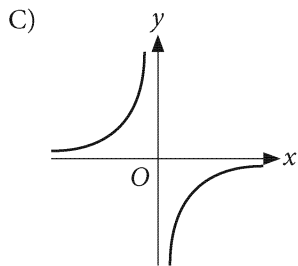
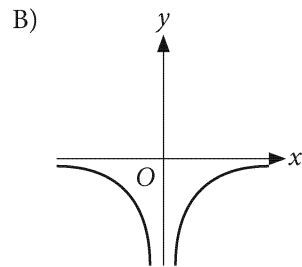
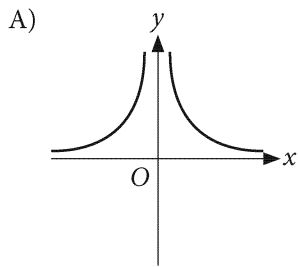
- A) $x^3 + 2x^2 + 3$
- B) $x^3 + 2x^2 - 3$
- C) $x^3 - 2x^2 + 3$
- D) $x^3 - 2x^2 - 3$



4

x	-2	-1	1	2
$r(x)$	1	4	4	1

The rational function r is defined for all values of x except $x = 0$. The table shows several values of x and the corresponding values of $r(x)$. Which of the following could be the graph of $y = r(x)$ in the xy -plane?

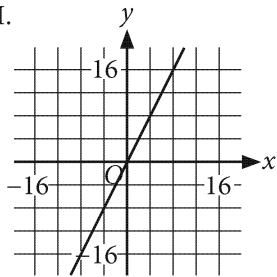




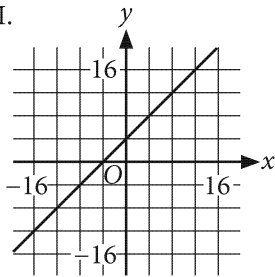
5

The function f is defined by $f(x) = 2x + c$, where c is a constant. Which of the following could be the graph of $y = f(x)$ in the xy -plane?

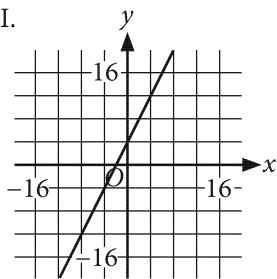
I.



II.

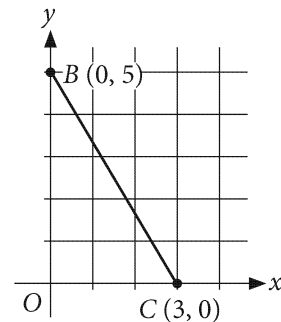


III.



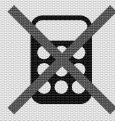
- A) I only
- B) II only
- C) I and III only
- D) II and III only

6



In the xy -plane above, \overline{BC} is perpendicular to line ℓ (not shown). If line ℓ contains the origin, which of the following is an equation of line ℓ ?

- A) $y = -\frac{5}{3}x$
- B) $y = -\frac{3}{5}x$
- C) $y = \frac{3}{5}x$
- D) $y = \frac{5}{3}x$



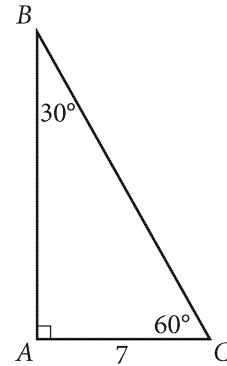
7

$$f(t) = 25(1.09)^t$$

The function f , defined by the given equation, models the number of reindeer in a population t years after 1900, where $0 \leq t \leq 40$. Which of the following equations best models the number of reindeer in the population d decades after 1900? (1 decade = 10 years)

- A) $f(d) = 25\left(\frac{1.09}{10}\right)^d$
- B) $f(d) = 25(1.09 \times 10)^d$
- C) $f(d) = 25(1.09)^{\frac{d}{10}}$
- D) $f(d) = 25(1.09)^{10d}$

8



In triangle ABC shown, what is $\sin B$?

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

9

The function f is defined by $f(x) = 12^{-x}$. For what value of x does $f(x) = \frac{1}{144}$?

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



10

Two right circular cylinders, cylinder X and cylinder Y, have the same height, but the radius of the base of cylinder X is twice the radius of the base of cylinder Y. What is the ratio of the volume of cylinder X to the volume of cylinder Y?

- A) 2 to 1
- B) 4 to 1
- C) 8 to 1
- D) 16 to 1

11

$$18x + 6 = k(9x + 6) + 9x$$

In the given equation, k is a constant. The equation has exactly one solution. Which value could NOT be the value of k ?

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

12

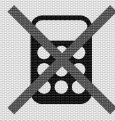
Which expression is equivalent to $5 \cdot \sqrt[3]{5}$?

- A) $5^{\frac{2}{3}}$
- B) $5^{\frac{3}{2}}$
- C) 5^4
- D) $5^{\frac{4}{3}}$

13

On one sailing of the British ship *Queen Mary*, there were a total of 3,131 passengers and crew members. The ratio of passengers to crew members was 1.67 to 1. Which system of equations represents this situation, where p is the number of passengers and c is the number of crew members?

- A) $p + c = 3,131$
 $1.67c = p$
- B) $p + c = 3,131$
 $1.67p = c$
- C) $p + c = 3,131$
 $pc = 1.67$
- D) $p + c = 3,131$
 $1.67pc = 1$



14

$$x^2 + y^2 + 6x + 8y - 11 = 0$$

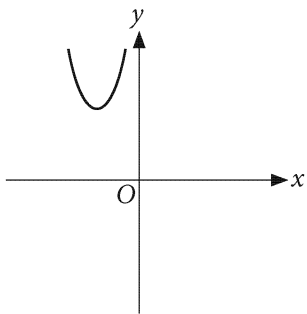
In the xy -plane, the graph of the given equation is a circle. What are the coordinates (x, y) of the center of the circle?

- A) (9, 16)
- B) (6, 8)
- C) (0, -11)
- D) (-3, -4)

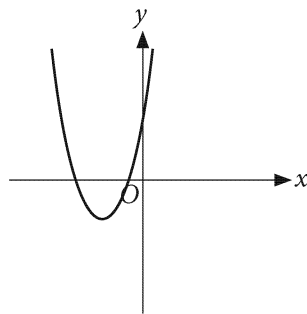
15

Which of the following could be the graph of the equation $y = (x + 1)(x + 5)$?

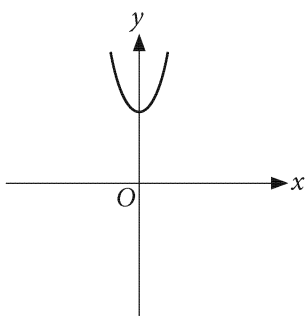
A)



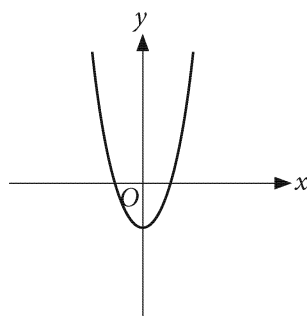
B)



C)




D)




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

Write answer in boxes. →

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

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

← Fraction line

Grid in result.

Answer: 2.5

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

← Decimal point

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

	2	/	3
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
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
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

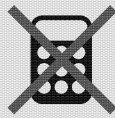
Answer: 201 – either position is correct

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

2	0	1	
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

$$\begin{aligned}2x + 4y &= 10 \\8x + 12y &= 36\end{aligned}$$

The solution to the given system of equations is (x, y) . What is the value of x ?

17

$$\frac{2}{3}x = 12$$

What is the solution to the given equation?

18

$$2|x - 1| = 10$$

What is the positive solution to the given equation?

19

The function f is defined by $f(x) = 4x - 5$. If the point $(k, k + 1)$ lies on the graph of $y = f(x)$ in the xy -plane, where k is a constant, what is the value of k ?

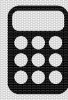
20

The positive solution to the equation $x^2 - 4 = 6x$ can be written in the form $a + \sqrt{b}$, where a and b are integers. What is the value of b ?

STOP

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

No Test Material On This Page



Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

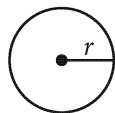
DIRECTIONS

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

NOTES

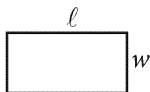
1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

REFERENCE

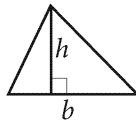


$$A = \pi r^2$$

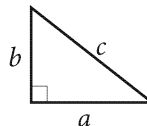
$$C = 2\pi r$$



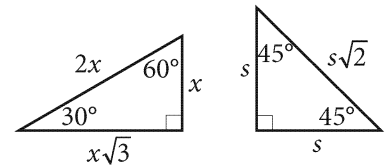
$$A = \ell w$$



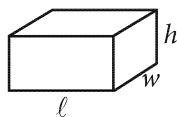
$$A = \frac{1}{2}bh$$



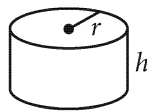
$$c^2 = a^2 + b^2$$



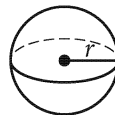
Special Right Triangles



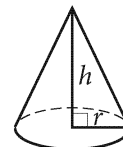
$$V = \ell wh$$



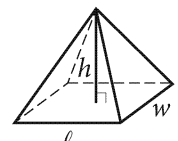
$$V = \pi r^2 h$$



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



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



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

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

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

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



1

If $6x + 8 = 10$, what is the value of $3x + 4$?

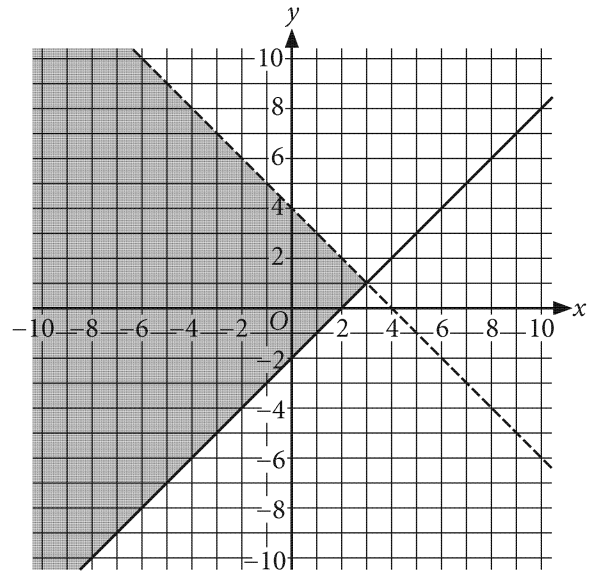
- A) $\frac{1}{3}$
- B) 5
- C) 13
- D) 20

2

After a certain city passed an extra tax on bottles of water, the quantity of bottles of water purchased in 2012 decreased by 6.4% compared to 2011. If 10,000 bottles of water were purchased in 2011, how many bottles of water were purchased in 2012?

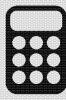
- A) 10,640
- B) 10,006
- C) 9,994
- D) 9,360

3



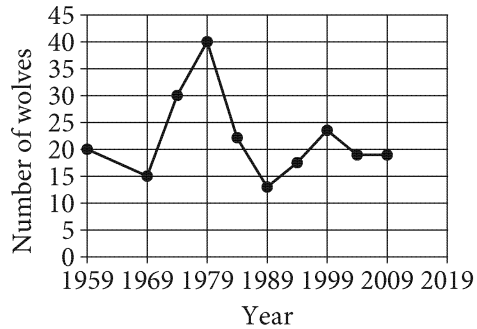
The shaded region shown represents all the solutions to a system of inequalities. Which ordered pair (x, y) is a solution to this system?

- A) $(-6, 0)$
- B) $(0, -6)$
- C) $(0, 6)$
- D) $(6, 0)$



4

The graph shows the number of wolves on Isle Royale, Michigan, from 1959 to 2009. How many wolves were on Isle Royale in 1979?



- A) 15
- B) 20
- C) 30
- D) 40

5

Dai's company rents a 1,200-square-foot office space for \$25,000 per year. What is the best approximation of the yearly cost, per square foot, to rent this office space?

- A) \$4.80
- B) \$20.83
- C) \$30.30
- D) \$180.00

6

The exchange rate on a particular day for 1 US dollar was 1.34 Australian dollars. On that day, how many Australian dollars would have been exchanged for 800 US dollars?

- A) 1,212
- B) 1,072
- C) 834
- D) 597

7

The function f is defined by $f(x) = \frac{1}{2}(3x - 12)$.

What is the value of $f(4)$?

- A) -12
- B) -6
- C) 0
- D) $\frac{1}{2}$



Questions 8 and 9 refer to the following information.

Fruit flies can have long or short wings and gray or black bodies. When a long-winged, gray-bodied fruit fly is mated with a short-winged, black-bodied fruit fly, there will be 4 types of fruit fly offspring. The table shows the proportion of each of these four types of offspring.

Wing length	Body color	
	Gray	Black
Long	0.375	0.125
Short	0.375	0.125

8

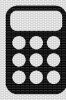
Based on the proportions in the table, if there are 312 offspring, how many have short wings and gray bodies?

- A) 39
- B) 117
- C) 156
- D) 234

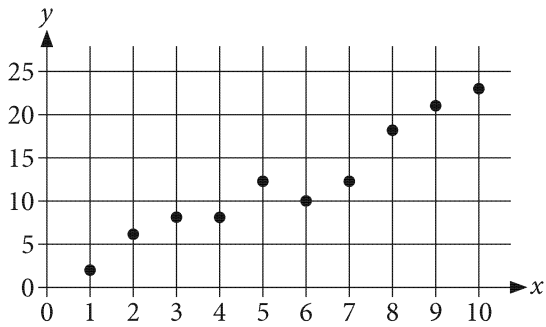
9

If one of the offspring from this mating is selected at random, what is the probability that the offspring will have long wings?

- A) $\frac{1}{8}$
- B) $\frac{1}{4}$
- C) $\frac{1}{2}$
- D) $\frac{3}{4}$



10



Which of the following could be an equation of a line of best fit for the data shown in the scatterplot?

- A) $y = 2.15x + 0.2$
- B) $y = -2.15x + 0.2$
- C) $y = 0.2x + 2.15$
- D) $y = -0.2x + 2.15$

11

If $x^2 - 8x + 16 = 0$, what is the value of $x - 4$?

- A) -8
- B) -4
- C) 0
- D) 4

12

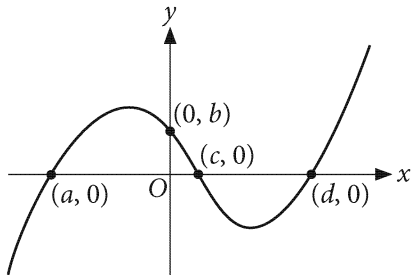
Which expression is equivalent to $(x^3 + 2)(x^2 - 1)$?

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



13

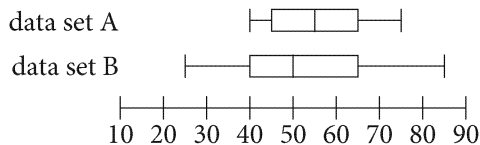
The graph of $y = f(x)$ is shown, where a , b , c , and d are constants.



What is the value of $f(0)$?

- A) a
- B) b
- C) $d - a$
- D) $\frac{b}{c}$

14



Two data sets are summarized by the box plots shown. Based on the box plots, which of the following must be true?

- A) The median of data set A is less than the median of data set B.
- B) The median of data set B is less than the median of data set A.
- C) There are more data values in data set A than in data set B.
- D) There are more data values in data set B than in data set A.

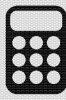
15

$$2x - y = 10$$

$$2x + y = 70$$

The solution to the system of equations above is (x, y) . What is the value of y ?

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



Questions 16 and 17 refer to the following information.

Favorite Way to Spend an Evening, 2015

Age	Activity				Total
	Spending time with family and friends	Watching television	Reading	Other	
18–38	218	32	31	204	485
39–59	127	46	53	120	346
60–80	65	52	47	92	256
81–101	25	75	23	70	193
Total	435	205	154	486	1,280

Favorite Way to Spend an Evening

Year	Activity			
	Spending time with family and friends	Watching television	Reading	Other
1960	8%	48%	14%	30%
1985	13%	34%	14%	39%
2010	32%	22%	11%	35%

The first table shows the results of a 2015 survey of 1,280 United States adults who were asked to indicate their favorite way to spend an evening, categorized by activity and age. The second table shows the percent of adults surveyed who indicated the category of their favorite activity for each of the years 1960, 1985, and 2010. For each year, 1,280 adults selected at random from the United States responded to the survey, and no person gave more than one response.

16

Let a and b represent the number of adults in the survey in 1985 and 2015, respectively, who indicated that their favorite way to spend an evening was reading. In the equation $b = ka$, where k is a constant, which of the following is closest to the value of k ?

- A) 0.02
- B) 0.25
- C) 0.86
- D) 1.16

17

If an adult in the age category 39–59 is selected at random from the adults surveyed in 2015, what is the probability that the selected adult indicated that his or her favorite way to spend an evening was spending time with family and friends?

- A) $\frac{127}{1,280}$
- B) $\frac{346}{1,280}$
- C) $\frac{127}{435}$
- D) $\frac{127}{346}$



18

$$\sqrt{(x+2)^2} = x+2$$

Which of the following values of x is NOT a solution to the equation shown?

- A) -3
- B) -2
- C) -1
- D) 0

19

In the xy -plane, line ℓ has equation $ax + by = c$, where a , b , and c are positive constants. If the value of c is doubled while a and b remain unchanged, how will line ℓ be affected?

- A) The y -coordinate of the y -intercept will increase.
- B) The y -coordinate of the y -intercept will decrease.
- C) The slope will increase.
- D) The slope will decrease.

20

In 1987, there were 6,898 elephants in a national park in Africa. Each year from 1987 to 1999, the number of elephants in this park increased by approximately 2.4% over the previous year's number. Which equation best models the number of elephants, y , in the park x years after 1987?

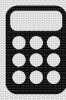
- A) $y = (2.4)^x$
- B) $y = (1.024)^x$
- C) $y = 6,898(2.4)^x$
- D) $y = 6,898(1.024)^x$

21

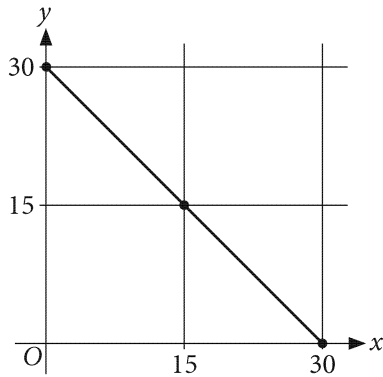
Time (number of weeks)	Mean dry mass per seedling (milligrams)
1	300
2	600
3	1,200
4	2,400
5	4,800

The table shows the mean dry mass, in milligrams, expected for xanthium seedlings for each of 5 weeks after germination. For this time period, what type of function best models the expected mean dry mass of these seedlings as a function of time?

- A) Increasing linear
- B) Decreasing linear
- C) Increasing exponential
- D) Decreasing exponential



22



Dominique spent \$30 at a farmer's market. The graph shows $y = f(x)$, where x is the amount of money, in dollars, Dominique could have spent on flowers and $f(x)$ is the amount of money, in dollars, Dominique could have spent on vegetables. Which of the following is the best interpretation of the point $(30, 0)$ in this context?

- A) Dominique spent \$0 on vegetables and \$0 on flowers.
- B) Dominique spent \$0 on vegetables and \$30 on flowers.
- C) Dominique spent \$30 on vegetables and \$0 on flowers.
- D) Dominique spent \$30 on vegetables and \$30 on flowers.

23

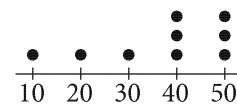
Triangles ABC and DEF are similar, where A corresponds to D , and B corresponds to E . The measure of angle A is 22° , and $AB = 4$. Which statement(s) must be true?

- I. The measure of angle D is 22° .
- II. $DE = 4$

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

24

Data set X



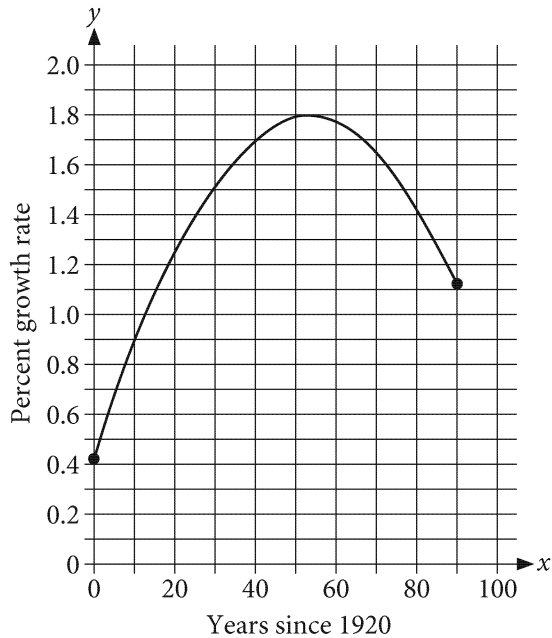
Data set X consists of the data points shown in the dot plot. Data set Y consists of each of the data points in data set X and the data point 100. Which of the following will be the same for data set X and data set Y?

- I. The mean
- II. The median

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



25



The graph models the annual percent growth rate of the world population for the years from 1920 through 2010. Based on the model, which of the following is the best estimate of the year that has the same annual percent growth rate as 1940?

- A) 1975
- B) 1985
- C) 1995
- D) 2005

26

Which expression is the result of increasing the positive quantity x by 70%?

- A) $0.7x$
- B) $1.7x$
- C) $7x$
- D) $70x$

27

$$\begin{aligned}x + 4y &= 7 \\ 3(x + 4y) &= 21\end{aligned}$$

How many solutions does the given system of equations have?

- A) Zero
- B) Exactly one
- C) Exactly two
- D) Infinitely many



28

A can in the shape of a right circular cylinder has a paper label covering all of the can except the circular top and the circular bottom. If the radius of the top of the can is about 1.6 inches and the height of the can is 4 inches, which of the following best approximates the area, in square inches, of the part of the can covered by the label?

- A) 20
- B) 32
- C) 40
- D) 127

29

The Sugar Act was passed in 1764 by Great Britain. It imposed a tax of 3 pence per gallon of molasses that was imported to American colonies from certain locations. Which equation represents the total number of pence, p , collected by Great Britain when g gallons of molasses was imported from these locations? (Pence is the plural of penny.)

- A) $p = 3g$
- B) $g = 3p$
- C) $p = 0.03g$
- D) $g = 0.03p$

30

The function f is linear, and $f(3) = 17$. When the value of x increases by 1, the value of $f(x)$ increases by 4. Which of the following defines f ?

- A) $f(x) = 3x + 4$
- B) $f(x) = 3x + 8$
- C) $f(x) = 4x + 5$
- D) $f(x) = 4x + 17$


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
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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

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

Write answer in boxes. →

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

← Fraction line

Grid in result.

Answer: 2.5

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

← Decimal point

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

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

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

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

Answer: 201 – either position is correct

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

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

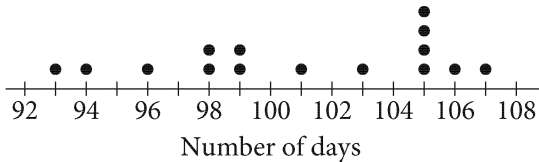
NOTE:

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



31

The dot plot shows the number of days from being planted to being harvested for 15 different canola plants.



What is the median number of days?

32

Value	Frequency
1	3
2	17
3	29
4	15
5	1
6	6

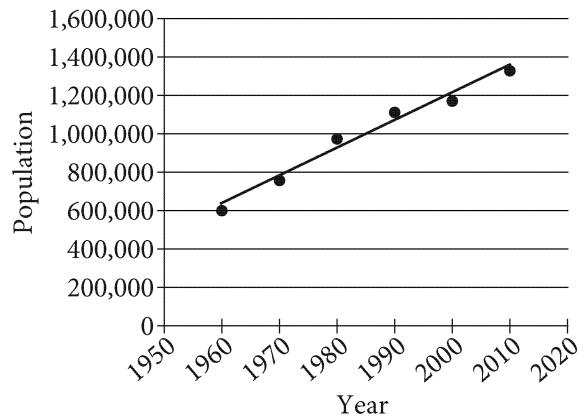
The frequency table summarizes 71 data values. How many of the data values are less than 4?

33

$$y = 2x$$

If the equation shown is graphed in the xy -plane, what is the y -coordinate of the y -intercept of the graph?

34



The scatterplot shows the population of Hawaii every 10 years from 1960 to 2010, along with a line of best fit. For how many of these years does the line of best fit predict a population greater than the actual population?



35

$$f(x) = 5x^2 - 2x - 8$$

For the function f shown, for what value of x does $f(x)$ obtain its minimum value?

36

Of the students who attend Madison Middle School, 84 travel to school by either bus, car, or bicycle. The rest of the students walk to school. If $\frac{1}{4}$ of the students walk to school, how many students attend Madison Middle School?

37

In triangle DEF , angle E is a right angle. If $\sin D = 0.73$, what is the value of $\cos F$?

38

Causes of Delays for Airline A, by Percent

Cause of delay	% of scheduled flights
Air carrier delay	4.7%
National aviation delay	6.0%
Weather delay	0.5%
Aircraft arrival delay	3.5%
Canceled or diverted	1.2%
Other	0.1%
Total	16.0%

In May 2015, 16% of the 34,000 scheduled flights for Airline A were delayed. For each cause listed in the table above, the percent of the 34,000 flights that were delayed due to that cause is shown. Based on the table, how many of the airline's flights in May 2015 were delayed due to an aircraft arrival delay?

STOP

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

December 5, 2020 US

Answer Key

Reading Test Answers

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

READING TEST
RAW SCORE
(NUMBER OF
CORRECT ANSWERS)

Writing and Language Test Answers

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

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

Math Test – No Calculator Answers

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

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

Math Test – Calculator Answers

1 B	11 C	21 C	31 101
2 D	12 C	22 B	32 49
3 A	13 B	23 A	33 0
4 D	14 B	24 B	34 4
5 B	15 D	25 D	35 $\frac{1}{5}$, .2
6 B	16 C	26 B	36 112
7 C	17 D	27 D	37 .73
8 B	18 A	28 C	38 1190
9 C	19 A	29 A	
10 A	20 D	30 C	

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