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# The SAT<sup>®</sup>

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# Question- and-Answer Service

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# 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 Helen Oyeyemi, *The Icarus Girl*. ©2005 by Helen Oyeyemi. After a long journey from her home in England, eight-year-old Jessamy is meeting her mother's family in Nigeria for the first time.

Line There they all stood, an uncertain circle, and then  
her grandfather came forward, greeted her mother,  
shook hands with her father. Although he seemed  
mellower and smaller than the picture that her  
5 mother had painted for her over the years, Jess had a  
sudden and irrational fear that he might start  
shouting at her.

He looked at her, put his hands on his hips in  
mock consternation, and her cousins and her mother  
10 laughed. Her father, standing slightly outside the  
circle, smiled encouragingly at her. Her grandfather  
held out a hand. His hands were big and square,  
spadelike, the palms deeply etched and callused. She  
took a step towards him, smiling a wobbly, nervous  
15 smile that she could not feel on her face.

She did not know what was expected of her.

She had nearly reached him when suddenly, on an  
outward gust of air, he half said, half announced a  
name.

20 "Wuraola."

Who?

She froze, not knowing what to say or do.

Of course, she knew that Wuraola was her  
Yoruba<sup>1</sup> name, the name that her grandfather had  
25 asked in a letter for her to be called when her mother

had held her Nigerian naming ceremony. Wuraola  
means gold.

She *knew* all this . . .

But nobody had ever called her Wuraola, not even  
30 her mother, whom she could now see from the  
corner of her eye making anxious, silent gestures for  
her to go to her grandfather.

Here, in this stone-walled corridor where the  
sunlight came in through enormous, stiff mosquito  
35 screens over every window and her clothes clung to  
her like another skin, Wuraola sounded like another  
person. Not her at all.

Should she answer to this name, and by doing so  
steal the identity of someone who belonged here?

40 Should she . . . *become* Wuraola?

But how?

She could not make herself move forward, so she  
stayed where she was, avoided his touch, looked up  
into her grandfather's face, smiled and said quietly,  
45 but firmly, in her most polite voice "Hello,  
Grandfather."

After they had taken baths and Jess had been  
made to eat a little, her mother disappeared with her  
youngest sister, Aunt Biola, and her father  
50 befriended Uncle Kunle, who was clearly as  
newspaper-minded as he was, and wanted to talk  
about politics. Swiftly dropping a kiss onto her  
forehead, her father released her into her  
grandfather's clutches before mounting the stairs that  
55 led up to the roof balcony of the house.

So her grandfather did have a face. It was a broad,  
lined face; the smile and frown lines ran deep into his

skin, his eyes made smaller by the loosened flesh around them. He had the same wide, strong jawline with the determined set as her mother, and the same prominent cheekbones, although Jess could see that his were made angular more through the emaciation of age than anything else. He was quite short and moved about very quickly.

As Jess sat in the parlor, keeping very still so that she wouldn't take up much space on the brown-and-white sofa, she allowed herself to stare openly and seriously at her grandfather, and he did the same. She felt as if she were a little piece of him that had crumbled off maybe, which he was examining for flaws and broken bits before deciding whether it was worth taking it to be reattached. It was impossible to tell what he thought of her.

She sat at a right angle from him, breathing out silence. He sat very upright (like her, she noted, with surprise), his hands on his knees, the crisp lines of his white shirt almost molding him, fixing him still in her sight. They were both waiting, supposedly for her Auntie Funke to bring them some soft drinks (her grandfather had called them "minerals"), but really Jessamy sensed that they were waiting to see if they would like each other or not.

<sup>1</sup> A people in Nigeria and other West African nations

1

In using the phrase "uncertain circle" (line 1), the narrator most nearly means that the family members are

- A) disoriented after an unusually difficult journey.
- B) self-conscious and tentative about interacting.
- C) openly suspicious of each other's motives.
- D) dependent on one another for reassurance.

2

Based on the passage, which factor most decisively influences Jess's reaction to meeting her grandfather?

- A) His intimidating physical presence and mannerisms
- B) His indifference to other family members' attitudes toward him
- C) Her parents' concerns about being reunited with him
- D) Her mother's ominous descriptions of his temperament

3

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

- A) Lines 1-3 ("There . . . father")
- B) Lines 3-7 ("Although . . . her")
- C) Lines 8-10 ("He looked . . . laughed")
- D) Lines 12-15 ("His . . . face")

4

In the passage, the actions of Jess's father suggest that he

- A) is less sociable than are the other members of the family.
- B) has an imperfect understanding of Nigerian culture.
- C) advocates for Jess to choose her own name.
- D) wishes to promote Jess's introduction to her grandfather.

5

Based on lines 21-32, which choice best describes Jess's initial reaction to being addressed as "Wuraola"?

- A) She resents that her Nigerian family insists on using the name.
- B) She recognizes the name but cannot recall its precise meaning in Yoruba.
- C) She is startled that her grandfather has remembered the name.
- D) She is aware that it is her name but is unable to acknowledge it as such.

6

Which choice best supports the idea that Jess is familiar with some of the customs that her mother's family observes?

- A) Lines 23-26 ("Of course . . . ceremony")
- B) Lines 29-32 ("But . . . grandfather")
- C) Lines 42-46 ("She could . . . Grandfather")
- D) Lines 59-63 ("He had . . . else")

7

The main purpose of the description in lines 33-37 is to

- A) underscore Jess's philosophical musings by invoking a natural setting.
- B) suggest the correspondence between Jess's physical surroundings and her emotional state.
- C) portray Jess's thoughts about her Nigerian background through a nostalgic lens.
- D) reveal Jess's acceptance of her new life by depicting a common occurrence.

8

The series of questions in lines 38-41 serves primarily to portray Jess's

- A) confusion over her grandfather's attachment to his culture.
- B) lack of familiarity with common Nigerian names.
- C) concern about constructing a new sense of who she is.
- D) uncertainty about the roles of other family members.

9

Jess's second encounter with her grandfather differs from her first encounter because in the second encounter Jess

- A) must face her grandfather without support from other members of her family.
- B) is more clearly startled by her grandfather's unpredictable behavior.
- C) has become more confident of her grandfather's ultimate approval.
- D) has little time to become acquainted with her grandfather before speaking to him.

10

As used in line 76, "crisp" most nearly means

- A) abrupt.
- B) fragile.
- C) sharp.
- D) refreshing.

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

This passage is adapted from Jennifer M. Groh, *Making Space: How the Brain Knows Where Things Are*. ©2014 by Jennifer M. Groh.

The implication of the overlap between areas of the brain responsible for cognition and areas responsible for sensory and motor processing is that perhaps the operations of cognition are implemented at least in part via sensory and motor structures. That is, perhaps “thinking” also involves activating some subset of sensory and motor pathways of the brain. For example, when you mentally picture sitting on the couch in your living room, that thought might be implemented by partially activating the visual, tactile, auditory, olfactory, and motor responses that would have occurred if you were actually there. The theory that thought might involve simulating the activity patterns in our sensory and motor areas of the brain is called *grounded* or *embodied cognition*.

Some of the evidence in favor of this view comes from behavioral experiments that show that how you respond to something depends on otherwise irrelevant features of the sensory stimulus. And of particular interest here, these seemingly irrelevant features often involve space. In one classic study, Mike Tucker and Rob Ellis at the University of Plymouth asked subjects to judge whether items were upside down or right side up. The stimuli consisted of photographs of common household objects like frying pans or spatulas. Subjects were to indicate their choice by pressing a designated button, one button for upright and the other for upside down. One button was placed near the subject’s left hand and the other near the right hand—a detail we wouldn’t normally consider to be important but that was essential for what Tucker and Ellis were really getting at.

Secretly, Tucker and Ellis were not particularly interested in the upright/inverted choices, but whether the subjects would respond faster when they had to press the button with the hand on the *same side* as the *handle* of the object in the photograph. All the objects had handles and were photographed in multiple orientations, upright with the handle on either the left or right, and inverted with the handle on either the left or right. Tucker and Ellis found that when the handle on the frying pan was on the left, responses involving the left hand were indeed faster

than those involving the right. Subjects also made fewer errors when the correct choice involved a match between the hand and the handle. When the objects were mirror reversed, the response pattern reversed as well, indicating that it was not simply a matter of being faster or more accurate with one hand than the other.

Another classic illustration of a seemingly unnecessary connection between space and cognition comes from *mental rotation* experiments. In one early study, Roger Shepard and Jacqueline Metzler presented subjects with drawings of blocks of various shapes (think Tetris but in three dimensions) and asked them to judge whether two pictures involved the same shape from a different viewpoint or a different shape altogether. They found that how long it took the subjects to make the judgment varied proportionally with the amount of rotation that would have been needed to bring the two objects into alignment, had they been real.

Both of these experiments, although strictly behavioral, suggest that mental reasoning can show signatures of real-world spatial constraints. In the frying-pan experiment, there is no reason for the side of the handle to affect responses—subjects must merely indicate whether the frying pan is upright or not—but it does. In the case of the mental rotation, there is no physical object to be actually turned, and yet the amount of time required to perform the task varies with how far such an object would have needed to be turned if it did exist.

Effect of Object Orientation and Response Hand on Response Time

Object handle orientation	Response hand	Mean response time (milliseconds)
Left	Left hand	628.2
Left	Right hand	638.8
Right	Left hand	639.8
Right	Right hand	627.3

Adapted from Mike Tucker and Rob Ellis, “On the Relations between Seen Objects and Components of Potential Actions.” ©1998 by American Psychological Association, Inc.

11

Which choice best represents the overall structure of the passage?

- A) A hypothesis is put forth, an experiment testing that hypothesis is outlined, and an explanation for the findings of that experiment is offered.
- B) A theory is described, studies exploring that theory are recounted, and the significance of the results of those studies is suggested.
- C) A generalization is presented, two examples of that generalization are contrasted, and a revision of that generalization is provided.
- D) A theory is introduced, potential criticism of that theory is considered, and a rebuttal of that criticism is presented.

12

Based on the passage, how would the author most likely respond to another scientist's claim that the theory of embodied cognition cannot account for thoughts regarding abstract concepts such as "peace" and "honesty"?

- A) By arguing that the scientist has not fully considered the mechanics of the theory of embodied cognition
- B) By asserting that thoughts about abstract concepts are less common than thoughts about concrete objects
- C) By suggesting that the theory of embodied cognition should be tested under different experimental conditions
- D) By conceding that the theory of embodied cognition may not account for all aspects of thought

13

According to the passage, embodied cognition is the theory that thought

- A) emerges from reactions to certain powerful events.
- B) can be used to improve various physiological functions.
- C) may involve activation of signals that also control the body.
- D) demands conscious mental effort from the thinker.

14

As used in line 20, "interest" most nearly means

- A) sympathy.
- B) importance.
- C) responsibility.
- D) attention.

15

When the author refers to certain studies as "classic" in line 21 and line 52, she most nearly means that the studies are

- A) simple and understated in their design.
- B) based on antiquated ways of thinking.
- C) frequently performed by other researchers.
- D) long established and well regarded in the field.

16

Based on the passage, which statement regarding the subjects in Tucker and Ellis's experiment can most reasonably be inferred?

- A) They were unaware of the true focus of the study.
- B) They had been carefully selected based on their backgrounds.
- C) They frequently used the utensils seen in the photographs.
- D) They had unusually well-developed spatial skills.

17

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

- A) Lines 21-24 (“In one . . . side up”)
- B) Lines 24-26 (“The stimuli . . . spatulas”)
- C) Lines 26-28 (“Subjects . . . down”)
- D) Lines 34-38 (“Secretly . . . photograph”)

18

Based on the passage, could the likelihood that most participants in Tucker and Elis’s study write with their right hands be used as an effective challenge to their conclusions?

- A) Yes, because right-handed people would naturally be able to grasp objects with their right hand more quickly than with their left.
- B) Yes, because right-handed people would be able to visualize objects on their right more clearly than those on their left.
- C) No, because the researchers’ study design had successfully ruled out the possibility that being right-handed would be a factor in the results.
- D) No, because the researchers switched the photographs shown based on whether participants were right- or left-handed.

19

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

- A) Lines 29-33 (“One . . . getting at”)
- B) Lines 38-42 (“All . . . right”)
- C) Lines 42-45 (“Tucker . . . right”)
- D) Lines 47-51 (“When . . . other”)

20

Based on the table, which statement best represents the findings about the mean response times?

- A) Subjects responded slowest when presented with objects with handles on the left for both response hands.
- B) Subjects responded slowest when presented with objects with handles on the right for both response hands.
- C) Subjects responded fastest when presented with objects with handles on the opposite side from their response hand for both object handle orientations
- D) Subjects responded fastest when presented with objects with handles on the same side as their response hand for both object handle orientations.

21

Based on the passage, how would an advocate of the theory of embodied cognition most likely explain the results presented in the table?

- A) When the response hand is on the same side as the object handle, the objects in the photographs are easier to recognize.
- B) When the response hand is on the same side as the object handle, sensory areas activate more slowly and deliberately.
- C) When the response hand is on the side that is opposite the object handle, the brain must take longer to adjust the mental visualization.
- D) When the response hand is on the side that is opposite the object handle, the brain is able to picture more sharply the object to be grasped.



**Questions 22-32 are based on the following passage and supplementary material.**

This passage is adapted from Emily Monosson, *Evolution in a Toxic World: How Life Responds to Chemical Threats*. ©2012 by Emily Monosson. UVB radiation can damage DNA; DNA photolyase is an enzyme that can repair DNA damage.

Andrew Blaustein, an ecologist at the University of Oregon, has studied frogs for decades, and for the past ten years he has turned his attention to the role of UV radiation in population declines. Like many  
 5 ectotherms (animals formerly known as cold-blooded), some frog species lay their eggs in sunlit ponds or puddles, expressly relying on the sun's energy to speed along egg hatching, larval development, and metamorphosis before their  
 10 ephemeral pond dries. Much like photosynthesis or vitamin D production, it's a trade-off—in the frog's case, faster development in a higher-risk environment. Of course, like most creatures living under the sun, amphibians are well defended against  
 15 UVB radiation. In addition to behavioral changes, like burrowing in mud or laying eggs in logs or under rocks, and the production of natural sunscreens, amphibians have redundant systems for DNA repair, including DNA photolyase.  
 20 Interested in the level of protection afforded by DNA photolyase, and the potential impacts of increased UVB exposures on frog populations, Blaustein and coauthor Lisa Belden compared the life history habits of several amphibian species with  
 25 DNA photolyase activity in their eggs. Their study reveals strong positive correlations between UVB-resistant frog species (a species, for example, whose eggs are normally most exposed to sunlight because they are laid in sunny shallow ponds) and increased  
 30 photolyase activity, in comparison to species whose eggs tend to be protected from direct sunlight. In other words, frog species that lay their eggs in sun-drenched environments are better able to repair DNA damage caused by UVB. Not only that, but  
 35 subsequent field studies confirmed the detrimental effects of naturally occurring levels of UVB to developing eggs of some frog species, while those with the highest concentration of photolyase, the Pacific tree frogs, were most resistant. Beyond killing  
 40 embryos, write Blaustein and Belden, UVB exposure may also cause sublethal and potential subtle (and therefore more difficult to measure) effects on larval growth and development. Their findings raise an

intriguing question. Are less-resistant species more  
 45 susceptible to DNA damage caused by increased UVB?

The question was answered in part by researchers working with a single species of frogs inhabiting different altitudes of the French Alps. Frog  
 50 populations adapted to life at higher altitudes, and therefore naturally higher UVB exposures, showed less DNA damage than did their lower-altitude brethren when exposed to UVB intensities typical of high altitude. Identifying the genetic mechanism of  
 55 this adaption—rapid evolution, increased protein production, or both—will require further study. Although DNA photolyase concentrations were not measured, the authors report an interesting twist that suggests increased photolyase activity in high-  
 60 altitude tadpoles. Interested in other ways frogs might experience DNA damage, they studied the effects of benzo(a)pyrene (BaP), a well-characterized carcinogen present in cigarette smoke, coal tar, oil, and myriad other combustion products. BaP is both  
 65 an ancient toxicant and a major industrial pollutant. Activated BaP binds with DNA, causing a kink in the DNA helix, just like UVB. A specialty of DNA photolyase is kinky DNA. It turns out that high-altitude frogs had less BaP-induced DNA damage  
 70 compared with their lowland cousins. Added protection by DNA photolyase? Maybe. Until enzyme concentrations are confirmed, any added protection cannot yet be attributed to increased DNA photolyase.



**Figure 1**

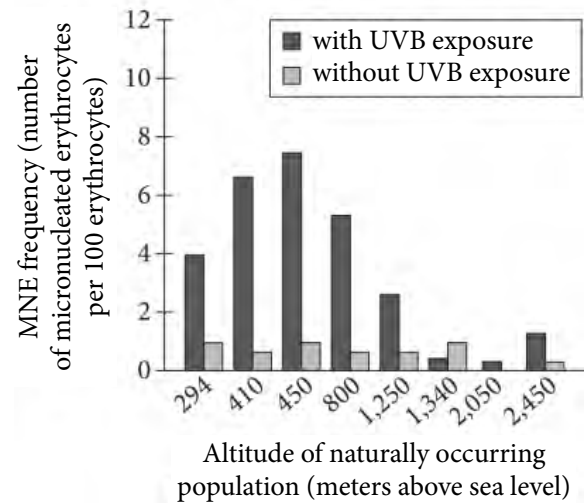
Photolyase Activity, Egg-Laying Location, and Exposure to Sunlight in Selected Amphibian Species

Species	Specific photolyase activity*	Egg-laying location/exposure to sunlight
<b>Frogs</b>		
<i>Ascaphus truei</i>	< 0.1	under stones/unexposed
<i>Hyla cadaverina</i>	3.5	attached to debris near surface/exposed
<i>Rana aurora</i>	6.1	attached to submerged stem/variable exposure
<i>Hyla regilla</i>	7.5	in open shallow water/high exposure
<b>Salamanders</b>		
<i>Plethodon dunni</i>	< 0.1	hidden/unexposed
<i>Aneides ferreus</i>	0.4	in logs or rock crevices/unexposed
<i>Batrachoseps wrighti</i>	0.7	in or under logs/unexposed
<i>Ambystoma gracile</i>	1.0	in open water/some exposure

\* $10^{11}$  UVB-caused DNA damages removed per hour per microgram of egg protein

**Figure 2**

Micronucleated Erythrocytes as Indicator of DNA Damage in UVB-exposed *Rana temporaria* Frogs by Altitude of Naturally Occurring Population in French Alps



Adapted from Andrew R. Blaustein and Lisa K. Belden, "Amphibian Defenses against Ultraviolet-B Radiation." ©2003 by Blackwell Publishing, Inc.

22

Based on the passage, which situation is most similar to that described in lines 10-13 (“Much . . . environment”)?

- A) A male elk that expends considerable energy to grow large antlers
- B) A deer that forages in an area with plentiful resources in close proximity to predators
- C) A bird that experiences rapid bone growth while losing bone strength
- D) A turtle that produces a small clutch of eggs because resources are scarce

23

The passage indicates that burrowing in mud may benefit some amphibians by

- A) delaying egg hatching and larval development.
- B) repairing damage caused by UVB.
- C) limiting their exposure to sunlight.
- D) reducing their need to produce sunscreen.

24

Based on the passage, it can most reasonably be inferred from the research conducted in the French Alps that

- A) living at higher altitudes affects larval growth and development.
- B) high levels of UVB exposure cause lethal effects at all altitudes.
- C) DNA photolyase concentrations are naturally higher in the species of frog that were studied.
- D) tolerance to UVB exposure can vary within a species.

25

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

- A) Lines 47-49 (“The question . . . Alps”)
- B) Lines 49-54 (“Frog . . . altitude”)
- C) Lines 54-56 (“Identifying . . . study”)
- D) Lines 57-60 (“Although . . . tadpoles”)

26

As used in line 61, “experience” most nearly means

- A) undergo.
- B) practice.
- C) withstand.
- D) feel.

27

It can reasonably be inferred from the passage that if further research demonstrated that DNA photolyase protected the high-altitude frogs from BaP-induced DNA damage, then Pacific tree frogs should

- A) demonstrate a similar ability to cope with BaP pollution in their environment.
- B) thrive in high-altitude habitats in the French Alps despite the change in climate.
- C) exhibit BaP-induced DNA damage only when exposed at high altitudes.
- D) produce tadpoles that have clear evidence of kinks in their DNA helices.

28

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

- A) Lines 25-31 (“Their . . . sunlight”)
- B) Lines 43-46 (“Their . . . UVB”)
- C) Lines 60-64 (“Interested . . . products”)
- D) Lines 66-70 (“Activated . . . cousins”)

29

As used in line 72, “confirmed” most nearly means

- A) administered.
- B) approved.
- C) verified.
- D) strengthened.

30

Which statement is best supported by the data in figure 1?

- A) Only those amphibian species with photolyase activity less than or equal to 0.7 lay their eggs where there is no exposure to sunlight.
- B) All amphibian species with photolyase activity greater than 3.5 lay their eggs in locations with high exposure to sunlight.
- C) Only those amphibian species with photolyase activity of 7.5 or greater lay their eggs in areas with variable exposure to sunlight.
- D) All amphibian species with photolyase activity of 1.0 or greater lay their eggs in open shallow water.

31

According to figure 1, which species lays its eggs in locations with the greatest exposure to sunlight?

- A) *Hyla cadaverina*
- B) *Rana aurora*
- C) *Hyla regilla*
- D) *Ambystoma gracile*

32

Which data from figure 2 appear to be inconsistent with the researchers’ observations about the frog populations in the French Alps as presented in the passage?

- A) The population at 800 meters above sea level without UVB exposure experienced less DNA damage than did the population at 450 meters above sea level without UVB exposure.
- B) The population at 410 meters above sea level without UVB exposure experienced less DNA damage than did the population at 410 meters above sea level with UVB exposure.
- C) The population at 800 meters above sea level with UVB exposure experienced more DNA damage than did the population at 294 meters above sea level with UVB exposure.
- D) The population at 450 meters above sea level with UVB exposure experienced more DNA damage than did the population at 2,450 meters above sea level with UVB exposure.

**Questions 33-42 are based on the following passage.**

This passage is from Mercy Otis Warren, *History of the Rise, Progress and Termination of the American Revolution*, vol. 2. Originally published in 1805. In this passage, Warren addresses the time period directly following the American Revolution.

Line But though the connexion was now dissolved, and the gordian knot of union between Great Britain and America cut in sunder; though the independence of the United States was, by the treaty, clearly

5 established on the broad basis of liberty; yet the Americans felt themselves in such a state of infancy, that as a child just learning to walk, they were afraid of their own movements. Their debts were unpaid, their governments unsettled, and the people out of  
10 breath by their long struggle for the freedom and independence of their country. They were become poor from the loss of trade, the neglect of their usual occupations, and the drains from every quarter for the support of a long and expensive war.

15 From the versatility of human affairs, and the encroaching spirit of man, it was yet uncertain when and how the states would be tranquillized, and the union consolidated, under wise, energetic, and free modes of government; or whether such, if  
20 established, would be administered agreeable to laws founded on the beautiful theory of republicanism, depicted in the closets of philosophers, and idolized in the imagination of most of the inhabitants of America.

25 It is indeed true, that from a general attention to early education, the people of the United States were better informed in many branches of literature, than the common classes of men in most other countries. Yet many of them had but a superficial knowledge of  
30 mankind; they were ignorant of the intrigues of courts, and though convinced of the necessity of government, did not fully understand its nature or origin; they had generally supposed there was little to do, but to shake off the yoke of foreign domination,  
35 and annihilate the name of *king*.

They were not generally sensible, that most established modes of strong government are usually the consequences of fraud or violence, against the systems of democratic theorists. They were not  
40 sensible, that from age to age the people are flattered, deceived, or threatened, until the hood-winked multitude set their own seals to a renunciation of

their privileges, and with their own hands rivet the chains of servitude on their posterity. They were  
45 totally fearless of the intrigues or the ambition of their own countrymen, which might in time render fruitless the expense of their blood and their treasures. These they had freely lavished to secure their equality of condition, their easy modes of  
50 subsistence, and their exemption from public burdens beyond the necessary demands for the support of a free and equal government. But it was not long before they were awakened to new energies, by convulsions both at home and abroad.

55 New created exigencies, or more splendid modes of government that might hereafter be adopted, had not yet come within the reach of their calculations. Of these, few had yet formed any adequate ideas, and fewer indeed were sensible, that though the name of  
60 *liberty* delights the ear, and tickles the fond pride of man, it is a jewel much oftener the play-thing of his imagination, than a possession of real stability: it may be acquired to-day in all the triumph of independent feelings, but perhaps to-morrow the world may be  
65 convinced, that mankind know not how to make a proper use of the prize, generally bartered in a short time, as a useless bauble, to the first officious master that will take the burden from the mind, by laying another on the shoulders of ten-fold weight.

70 This is the usual course of human conduct, however painful the reflection may be to the patriot in retirement, and to the philosopher absorbed in theoretic disquisitions on human liberty, or the portion of natural and political freedom to which  
75 man has a claim. The game of deception is played over and over to mislead the judgment of men, and work on their enthusiasm, until by their own consent, hereditary crowns and distinctions are fixed, and some scion of royal descent is entailed upon  
80 them forever. Thus by habit they are ready to believe, that mankind in general are incapable of the enjoyment of that liberty which nature seems to prescribe, and that the mass of the people have not the capacity nor the right to choose their own  
85 masters.

33

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

- A) an analysis of the difficulties facing Americans to a reflection on the repercussions of a human characteristic.
- B) a warning about America's government to a critique of Great Britain's government.
- C) a description of America's education system to an analysis of a specific philosophy.
- D) a recollection of the end of the war to a recommendation that Americans implement a democratic system.

34

The image of the "child just learning to walk" (line 7) mainly serves to

- A) characterize the United States' decision to seek independence from Great Britain as juvenile.
- B) emphasize the inexperience of Americans in navigating their new political position.
- C) acknowledge the naïveté of Americans in believing in an equitable society.
- D) criticize the United States' attempts to become isolated from the rest of the world.

35

Warren implies that after Americans won independence, they questioned whether they would be

- A) forced to rejoin with Great Britain to secure their financial future.
- B) able to return to the occupations they held before the war.
- C) able to create a political system that appeases all citizens.
- D) beholden to other countries because of their amassed debt.

36

Warren contrasts Americans' knowledge of different areas of study with their unworldly view of

- A) popular literature.
- B) human nature.
- C) education in other countries.
- D) the theories of democracy.

37

In the passage, Warren characterizes Americans of the post-Revolutionary War period as

- A) naïve and idealistic.
- B) aimless and neglected.
- C) imaginative and resourceful.
- D) learned and cultured.

38

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

- A) Lines 19-24 ("or whether . . . America")
- B) Lines 25-28 ("It is . . . countries")
- C) Lines 30-35 ("they . . . *king*")
- D) Lines 62-69 ("it may . . . weight")

39

Warren claims that there is a historical pattern of governance that should serve as a warning to Americans, in that the most successful governments are

- A) reluctant to impose constraints on their citizens but actively censor any public criticism.
- B) unable to discontinue policies enforced by their previous leaders.
- C) enabled by their citizens' blind trust to act without oversight.
- D) willing to use treachery or intimidation to maintain their position of power.

40

Which choice provides the best evidence that after the war, Americans wanted a political system that did not require much of them?

- A) Lines 39-44 (“They . . . posterity”)
- B) Lines 48-52 (“These . . . government”)
- C) Lines 55-57 (“New . . . calculations”)
- D) Lines 80-85 (“Thus . . . masters”)

41

As used in line 48, “secure” most nearly means

- A) guarantee.
- B) fasten.
- C) promise.
- D) control.

42

In the last paragraph, Warren states that rulers are appointed through deceptive means and by

- A) promising economic equality to all citizens.
- B) the persuasive ideologies of philosophers.
- C) bartering with other political leaders.
- D) the compliance of the public.



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

Passage 1 is adapted from Cristina Eisenberg, *The Carnivore Way: Coexisting with and Conserving North America's Predators*. ©2014 by Cristina Eisenberg. Passage 2 is adapted from John R. Squires et al., "Missing Lynx and Trophic Cascades in Food Webs: A Reply to Ripple et al." ©2012 by The Wildlife Society. A trophic cascade occurs when the presence of a predator decreases the population of its prey, thereby increasing the numbers of organisms at the next-lower trophic level.

**Passage 1**

In the early 2000s, wolves began to drift down from Canada and across the border from Idaho into Washington State. This natural wolf recolonization inspired ecologists such as William Ripple and his  
 Line 5 colleagues to conduct an exercise in scientific thinking to consider potential impacts that an apex predator like the wolf would have on the intricate workings of the lynx-snowshoe hare food web. At the time, Washington had low hare and lynx populations  
 10 and a high coyote population. Coyotes had recently expanded their range and abundance there. Wolves prey on coyotes. What if the wolf's return to the Pacific Northwest could indirectly improve lynx conservation, via trophic cascade effects?

15 Ripple and colleagues hypothesized that two mechanisms would drive wolf-coyote-lynx-snowshoe hare trophic cascades. First, by killing coyotes, wolves would reverse the mesopredator release that had occurred when wolves had been extirpated from  
 20 this region nearly a century earlier. When humans hunted wolves to extinction, they removed an important check on coyote numbers—creating a "release" on the numbers of this mid-sized predator. Coyote numbers increased, which put more pressure  
 25 on lynx via competition for food resources such as snowshoe hares. Therefore, by reducing coyotes in this system, a returning wolf population could indirectly create ecological benefits for lynx. The researchers further hypothesized that because  
 30 coyotes also prey on lynx, a reduction of coyote numbers by wolves would release predation pressure on lynx.

Second, in western North America, south of the US-Canada border, wolves prey primarily on elk and  
 35 deer. When elk and deer numbers are high, these herbivores can suppress shrubs via heavy browsing. Ripple and colleagues hypothesized that the wolf's return would reduce elk and deer numbers and also

change their behavior, as has been found in places  
 40 like Yellowstone by John Laundré and others. Elk and deer need to stay alert in order to survive in areas where wolves exist. This means keeping their heads up and spending less time standing in one spot with their heads down, as they typically do when there are  
 45 no wolves in a system. Via this predation risk mechanism, wolves could indirectly reduce browsing pressure on shrubs, which would improve snowshoe hare habitat, thereby benefiting lynx.

**Passage 2**

Ripple et al. correctly state that wolves can affect  
 50 coyotes, both behaviorally and ecologically, in the Greater Yellowstone Ecosystem (GYE), as shown by Berger and Gese, and that such regulation can have cascading effects. However, despite the well-publicized initial declines in coyote abundance in the  
 55 GYE following wolf recovery, coyotes may now be adapting to wolves and coyote pack numbers may have rebounded. The trophic strength of wolf effects on coyotes may also differ geographically with variation in climate, primary productivity, carnivore  
 60 and prey communities, and the degree of human persecution. The inverse relationship between wolves and coyotes in Yellowstone is not supported outside the two national parks (Yellowstone and Grand Teton) included in the analyses by Berger and Gese.  
 65 In other systems where wolves, coyotes, and lynx coexist, research shows a positive relationship between wolves and coyotes, whereby coyotes benefit from scavenging on wolf-killed ungulate carcasses. The generally low mortality rates of radio-collared  
 70 coyotes killed by wolves outside of Yellowstone in Northwest Montana is three times less than those killed by cougars. Thus, this quick review of the literature suggests that the strongest generality of  
 75 Ripple et al.'s hypothesis that wolves have a direct negative effect on coyotes is, at best, inconsistent, both within the GYE and across wolf-coyote range in North America.

Buskirk et al. hypothesized that coyotes compete with lynx through both interference competition  
 80 (direct killing or displacement) and indirect exploitative competition for shared food resources. Ripple et al. speculated that these interactions are, in part, responsible for the imperiled status of southern lynx. Unfortunately, evidence for interference  
 85 competition is essentially limited to anecdotal observations. An observation of a single juvenile lynx

killed by a coyote in the Yukon is not *prima facie* [at first sight] evidence for a trophic-level interaction. Further, in this northern population, more predation  
 90 mortality of radio-collared lynx was attributed to wolves, wolverines, and other lynx than to coyotes. Direct interactions between coyotes and lynx were rare.

43

One important function of the first paragraph of Passage 1 is to

- A) assert the strength of the assumptions that informed the hypothesis that Ripple and his colleagues developed.
- B) describe the ecological situation that Ripple and his colleagues considered.
- C) define important concepts that Ripple and his colleagues employed in their research.
- D) compare behavioral traits of the animals that Ripple and his colleagues studied.

44

As used in line 16, “drive” most nearly means

- A) cause.
- B) convey.
- C) operate.
- D) repulse.

45

Passage 1 indicates that Ripple and his colleagues would expect to find that in areas where wolves have returned, elk and deer

- A) feed on fewer varieties of shrubs than do elk and deer in areas where no wolves are found.
- B) exist in lower numbers than they did prior to the local extermination of wolves.
- C) graze for shorter periods without interruption than they did before the return of wolves.
- D) demonstrate less fearful behavior toward coyotes than toward wolves.

46

Which choice from Passage 2 best supports the idea that findings about the effect of wolves on coyotes in some locations may not be representative of the effects of wolves on coyotes in all locations?

- A) Lines 49-53 (“Ripple . . . effects”)
- B) Lines 53-57 (“However . . . rebounded”)
- C) Lines 61-64 (“The inverse . . . Gese”)
- D) Lines 78-81 (“Buskirk . . . resources”)

47

The authors of Passage 2 provide the information about coyote mortality rates in Northwest Montana most likely to

- A) offer an alternative explanation for coyote declines in the Greater Yellowstone Ecosystem.
- B) emphasize the strength of the wolf-caused trophic cascade in that area.
- C) illustrate the claim that the presence of wolves can indirectly benefit coyotes.
- D) support the claim that wolves may not always pose a major direct threat to coyotes.

48

In line 81, the authors of Passage 2 use the word “shared” most likely to indicate that coyotes and lynx

- A) have some overlap in their diets.
- B) will sometimes feed together.
- C) are both preyed on by wolves.
- D) may scavenge each other’s prey.

49

Which choice best describes the relationship between the passages?

- A) Passage 2 presents information that challenges aspects of the hypotheses described in Passage 1.
- B) Passage 2 casts doubt on the authenticity of the data supporting the hypotheses offered in Passage 1.
- C) Passage 2 argues for the need for modifications to the hypotheses advanced in Passage 1.
- D) Passage 2 discusses a study intended to test parts of the hypotheses presented in Passage 1.

50

Based on the passages, Ripple and his colleagues and the authors of Passage 2 would likely agree with which statement about wolves and coyotes?

- A) Wolves and coyotes typically occupy the same trophic level in an ecosystem.
- B) It is possible for wolves to initiate trophic cascades through their effects on coyotes.
- C) There are some circumstances in which the presence of wolves may benefit coyotes.
- D) Wolves and coyotes can have both ecological and behavioral effects on large herbivores.

51

The authors of Passage 2 suggest that the hypothesis described in lines 28-32 (“The researchers . . . lynx”) is

- A) contradicted by anecdotal observations.
- B) valid for many populations but not for all.
- C) difficult to test in a natural setting.
- D) based on insufficient data

52

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

- A) Lines 65-68 (“In other . . . carcasses”)
- B) Lines 69-72 (“The generally . . . cougars”)
- C) Lines 82-84 (“Ripple . . . lynx”)
- D) Lines 86-88 (“An observation . . . interaction”)

**STOP**

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

# Writing and Language Test

35 MINUTES, 44 QUESTIONS

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

## DIRECTIONS

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

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

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

Questions 1-11 are based on the following passage.

### The Pioneers of the Great Exodus

At the end of the Reconstruction era that followed the American Civil War, tens of thousands of black former slaves left the southern United States **1** for finding social and economic opportunity in the western states and territories. The movement was known as the Great Exodus, and **2** their participants came to be

1

- A) NO CHANGE
- B) in search of
- C) with a look for
- D) to the discovery of

2

- A) NO CHANGE
- B) his or her
- C) its
- D) one's

called exodusters. **3** During this time, travel from one part of the country to another took days or even weeks, and the dangers wild animals posed were not to be underestimated.

The most popular destination was Kansas, in part because of its role as an early stronghold of the movement to abolish slavery. One settlement in that state was Nicodemus, a town in northwestern Kansas that drew more than 300 settlers to make the long journey from Kentucky in 1877. **4** Real estate agents

**5** mentioned Nicodemus in brochures and newspapers, but the reality that exodusters confronted on arrival was less appealing. For one early settler of Nicodemus, Willianna Hickman, the flat, empty landscape contrasted starkly with the forested hills where she grew up—Hickman recalled bursting into tears when she first saw her new home.

3

Which choice provides the most appropriate context for the discussion that follows in the passage?

- A) NO CHANGE
- B) Settlers from Kentucky, Tennessee, and Missouri were part of the Great Exodus.
- C) The Great Exodus has parallels to large-scale migrations that occurred in the United States during the twentieth century.
- D) Drawn by the promise of farming on their own land rather than sharecropping for a landlord, exodusters founded dozens of communities in the West in the 1870s and 1880s.

4

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

Between 1870 and 1879, approximately 10,000 exodusters entered Kansas.

Should the writer make this addition here?

- A) Yes, because it sheds light on an aspect of the settlers' backgrounds.
- B) Yes, because it provides a historical context for the discussion of the Great Exodus.
- C) No, because it contradicts information in the previous paragraph.
- D) No, because it digresses from the discussion of the settlement of Nicodemus.

5

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

- A) NO CHANGE
- B) wrote songs and slogans to attract settlers,
- C) advertised the location and characteristics of Nicodemus,
- D) promised plentiful harvests and abundant wildlife,

Some exodusters returned to the familiar **6** expanse of their home **7** states; but others— including Hickman and her husband, Daniel, decided to stay in their new farming villages. These farmers faced many difficulties. In Nicodemus, the lack of trees for home construction or fuel forced settlers to build houses out of sod and burn materials such as sunflowers for heat. Possessing less wealth than settlers from Europe or other parts of the United States, **8** horses or farm implements could not be afforded by many exodusters, who had to do agricultural work with inadequate hand tools. In the first years, many could not raise enough crops to sustain themselves and had to seek aid from neighbors or state governments.

6

- A) NO CHANGE
- B) terrain
- C) spread
- D) locale

7

- A) NO CHANGE
- B) states—but others
- C) states; but, others
- D) states, but others,

8

- A) NO CHANGE
- B) affording horses or farm implements was impossible for many exodusters, who
- C) many exodusters could not afford horses or farm implements and
- D) the lack of affordability of horses or farm implements meant many exodusters



The prosperity of exoduster settlements depended on the yields of their farms. **9** Eventually, harvests in Nicodemus grew, which allowed residents to purchase lumber for their houses and attracted **10** banks, grocery stores, and other businesses. But the challenges of small-scale farming, **11** exacerbated and made worse by economic volatility, slowed the Great Exodus. By the twentieth century, Nicodemus had stopped growing, with many businesses moving away, and other exoduster communities had disappeared altogether. As settlers left the region, Nicodemus became the only original exoduster town to endure to the present day. It remains, in the words of a 1996 congressional bill establishing it as a National Historic Site, “symbolic of the pioneer spirit of African Americans who dared to leave the only region they had been familiar with to seek personal freedom and the opportunity to develop their talents and capabilities.”

9

- A) NO CHANGE
- B) Still,
- C) Rather,
- D) Next,

10

- A) NO CHANGE
- B) banks, grocery, stores
- C) banks; grocery stores,
- D) banks; grocery stores

11

- A) NO CHANGE
- B) exacerbated and worsened
- C) exacerbated
- D) made worse by exacerbation

Questions 12-22 are based on the following passage.

### Debunking Myths of the Dodo

Julian Hume, a paleontologist at the Natural History Museum in Hertfordshire, United Kingdom, has long been troubled by the misunderstandings surrounding the scientific community's knowledge of the dodo (*Raphus cucullatus*), a large, flightless **12** bird. This was a bird that was endemic to the Indian Ocean island of Mauritius and likely went extinct by the year 1693.

**13** Consequently, the dodo has been depicted as an unintelligent, oddly shaped animal with tiny wings and a clumsy demeanor—a veritable buffoon of a bird.

**14** However, Hume and others have shown that the dodo was much more capable than such depictions would suggest.

12

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

- A) bird that was endemic to the Indian Ocean island of Mauritius and
- B) bird, a bird that was endemic to the Indian Ocean island of Mauritius and that
- C) bird, which was endemic to the Indian Ocean island of Mauritius; here the dodo
- D) bird endemic to the Indian Ocean island of Mauritius—one that on this island

13

- A) NO CHANGE
- B) Traditionally,
- C) Therefore,
- D) Similarly,

14

The writer is considering revising the underlined portion to the following.

However, using cutting-edge techniques to analyze skeletal specimens,

Should the writer make this revision?

- A) Yes, because it introduces information that is developed later in the passage.
- B) Yes, because it gives details that reinforce the description in the previous sentence.
- C) No, because it adds an idea that is not directly related to the passage's main discussion.
- D) No, because it contradicts information provided in the concluding paragraph.

[1] Hume was part of a team of paleontologists that employed 3-D laser scanning to produce high-resolution images of each bone from two nearly complete dodo specimens. [2] The team used the images to reconstruct a more streamlined model of dodo skeletal structure; they also evaluated the individual bone images. [3] Hume noted that the robust kneecaps of *R. cucullatus*, along with its thick leg bones and broad **15** pelvis would have provided **16** them with the strength and maneuverability to easily navigate the rocky and densely forested landscape of Mauritius. [4] The prominence of these features suggests a well-developed musculature, indicating that the wings, while small in size relative to the rest of the body, likely enhanced the dodo's speed and agility. **17**

15

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

16

- A) NO CHANGE
- B) it
- C) these
- D) that

17

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

The team also argued for the anatomical significance of the ridges and indentations in the dodo's wing bones.

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

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

Another team of scientists, **18** being a team that was overseen and led by comparative biologist Eugenia Gold, then a graduate student working at the American Museum of Natural History, focused on the dodo's capacity for cognition. They used computed tomography scanning on a well-preserved *R. cucullatus* skull to create a virtual endocast, a 3-D model of the brain cavity. The team created similar models for eight of the dodo's presumed closest relatives, including several extant species, **19** they calculated the ratio of brain volume to total body mass for each specimen. The ratio for the dodo was comparable to that of a modern bird possessing considerable navigational and visual skills and a vaunted capacity for learning. **20** While brain volume is not an infallible indicator of intelligence, Gold's team concluded that the dodo was not all that dimwitted.

18

- A) NO CHANGE
- B) led
- C) a team led
- D) overseen and also led

19

- A) NO CHANGE
- B) also they
- C) and
- D) DELETE the underlined portion.

20

The writer wants to acknowledge a potential objection to the means by which Gold and her team reached their conclusion. Which choice most effectively accomplishes this goal?

- A) NO CHANGE
- B) Comparing dodos to Neanderthals, another underestimated extinct species,
- C) Despite the fact that the dodo is extinct,
- D) Since the dodo's brain volume was correlated to its body size,

21 Hume and Gold's results', obtained with more comprehensive data than previously available and with the aid of improved analytical techniques, offer a necessary revision of the dodo's reputation. The dodo may not have been the most graceful of birds or an avian Einstein, but neither 22 was it the clownish creature that is so often imagined.

21

- A) NO CHANGE
- B) Humes' and Gold's results,
- C) Hume's and Gold's result's,
- D) Hume's and Gold's results,

22

- A) NO CHANGE
- B) will it be
- C) is it being
- D) will it have been

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

### VISTA Offers New Perspectives

Considering her options after graduation, college student Shauntia Dyson **23** thought about what she might do and decided that she wanted to use her skills to help people struggling with the challenges of poverty. A search for such opportunities led her to the AmeriCorps VISTA (Volunteers in Service to America) program. Each VISTA member works full time for one year at a private nonprofit or public agency in a low-income community. In 2016, Dyson began her VISTA service at the Forsyth Farmers' Market in Savannah, **24** Georgia, where, in exchange for a modest salary and benefits, she supports the organization in its mission of offering locally produced food options to people in the Savannah area. Dyson and **25** their fellow VISTA members, or VISTAs, have made an excellent decision, one that will benefit them now and in the future.

23

- A) NO CHANGE
- B) mulled over her future plans and decided
- C) made a choice, deciding
- D) decided

24

- A) NO CHANGE
- B) Georgia; where,
- C) Georgia, where:
- D) Georgia; where

25

- A) NO CHANGE
- B) its
- C) her
- D) one's



VISTAs' salaries may be low, but the VISTA experience is very rewarding in other ways. The program's dedication to assisting people in need makes the work especially **26** reassuring to those who, like Dyson, find joy in serving and helping others.

**27** However, VISTAs' responsibilities tend to be at a higher level than those found in private-sector jobs. VISTAs are typically not hired to offer direct services such as delivering **28** food, rather they use their talents on big-picture initiatives such as building the capacity and improving the financial health of the organizations that employ them. Dyson enthusiastically **29** explains that: her role at the farmers' market involves, "enhancing the organization's reach and visibility" as well as "increasing and diversifying financial and in-kind resources."

26

- A) NO CHANGE
- B) thankful
- C) satisfactory
- D) gratifying

27

- A) NO CHANGE
- B) To that end,
- C) What's more,
- D) Nevertheless,

28

- A) NO CHANGE
- B) food, rather,
- C) food; rather,
- D) food, rather:

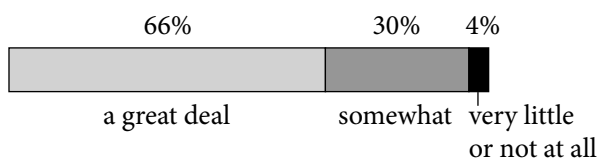
29

- A) NO CHANGE
- B) explains that her role at the farmers' market involves:
- C) explains, that her role at the farmers' market involves
- D) explains that her role at the farmers' market involves

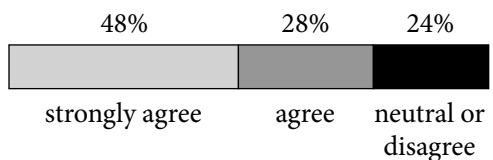
The program also assists VISTAs in **30** preparing for their future careers. A 2015 study asked VISTA alumni to rate the program's success in helping them build various career-specific skills. Five of these skills—communicating in writing, conducting oneself professionally, working independently, meeting deadlines, and prioritizing tasks—were grouped under the heading “Managing Self and Work.” The data are persuasive: **31** 30% of alumni rated VISTA service as having improved their management of self and work “somewhat,” while a mere 4% said the program improved their skills in this area “very little or not at all.” Additionally, **32** most VISTA alumni surveyed, about three-fourths, agreed or strongly agreed with the claim that VISTA was a worthwhile experience in furthering their professional goals.

Results from 2015 Survey of  
VISTA Alumni

Percent indicating that VISTA helped build skills  
in the area of managing self and work



Percent indicating that VISTA was a worthwhile  
experience in furthering professional goals



Adapted from “AmeriCorps Alumni Outcomes Summary Report.”  
Corporation for National and Community Service. Published in 2015.

30

Which choice provides the most effective introduction to the paragraph?

- A) NO CHANGE
- B) learning to meet deadlines.
- C) determining what they want to do for a living.
- D) furthering their commitment to public service.

31

Which choice most effectively uses information from the graph to support the writer's argument for VISTA service?

- A) NO CHANGE
- B) 66% of alumni rated VISTA service as having improved their management of self and work “a great deal,”
- C) more VISTA alumni reported that the program had improved their management of self and work than reported that it had not done so,
- D) of the VISTA alumni who responded to the survey, some thought the program had improved their management of self and work,

32

Which choice most effectively uses information from the graph to support the main idea of the paragraph?

- A) NO CHANGE
- B) many VISTA alumni surveyed, about half, agreed with
- C) only about one-fourth of VISTA alumni surveyed disagreed with
- D) virtually all VISTA alumni surveyed either agreed with or were neutral regarding

By joining VISTA, Shauntia Dyson is following in the footsteps of hundreds of thousands of people, over the program's fifty-year history, who **33** are helping improve both their communities and their career prospects. More US students should consider devoting a year as a volunteer in service to America.

33

- A) NO CHANGE
- B) have helped
- C) will have helped
- D) would have helped

Questions 34-44 are based on the following passage.

### Where Do the Parthenon Sculptures Belong?

In 1801 British nobleman Thomas Bruce, the Earl of Elgin, arrived in Athens, Greece, to document the beautiful marble sculptures that decorated the Parthenon, a temple built in the fifth century BCE. Elgin arrived with a permit from officials of the Ottoman Empire, which then occupied **34** Greece. Granting him permission to make drawings and casts of the sculptures; the permit also allowed him to “take away any pieces of stone with inscriptions or figures.” After finding that many of the Parthenon sculptures had been harmed and that others were being sold to tourists, Elgin decided to take full advantage of the permit and arranged to take many of the sculptures to Britain. Some public figures—including the poet Lord Byron and the politician Sir John Newport—immediately questioned the legitimacy of Elgin’s seemingly good **35** intentions.

34

- A) NO CHANGE
- B) Greece, granting
- C) Greece, it granted
- D) Greece and granting

35

The writer is considering revising the underlined portion to the following.

intentions: to them, it seemed that Elgin was stealing rather than protecting an important part of Greek culture.

Should the writer make this revision here?

- A) Yes, because it clarifies the opinions of the public figures in a way that helps establish the focus of the passage.
- B) Yes, because it suggests that Greek culture was able to thrive within the Ottoman Empire.
- C) No, because it disrupts the passage’s narrative about the Parthenon sculptures by giving loosely related information.
- D) No, because it merely records uncredited hearsay about the actions of Elgin.

Following an investigation, a British parliamentary committee concluded in 1816 that Britain should give “asylum” to the sculptures. **36** In 1823 Lord Byron sailed to Greece to support the Greek quest for independence from the Ottoman Empire. After Greece gained independence in 1832, however, some argued that the agreement Elgin had made with the Ottoman government was **37** now totally bogus and that the sculptures should be returned. In 1925 a series of newspaper debates brought the issue to popular attention, and Greece has **38** razed the question of the sculptures’ repatriation with almost every British ambassador ever since.

36

Which choice provides the most effective transition between the discussion of the committee’s investigation and the next event in the narrative?

- A) NO CHANGE
- B) The concept of asylum typically applies to situations involving political refugees.
- C) They were installed in the British Museum that same year.
- D) They no longer had the vivid colors applied by ancient Greek artisans.

37

- A) NO CHANGE
- B) no longer valid
- C) not OK anymore
- D) henceforth bereft of legitimacy

38

- A) NO CHANGE
- B) appraised
- C) upraised
- D) raised

Officials from the British Museum have long argued that the expertise of their curators **39** has protected the sculptures from the elements. In support of their argument, they note that the sculptures that Elgin did not remove have suffered from pollution. In an effort to **40** beautify Athens, the Greek government constructed a large, state-of-the-art museum, which opened in 2009, to house the Parthenon sculptures that remain in the country. This **41** museums facility's would also be capable of housing the sculptures that are currently in Britain should they be returned.

39

- A) NO CHANGE
- B) have protected
- C) are protecting
- D) were protecting

40

Which choice provides the most effective explanation for the action described in the sentence?

- A) NO CHANGE
- B) generate more revenue from tourism,
- C) prove its commitment to the sculptures' well-being,
- D) attract more art enthusiasts to its collection of antiquities,

41

- A) NO CHANGE
- B) museum's facilities
- C) museum facilities
- D) museums' facility



**42** Regardless of the controversy, the Parthenon sculptures deserve a wide audience. Some argue that cultural artifacts belong in the country where they were created, while others still say that a large international institution like the British Museum is best suited to house objects that are significant to human history. In 2015 the Greek government decided not to pursue legal action against **43** Britain. It opted instead for continued diplomatic efforts. As of 2018, it remains uncertain where **44** the Parthenon sculptures in the British Museum will ultimately reside?

42

Which choice most effectively introduces the sentence that follows in the paragraph?

- A) NO CHANGE
- B) The debate over the ultimate fate of the Parthenon sculptures continues to this day.
- C) Many questions remain about the construction of the Parthenon sculptures.
- D) The argument about the Parthenon sculptures is one of many arts-related controversies.

43

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

- A) Britain instead of opting
- B) Britain; instead, the Greek government opted
- C) Britain, which opted instead
- D) Britain, opting instead

44

- A) NO CHANGE
- B) the Parthenon sculptures in the British Museum will ultimately reside.
- C) will the Parthenon sculptures in the British Museum ultimately reside?
- D) will the Parthenon sculptures in the British Museum ultimately reside.

## 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.

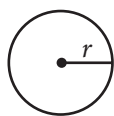
## DIRECTIONS

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

## NOTES

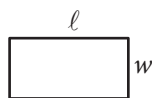
1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

## REFERENCE

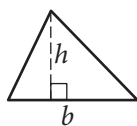


$$A = \pi r^2$$

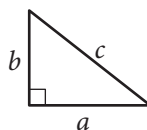
$$C = 2\pi r$$



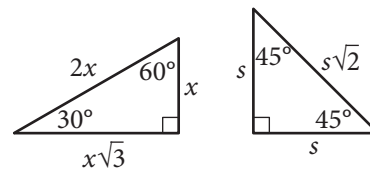
$$A = \ell w$$



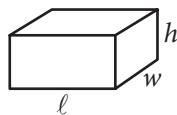
$$A = \frac{1}{2}bh$$



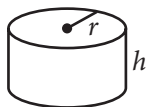
$$c^2 = a^2 + b^2$$



Special Right Triangles



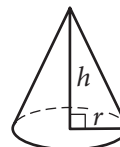
$$V = \ell wh$$



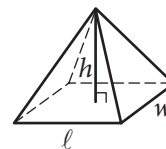
$$V = \pi r^2 h$$



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



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



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

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

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

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



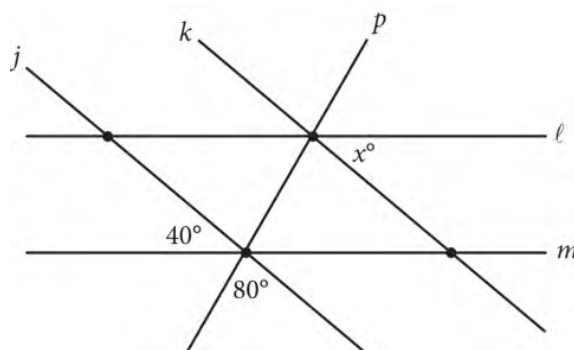
1

$x$	-1	0	1	2	3
$y$	1	2	3	4	5

The table above shows some values of  $x$  and their corresponding values of  $y$ . Which of the following equations shows a possible relationship between  $x$  and  $y$ ?

- A)  $y = x + 2$
- B)  $y = x - 2$
- C)  $y = 2x + 3$
- D)  $y = 3x - 2$

2



In the figure shown, line  $j$  is parallel to line  $k$  and line  $\ell$  is parallel to line  $m$ . What is the value of  $x$ ?

- A) 40
- B) 60
- C) 80
- D) 100

3

The function  $f$  is defined by  $f(x) = x^2 - 5x + 6$ . What is the value of  $f(4)$ ?

- A) 0
- B) 2
- C) 12
- D) 30



4

Aracely can spend up to a total of \$20 on streamers and balloons for a party. Streamers cost \$1.49 per pack, and balloons cost \$4.39 per pack. Which of the following inequalities represents this situation, where  $s$  is the number of packs of streamers Aracely can buy, and  $b$  is the number of pack of balloons Aracely can buy? (Assume there is no sales tax.)

- A)  $1.49s - 4.39b \leq 20$
- B)  $1.49s + 4.39b \leq 20$
- C)  $1.49s - 4.39b \geq 20$
- D)  $1.49s + 4.39b \geq 20$

5

Bill is planning to drive 1,000 miles to visit his family. If he plans to drive 250 miles per day, which of the following represents the remaining distance  $d$ , in miles, that Bill will have to drive to reach his family after driving for  $n$  days?

- A)  $d = 1,000 + 250n$
- B)  $d = 1,000n - 250$
- C)  $d = 250n - 1,000$
- D)  $d = 1,000 - 250n$

6

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

Which of the following is equivalent to the given expression?

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

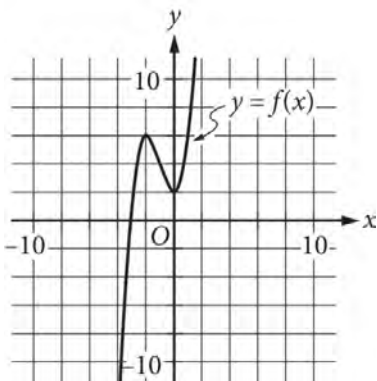


7

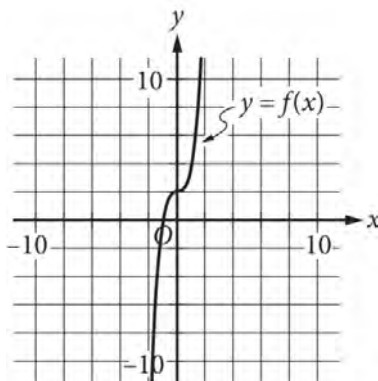
$x$	$f(x)$
-2	-2
-1	3
0	2
1	7
2	30

The table gives some values of  $x$  and the corresponding values of  $f(x)$  for polynomial function  $f$ . Which of the following could be the graph of  $f$  in the  $xy$ -plane, where  $y = f(x)$ ?

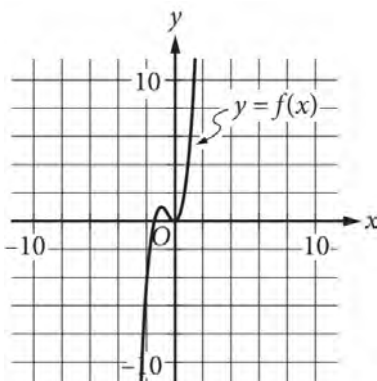
A)



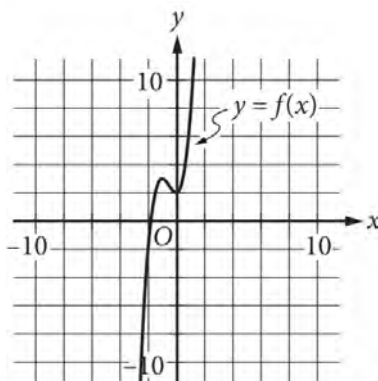
B)



C)



D)





8

$$\frac{x+2}{(x+2)^2}$$

Which of the following expressions is equivalent to the given expression, where  $x \neq -2$ ?

A)  $x + 2$

B)  $\frac{1}{x+2}$

C)  $x^2 + 2x + 4$

D)  $\frac{1}{x^2 + 2x + 4}$

9

Which of the following is an equation of the line in the  $xy$ -plane that contains the points  $(1, 3)$  and  $(5, 15)$ ?

A)  $y = 3x$

B)  $y = 2x + 5$

C)  $y = x + 2$

D)  $y = \frac{1}{3}x$



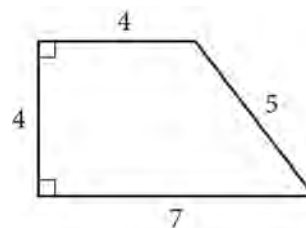
10

$$\frac{4x + b}{2} = 2x + 8$$

In the given equation,  $b$  is a constant. If the equation has infinitely many solutions, what is the value of  $b$ ?

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

11



What is the area, in square units, of the figure shown?

- A) 20
- B) 22
- C) 24
- D) 28



12

What is the  $y$ -intercept of the graph of  $y = 4^x$  in the  $xy$ -plane?

- A) (1, 4)
- B) (1, 0)
- C) (0, 1)
- D) (4, 1)

13

$$x^2 - 14x + 40 = 2x + 1$$

What is the sum of the solutions to the given equation?

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





14

$$L = S\sqrt{1 - \frac{v^2}{c^2}}$$

When the speed of an object approaches the speed of light, its length as seen by an observer changes. When the object is stationary relative to an observer, its length is  $S$ , and when the same object is moving at speed  $v$  relative to the observer, its length is  $L$ . The formula above expresses  $L$  in terms of  $S$ ,  $v$ , and  $c$ , the speed of light. Which of the following gives the speed of the object in terms of the other quantities?

- A)  $v = c\sqrt{1 - \frac{L^2}{S^2}}$
- B)  $v = c\sqrt{1 + \frac{L^2}{S^2}}$
- C)  $v = c^2\left(1 - \frac{L^2}{S^2}\right)$
- D)  $v = c^2\left(1 + \frac{L^2}{S^2}\right)$

15

The half-life of a certain substance in an aquatic environment is about 150 years. Which of the following exponential functions best models the amount  $A(t)$ , in grams, of the substance  $t$  years after 200 grams of the substance is applied to the aquatic environment? (The half-life is the length of time needed for an amount of the substance to decrease to one-half of that amount.)

- A)  $A(t) = 150\left(\frac{1}{2}\right)^{\frac{t}{200}}$
- B)  $A(t) = 150\left(\frac{1}{2}\right)^{200t}$
- C)  $A(t) = 200\left(\frac{1}{2}\right)^{150t}$
- D)  $A(t) = 200\left(\frac{1}{2}\right)^{\frac{t}{150}}$

**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.

5. **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"/>
<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  $3\frac{1}{2}$ .)

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

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

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

Grid in result. →

← Fraction line

**Answer: 2.5**

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

← Decimal point

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

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

.	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"/>
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

.	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"/>
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

**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"/>
1	1	1	1
2	2	2	2
3	3	3	3

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

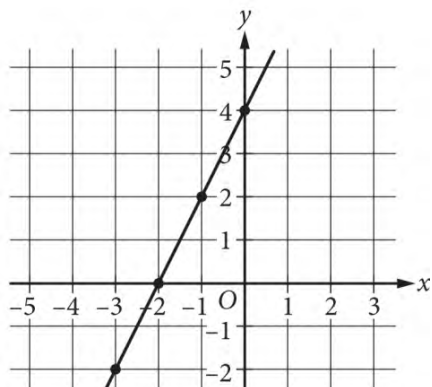
**NOTE:**

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



16

The graph of  $y = mx + b$ , where  $m$  and  $b$  are constants, is shown in the  $xy$ -plane.



What is the value of  $m$ ?

17

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

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

18

$$5(x - 3)(x + 1) = 0$$

What positive value of  $x$  satisfies the equation above?

19

$$3x - 0.6 = 1.8$$

What value of  $x$  satisfies the equation above?

20

A square is inscribed in a circle with radius  $6\sqrt{2}$  inches. What is the perimeter of the square in inches?

# STOP

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



# Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

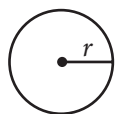
## DIRECTIONS

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

## NOTES

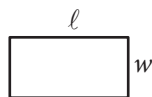
1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

## REFERENCE

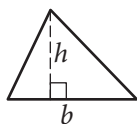


$$A = \pi r^2$$

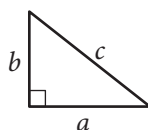
$$C = 2\pi r$$



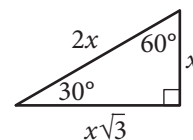
$$A = \ell w$$



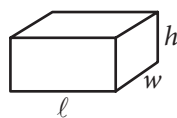
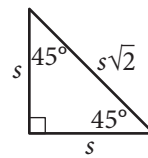
$$A = \frac{1}{2}bh$$



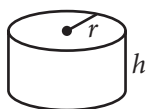
$$c^2 = a^2 + b^2$$



Special Right Triangles



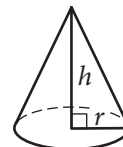
$$V = \ell wh$$



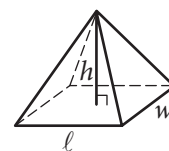
$$V = \pi r^2 h$$



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



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



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

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

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

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



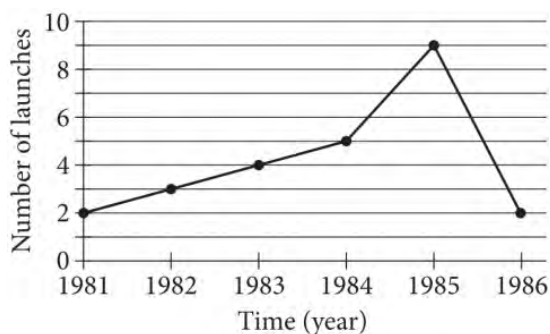
1

If  $s = 4$ , what is the value of  $20s - 15s$ ?

- A) 4
- B) 5
- C) 15
- D) 20

2

The line graph shows the number of space shuttle launches by the United States from 1981 through 1986.



During which year of this time period was the number of space shuttle launches the greatest?

- A) 1982
- B) 1983
- C) 1984
- D) 1985

3

American marsupials and Australian marsupials are two primary groups of marsupials. The table shows the number of species in each order of living marsupial, by group.

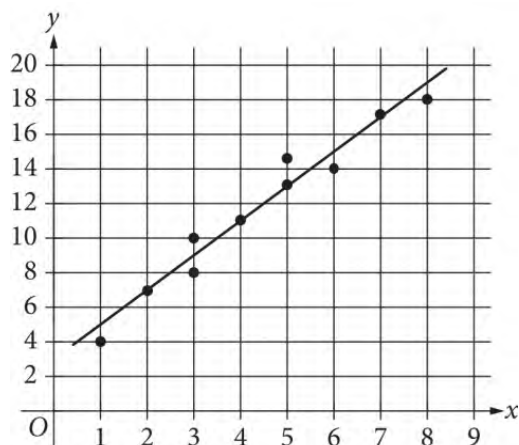
Group	Order	Number of species
American	Didelphimorphia	93
	Paucituberculata	6
Australian	Microbiotheria	1
	Dasyuromorphia	71
	Peramelemorphia	24
	Notoryctemorphia	2
	Diprotodontia	137

Based on the table, what fraction of the Australian marsupial species are from the order Peramelemorphia?

- A)  $\frac{24}{211}$
- B)  $\frac{24}{235}$
- C)  $\frac{24}{334}$
- D)  $\frac{235}{334}$



4



Ten data points are in the scatterplot shown, along with a line of best fit. Which of the following best estimates the predicted value of  $y$  when  $x = 6.5$ ?

- A) 2
- B) 8
- C) 13
- D) 16

5

What is 120% of 2,000?

- A) 240
- B) 400
- C) 2,400
- D) 4,000

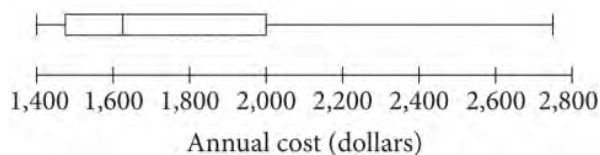
6

A field has a perimeter of 960 feet. Of the following, which is closest to the perimeter of the field, in meters? (1 foot = 0.3048 meter)

- A) 89
- B) 290
- C) 3,200
- D) 10,000

7

Automobile Insurance in a Certain US City



The box plot summarizes the data for the annual cost of automobile insurance for automobile owners in a certain US city. Which of the following could be the median annual cost of automobile insurance for automobile owners in this city?

- A) \$1,625
- B) \$2,000
- C) \$2,100
- D) \$2,750



8

Speed (km/h)	Pulse (bpm)
4	77
6	87
8	97

The table lists selected values of Sam's walking speed, in kilometers per hour (km/h), and his corresponding pulse, in beats per minute (bpm). There is a linear relationship between Sam's speed,  $x$ , and his pulse,  $f(x)$ . Which of the following equations describes  $f(x)$ ?

- A)  $f(x) = x + 57$
- B)  $f(x) = -x + 97$
- C)  $f(x) = 5x + 57$
- D)  $f(x) = -5x + 97$

9

Based on the 2010 US census, the population of Milwaukee, Wisconsin, was about 96% of the population of Baltimore, Maryland. In 2010, if Milwaukee's population was about 595,000, which of the following is the best approximation of Baltimore's population?

- A) 620,000
- B) 570,000
- C) 300,000
- D) 95,000

10

In 1855, Louis Remme traveled from Sacramento, California, to Portland, Oregon, stopping to rest for only 10 hours of the 143 hours it took him to reach Portland. If his average speed while traveling without resting was 5 miles per hour, how many miles did Louis Remme travel?

- A) 665
- B) 705
- C) 715
- D) 765

11

Interval	Frequency
1 to 10	7
11 to 20	5
21 to 30	3
31 to 40	8
41 to 50	2

Each of the 25 data values in a data set is a different integer between 1 and 50, inclusive. The table gives the frequency of the data for five intervals. Which of the following intervals contains exactly  $\frac{2}{5}$  of the values in the data set?

- A) 1 to 20
- B) 11 to 30
- C) 21 to 40
- D) 31 to 50



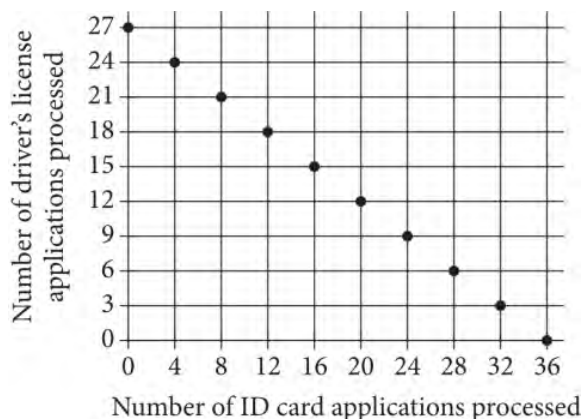
12

Number of activities	Percent of students
None	5%
One	30%
Two	55%
More than two	10%

The table above shows the distribution of the number of extracurricular activities that students at a middle school participate in. If the number of students who participate in two extracurricular activities is 120 more than the number of students who participate in one extracurricular activity, what is the total number of students who attend the middle school?

- A) 240
- B) 480
- C) 600
- D) 900

13



For her job, Natasha spent a total of  $n$  minutes processing ID card applications and driver's license applications. It takes Natasha 15 minutes to process an ID card application and 20 minutes to process a driver's license application. The graph above represents all possible combinations for the number of ID card applications and the number of driver's license applications that Natasha could have processed in the  $n$  minutes. What is the value of  $n$ ?

- A) 720
- B) 540
- C) 420
- D) 360



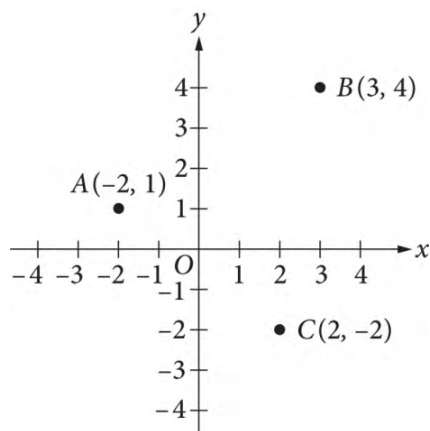


14

In the  $xy$ -plane, what is the  $y$ -coordinate of the  $y$ -intercept of the graph of the equation  $y = \frac{3x - 12}{x + 2}$ ?

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

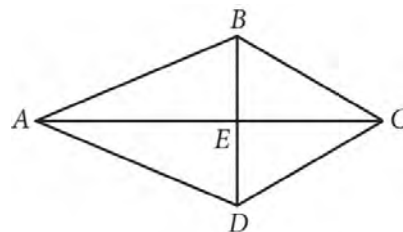
15



The coordinates of points  $A$ ,  $B$ , and  $C$  are shown in the  $xy$ -plane above. For which of the following inequalities will each of the points  $A$ ,  $B$ , and  $C$  be contained in the solution region?

- A)  $y > -x - 2$
- B)  $y \geq -x$
- C)  $y < x + 3$
- D)  $x < 3$

16

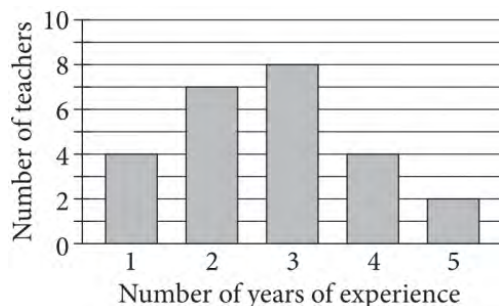


In the figure above,  $AB = AD$ ,  $BC = CD$ ,  $BE = 2$ ,  $BC = 4$ , and  $AC = 10$ . What is the area of triangle  $ABD$ ?

- A)  $40 - 8\sqrt{3}$
- B)  $30 - 6\sqrt{3}$
- C)  $20 - 4\sqrt{3}$
- D)  $10 - 2\sqrt{3}$



17



The graph above shows the distribution of the number of years of experience for 25 teachers enrolled in an advanced-degree program at a particular university. If a 26th teacher with 2 years of experience is added to the program and to the data set, what will be the effect on the mean and median of the data set?

- A) The mean and median will both decrease.
- B) The mean and median will both remain the same.
- C) The mean will decrease and the median will remain the same.
- D) The mean will remain the same and the median will decrease.

18

A sports store had 60 backpacks in stock, some with wheels and some without wheels, before a new shipment of backpacks arrived. The number of wheeled backpacks in the new shipment was twice the number of wheeled backpacks already in stock, and the number of backpacks without wheels in the new shipment was five times the number of backpacks without wheels already in stock. After the new shipment arrived, there were 330 backpacks in the store. Before the shipment, there were  $x$  wheeled backpacks and  $y$  backpacks without wheels. Which of the following equations can be used with  $x + y = 60$  to solve for  $x$  and  $y$ ?

- A)  $2x + 5y = 330$
- B)  $2x + 5y = 270$
- C)  $5x + 2y = 270$
- D)  $5x + 2y = 330$

19

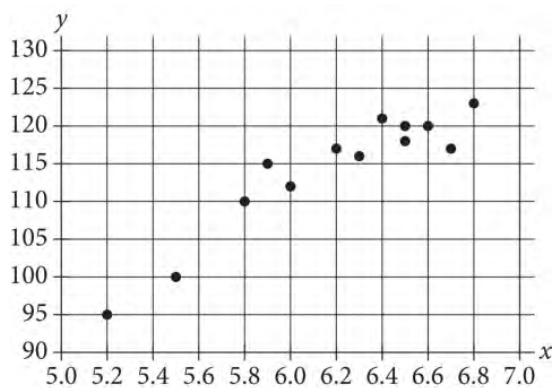
$$h(x) = (x - 5)(x + 5)$$

The function  $h$  is defined as shown. For what value of  $x$  does the function  $h$  reach its minimum value?

- A) -25
- B) -5
- C) 0
- D) 5



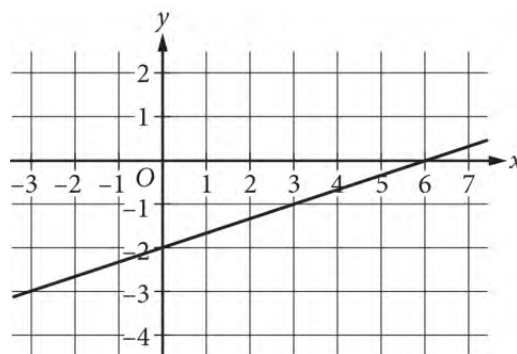
20



A set of data is represented by the scatterplot in the portion of the  $xy$ -plane shown. Which of the following linear equations best fits the data?

- A)  $y = -15.2 + 1.6x$
- B)  $y = 15.2 + 1.6x$
- C)  $y = -15.2 + 16x$
- D)  $y = 15.2 + 16x$

21



An equation of the graph shown is  $ax + by = 6$ , where  $a$  and  $b$  are constants. What is the value of  $b$ ?

- A)  $-3$
- B)  $-1$
- C)  $1$
- D)  $3$



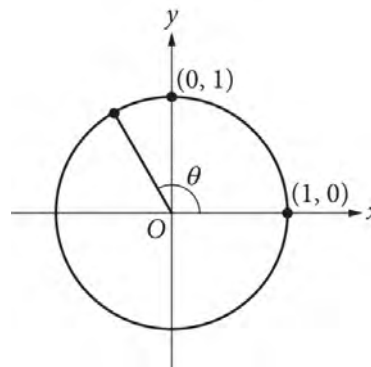
22

$$W(L) = 0.04(1.22)^L$$

The function  $W$  gives the estimated weight  $W(L)$ , in pounds, of a rainbow trout based on its length  $L$ , in inches. Which of the following is the best interpretation of the number 1.22 in this context?

- A) For each increase of 1 pound in weight, the estimated length of the trout, in inches, increases by 22%.
- B) For each increase of 1 inch in length, the estimated weight of the trout, in pounds, increases by 22%.
- C) For each increase of 1 pound in weight, the estimated length of the trout increases by 1.22 inches.
- D) For each increase of 1 inch in length, the estimated weight of the trout increases by 1.22 pounds.

23



In the given figure,  $\theta$  is an angle. If  $\sin \theta = \frac{\sqrt{3}}{2}$ , what is  $\cos \theta$ ?

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



24

Change in Value of 50 Stocks

	Increased in July	Decreased in July	Total
Increased in August	21	9	30
Decreased in August	4	16	20
Total	25	25	50

The two-way table categorizes the change in value in July and August for 50 stocks. If one of the stocks that increased in value in August is chosen at random, what is the probability that the stock also increased in value in July?

- A) 0.42
- B) 0.60
- C) 0.70
- D) 0.84

25

Minato drove 390 miles. Part of the drive was along local roads, where his average speed was 20 miles per hour, and the rest was along a highway, where his average speed was 60 miles per hour. The drive took 8 hours. What distance, in miles, did Minato drive along local roads?

- A) 30
- B) 45
- C) 90
- D) 120

26

$$x^2 + bx + 16 = 0$$

In the quadratic equation shown,  $b$  is a constant. For what values of  $b$  does the equation have only one solution?

- A)  $-4$  only
- B)  $-8$  only
- C)  $-4$  and  $4$
- D)  $-8$  and  $8$

27

The function  $f$  is defined for all real numbers, and the graph of  $y = f(x)$  in the  $xy$ -plane is a line with a negative slope. Which of the following must be true?

- I. If  $a < b$ , then  $f(a) > f(b)$ .
- II. If  $a < 0$ , then  $f(a) > 0$ .
- III. If  $a > 0$ , then  $f(a) < 0$ .

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



28

$$y = bx(x - a)(x - a)(x + b)(x - b)$$

In the equation above,  $a$  and  $b$  are positive constants and  $a \neq b$ . How many distinct  $x$ -intercepts does the graph of the equation in the  $xy$ -plane have?

- A) Two
- B) Three
- C) Four
- D) Five

29

$$\frac{1}{3}(x - k) = kx$$

In the given equation,  $k$  is a constant. If the equation has no solution, what is the value of  $k$ ?

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

30

The expressions  $x^2 + bx + 10$  and  $(x - 3)^2 + c$ , where  $b$  and  $c$  are constants, are equivalent. What is the value of  $b + c$ ?

- A) 7
- B) 4
- C) 3
- D)  $-5$


**DIRECTIONS**

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

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
- Mark no more than one bubble in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as  $3\frac{1}{2}$  must be gridded as 3.5 or  $7/2$ . (If 

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"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<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:  $\frac{7}{12}$**

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

Grid in result. →

← Fraction line

**Answer: 2.5**

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

$$(x - 3)^4 = 0$$

What value of  $x$  makes the equation above true?

32

4, 13, 5, 8,  $R$ , 5, 11

In the data set shown,  $R$  is an integer. If the median of the data set is 8 and  $R < 11$ , what is a possible value of  $R$ ?

33

$$4x + y = 4$$

$$8x + y = 5$$

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

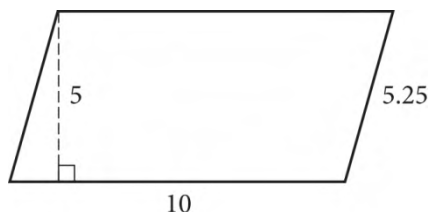




34

One serving of a certain brand of microwave popcorn provides 150 calories, 90 of which are from fat. One serving of a certain brand of low-sodium pretzels provides 120 calories, 12 of which are from fat. How many more calories from fat are provided by a 100-calorie serving of the microwave popcorn than are provided by a 100-calorie serving of the pretzels?

35



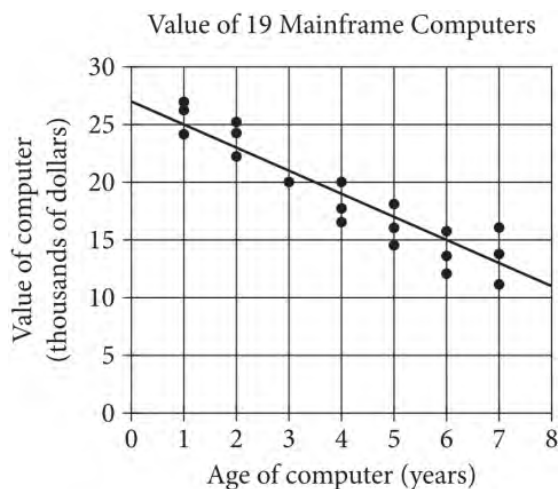
The length, in meters, of the sides and the height of a parallelogram are shown in the figure. What is the area, in square meters, of the parallelogram?

36

The linear function  $f$  is defined by  $f(x) = cx + d$ , where  $c$  and  $d$  are constants. If  $f(50) = 27,000$  and  $f(100) = 38,000$ , what is the value of  $c$ ?



Questions 37 and 38 refer to the following information.



A large company has 19 mainframe computers of a certain class. The scatterplot above shows the value and age for each of the 19 computers. A line of best fit for the data is also shown.

37

Based on the line of best fit, the estimated value of a 6-year-old computer is  $k$  thousand dollars, where  $k$  is an integer. What is the value of  $k$ ?

38

What is the number of computers for which the line of best fit predicts a value less than the actual value?

**STOP**

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