PSAT/NMSQT®

CollegeBoard / NATIONAL MERIT SCHOLARSHIP CORPORATION

Wednesday
October 25, 2017

PSAT/NMSQT®

Preliminary SAT/National Merit Scholarship Qualifying Test

Test Book

IMPORTANT REMINDERS

1

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

2

Sharing any questions with anyone is a violation of Test Security and Fairness policies and may result in your scores being canceled.

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Test begins on the next page.

Reading Test

60 MINUTES, 47 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 1-9 are based on the following passage.

This passage is adapted from Kirstin Valdez Quade, "Night at the Fiestas." ©2015 by Kirstin Valdez Quade.

Frances was pretending to be someone else, someone whose father was not the bus driver. Instead, she told herself, she was a girl alone in the world, journeying to the city. With every gesture, she pictured herself: turning the page of her book, tucking a sweaty lock of hair behind her ear, lifting her chin to gaze out the bus window. Except Frances wasn't alone, and her father, evidently thinking she'd come along today for his company, kept calling back to her with boisterous cheer over the exertions of the engine.

"Broke down here in '42, Francy." He indicated the endless yellow grass, summer-dry and dotted with cows and the occasional splintered shed, and Frances sighed and lowered her book politely to meet his eye in the rearview mirror. "Had a busload of fellows all on their way to training at Fort Bliss. Every day for three years I picked up two, three boys from each town and brung them south." He chuckled at the memory. "You wouldn't believe how many ideas twenty ranch boys have about a bus engine."

Not counting Frances, eleven passengers had boarded early that morning in Raton, many of them also heading to Santa Fe for the Fiestas. Frances's father had offered each and every one of them a jolly greeting. "Glorious day, isn't it?" "Got my girl with me." "Getting off in Santa Fe? So's my Frances." Each time a lady boarded—three did—he took her bag and followed her to her seat and stowed it in the net above while she removed her gloves and arranged her purse. Then he stood aside with his bulk pressed into the seats to let other passengers by. Frances had found herself looking away from his sad, obsequious displays of friendliness, embarrassed.

The day of the breakdown must have been a good one for her father; it must have been a thrill to share in the camaraderie with fellows his own age, part of a brotherhood, if only until the gas line or distributor or whatever it was got fixed. Frances pictured him twenty years younger, standing among the uniformed boys, grinning and eager and tongue-tied. Pity and affection welled in her.

Frances hadn't been born then, but she was aware that the war years must have been hard for him, strangers looking him up and down, wondering why he wasn't in Europe or the Pacific. Frances had felt the shame herself as a child when kids at school talked about their fathers' service. They'd traveled to incredible places, those fathers—Japan and Singapore, Italy, England, France—and they had souvenirs in their houses to prove it: flags, medals, a German helmet, a tin windup rabbit.

"My dad was a conscientious objector," Frances had said at school when she was eleven. "We're pacifists." She'd shrugged, regretful, smug. "We just don't believe in fighting." But she'd had to stop saying that when it got back to her mother, who'd pinched her hard on the upper arm.

"Do you know what it would do to your father to hear you spreading those lies? He isn't a coward. He has a condition."

CONTINUE

The condition in question was a heart murmur, and, as far as Frances knew, the only ill effect he'd ever suffered was fainting once on the football field in high school. Now, nearly an adult, Frances no longer judged her father for those war years, but it did strike her as darkly amusing that, not trusting his heart to hold out in the army, someone saw fit to put her father in charge of a busload of civilians careening down the highway at fifty miles an hour.

Now, an hour and a half into the trip, the passengers were scattered throughout the baking bus, dozing against the windows or reading newspapers; across the aisle, a stout woman was crocheting something in pink acrylic. Even with the windows lowered, the air blowing through was hot and dry, and Frances was worried about the state of her hair, which she'd tied up in rags last night. She lifted the limp curls off her sweaty neck and shifted in her seat and tried to concentrate on *Tess of the D'Urbervilles*. The frieze upholstery was scratchy through the cotton lawn of her new dress.

Frances was sixteen years old and twitchy with impatience. If Frances's life was to be a novel—as Frances fully intended—then finally, *finally*, something might happen at the Fiestas that could constitute the first page.

1

Based on the passage, which choice best describes how Frances's father feels about his daughter?

A) He is embarrassed for her.

B) He is proud of her.

C) He is fearful for her.

D) He is amused by her.

2

Which detail about Frances's father provides the best evidence for the answer to the previous question?

A) He is happy to take Frances to Santa Fe to attend the Fiestas.

B) He chuckles as he tells her stories of his past.

C) He keeps mentioning Frances to passengers as they board the bus.

D) He wants to tell Frances about the time the bus broke down.

3

The narrator's use of the words "embarrassed" (line 34) and "shame" (line 47) mainly emphasize that Frances is someone who

A) has been concerned for years with how people perceive her father.

B) worries about how she will be perceived by people at the Fiestas.

C) has been trying to impress the other passengers on the bus with her grown-up attitude.

D) describes herself critically in the autobiographical novel she is writing.

4

Recounting the story of the bus breaking down, the narrator says, "until the gas line or distributor or whatever it was got fixed" (lines 38-39). What is the most likely reason that the exact cause of the mechanical problem is not part of the story?

A) Wartime shortages prevented Frances's father from having the bus repaired properly.

B) Each soldier riding the bus had his own idea about what had caused the breakdown, so there were too many possibilities to include.

C) Frances's father is vague in discussing the breakdown because he had inadvertently caused it.

D) The precise reason for the breakdown is less important than what the experience meant to Frances's father.

CONTINUE

5

Which choice best supports the idea that the objects in her friends' houses represented more to Frances than just souvenirs from exotic places?

A) Frances remembering the way her mother pinched her hard

B) Frances noticing that people looked her father up and down

C) Frances lying to her friends about her family being pacifists

D) Frances noticing the windup toy among the war mementos

6

Based on the passage, which choice best characterizes both Frances's feelings regarding the lie she told when she was eleven and her mother's reaction to that lie?

A) Frances was proud of making up such a believable lie; Frances's mother was proud of Frances for trying to protect her father's reputation.

B) Frances lied to hide her embarrassment; Frances's mother was angry at the thought of how ashamed Frances's father would feel if he heard the lie.

C) Frances was ashamed of lying; Frances's mother understood the reason for the lie and was sympathetic.

D) Frances thought her lie was justifiable; Frances's mother thought that there was no reason good enough to lie to friends.

7

According to the passage, what does Frances find "darkly amusing" (line 67) about her father's situation?

A) He is healthy enough to be trusted to drive people but was not deemed strong enough to go to war.

B) He seems to have been sociable with soldiers but behaves awkwardly around civilian passengers.

C) He is capable of helping female passengers stow their luggage but once passed out on the football field.

D) He tends to charm the female passengers but is seldom able to amuse his wife and daughter.

8

The main idea of the ninth paragraph (lines 71-82) is that

A) the bus trip is hot and boring.

B) Frances's father has recovered from his heart murmur.

C) the passengers on the bus seem dull to Frances.

D) the trip is lasting longer than usual.

9

What is the most likely reason the word "finally" is repeated and its second use italicized in the last sentence of the passage?

A) To stress the color and cheeriness of Frances's destination at the Fiestas compared with the drabness of the bus

B) To emphasize how long Frances feels she has been waiting for her life as an adult to begin

C) To make a point of showing that Frances is not a good traveler because she is impatient

D) To indicate that Frances is starting to be nervous about attending the Fiestas without her mother

CONTINUE

Questions 10-18 are based on the following passage and supplementary material.

This passage is from Richard Florida, *The Rise of the Creative Class*. ©2002 by Richard Florida.

For all the attention given to workplace motivation over the years, surprisingly little hard numerical research or analysis has been done on what motivates today's creative workers. In the summer of 2001, I had a chance to address this issue by analyzing data from what I believe are among the largest and most comprehensive extant surveys on the subject. As a columnist for *Information Week*, a print/on-line magazine covering the information-technology industry, I have access to the publication's research data. Every year *Information Week* conducts a Salary Survey that asks readers detailed questions not only about their pay and benefits, but about their job satisfaction and a host of work-related factors. Some 20,000 information-technology (IT) workers completed the survey in both 2000 and 2001. Of these, approximately 11,000 identified themselves as IT staff and 9,000 as management. The sample is not scientifically random, since people self-select by choosing to respond. But it is extremely large and it reaches far beyond the computer and software industries per se, including IT workers in virtually every sector of the economy.

IT workers provide an interesting vantage point from which to examine these issues. On the one hand, they have been said to be a fairly conventional sector of the Creative Class. They are certainly a good deal more mainstream than artists, musicians or advertising copywriters. On the other, IT workers are said to care a great deal about money. They are a high-paid segment of the workforce to begin with, and during the late 1990s, companies went to great lengths to provide bonuses, stock options,[1] six-figure salaries and other financial incentives to lure them. My colleague Kevin Stolarick and I combed through the raw data from the *Information Week* surveys and repeatedly resifted it to seek a better understanding of what IT workers value.

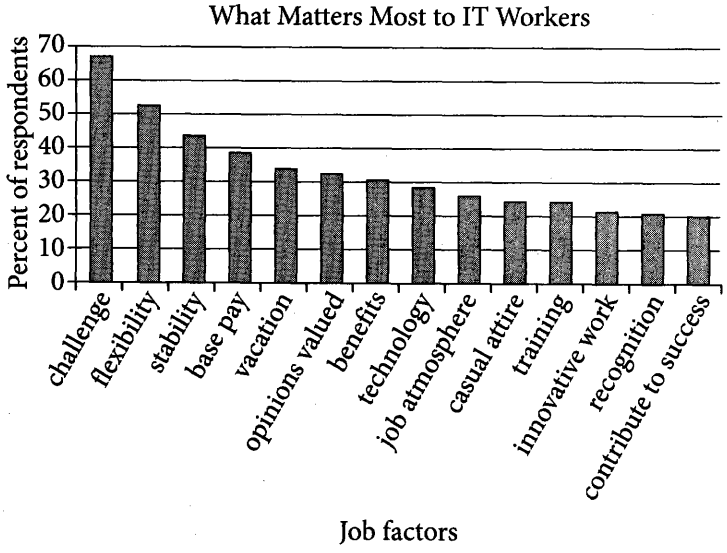
One key question in the survey asked: "What matters most to you about your job?" It then listed thirty-eight factors from which respondents could check one or more. Just from glancing at the initial results, one bottom line is clear: money is an important but insufficient motivator (see "Job factors" graph). Base pay ranked fourth as a factor, selected by 38.5 percent of respondents. Nearly twice as many selected "challenge of job/responsibility," making it the top-ranked factor. Interestingly, the ability to share in the financial upside through stock options did not even make the top twenty: fewer than 10 percent of all people selected it.

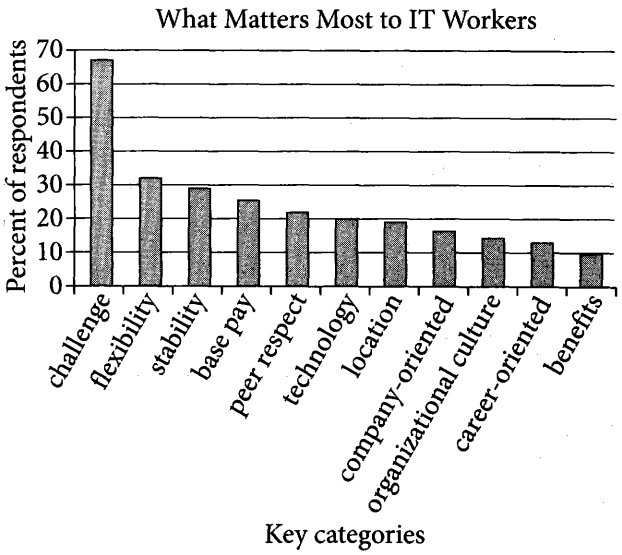
When we sorted the thirty-eight individual job factors in the *Information Week* survey into eleven broad clusters, challenge remained by far the top-ranked factor, followed by flexibility and job stability (see "Key categories" graph). Compensation was again fourth, followed by peer respect, technology and location; and further down the list were company orientation, organizational culture, career orientation and benefits.

The things that matter to IT workers tend to stay fairly constant as economic conditions change. To determine this, I compared the *Information Week* surveys for two consecutive years. The surveys are taken early in the year and the one for 2000 was done before the high-tech downturn, when the stock-option dream was supposedly hottest. The 2001 survey came after the NASDAQ crash had supposedly wiped out the dream. The same three general attributes—a challenging job, a flexible workplace and job stability—topped the list in both years. Only a small percentage of people in each survey, the roughly 10 percent cited above, ranked stock options as being very important. Both before and after the crash, pay was generally important, but not nearly so much as intrinsic rewards. What people value and desire in their work is not contingent on the stock market or the rise and fall of the tech sector.

[1] Contracts that allow employees to buy shares in the company at a fixed price, typically below market rate

CONTINUE





Source: Data from *Information Week* Salary Survey, 2001; analysis by Richard Florida and Kevin Stolarick.

10

The primary purpose of the passage is to

A) explain why people seek employment in IT industries.

B) compare the motivations of IT workers and non-IT workers.

C) report information about the professional values of IT workers.

D) highlight the diverse goals of IT workers.

11

In the first paragraph, the author refers to the number of people who completed the survey primarily to

A) concede that some types of IT workers may not be represented in the data.

B) explain why he and his research partner sorted the data into new categories.

C) underscore the broad range of values among the survey respondents.

D) establish the scope of the data captured in the survey.

12

The author indicates that the evidence about IT workers' attitudes that he presents is

A) corroborated by employers' descriptions of their IT workers' attitudes.

B) representative of the attitudes of IT workers in a variety of fields.

C) at odds with the findings of earlier research on IT workers' attitudes.

D) consistent with the popular view of IT workers' attitudes.

13

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

A) Lines 1-4 ("For all . . . workers")

B) Lines 17-19 ("Of these . . . management")

C) Lines 21-24 ("But it . . . economy")

D) Lines 26-28 ("On the . . . Class")

CONTINUE

14

As used in line 37, "raw" most nearly means

A) approximate.
B) unprocessed.
C) natural.
D) unprotected.

15

The author suggests which of the following about the compensation packages that employers offered to IT workers in the late 1990s?

A) Those packages largely failed to lure IT workers in the numbers that employers had hoped.
B) IT workers tended to reject those packages for jobs that presented greater professional challenges.
C) The costs of those packages to employers were generally not worth the increases in employee productivity.
D) Those packages included an incentive that had relatively little effect on IT workers' job satisfaction.

16

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

A) Lines 30-31 ("On the . . . money")
B) Lines 31-35 ("They . . . them")
C) Lines 49-52 ("Interestingly . . . it")
D) Lines 62-63 ("The things . . . change")

17

As used in line 51, "make" most nearly means

A) create.
B) reach.
C) enact.
D) constitute.

18

In the fourth paragraph (lines 53-61), the author describes how he and his research partner created the "Key categories" graph by reorganizing the data in the "Job factors" graph. Which statement best describes an effect of presenting the data differently in the "Key categories" graph than in the "Job factors" graph?

A) "Challenge" appears to be more significant among the responses in the "Key categories" graph than it does in the "Job factors" graph.
B) "Challenge" appears to have been selected by a greater percentage of respondents in the "Key categories" graph than in the "Job factors" graph.
C) Financial compensation appears to be unrepresented among responses in the "Key categories" graph, despite its prominence in the "Job factors" graph.
D) The difference between the most popular response and the least popular response appears to be smaller in the "Key categories" graph than it appears to be in the "Job factors" graph.

CONTINUE

Questions 19-28 are based on the following passage.

This passage is adapted from Erin Biba, "A Superplume Is the Reason Africa Is Splitting Apart." ©2014 by Scientific American, a division of Nature America, Inc.

Africa is splitting in two. The reason: a geologic rift runs along the eastern side of the continent that one day, many millions of years in the future, will be replaced with an ocean. Scientists have argued for decades about what is causing this separation of tectonic plates. Geophysicists thought it was a superplume, a giant section of the earth's mantle that carries heat from near the core up to the crust. As evidence, they pointed to two large plateaus (one in Ethiopia and one in Kenya) that they said were created when a superplume pushed up the mantle. Geochemists were not able to confirm that theory. Instead they thought there might be two small, unrelated plumes pushing up the plateaus individually. The theories did not align, says David Hilton, a geochemist at the Scripps Institution of Oceanography in La Jolla, California. "There was a mismatch between the chemistry and the physics."

So in 2006 and 2011 Hilton headed to East Africa to see whether he could lay the argument to rest. He and his team decided to use gases emanating from the rift to determine how it was created. Donning gas masks, they hiked to the tops of volcanoes in Tanzania and Ethiopia and climbed into *mazuku* (the Swahili word for "evil wind")—geothermal vents and depressions where deadly gases accumulate and often kill animals. At these locations, the team collected samples of rocks deposited during eruptions, including olivines, crystals that trap volcanic gases like a bottle.

Back home in California, Hilton crushed the rocks inside a vacuum to release their gases. He was looking for helium-3, an isotope of helium present when the planet was forming that was trapped in the earth's core. Hilton figured that if rocks around both the Ethiopian and Kenyan plateaus contained this primordial gas, that would at least confirm that underground mantle plumes created them. The readings showed that, indeed, both plateaus contained helium-3. But Hilton and his group still had to wonder: Was one superplume behind it all? Or were there a couple of lesser plumes?

To answer this question, they turned to another primordial gas trapped in the mantle: neon-22. They found that neon-22 existed in both plateaus and that the ratios of helium to neon in those locations matched, according to results published in April 2014 in *Geophysical Research Letters*. That meant that the plume underneath both plateaus was of the same material and of the same age. Hence, there was one common superplume. The geophysicists, it turns out, had been right all along.

"The 'naysayers' who claim that the rifting and plume activity are unconnected—and some who would even deny a mantle plume is present—no longer have a leg to stand on," says Pete Burnard, a geochemist at the French National Center for Scientific Research, who was not involved in the latest work.

The African superplume will provide scientists with easier access to study the earth's inner workings (another lies underneath the Pacific Ocean). Hilton and his team are now measuring how much carbon the mantle in East Africa is releasing, how old it is and if it has been recycled from carbon originally captured on the surface billions of years ago. This information, Hilton says, will help geologists figure out how the earth's layers interact on a longer time scale, including the hundreds of millions of years it takes for continents to form—and split.

19

The primary purpose of the passage is to

A) describe research that helps to resolve a scientific debate.

B) explain the origins of a rivalry between two groups of scientists.

C) discuss the historical development of a scientific theory.

D) summarize the differences between two scientific disciplines.

20

As used in line 15, "align" most nearly means

A) agree.

B) adjust.

C) straighten.

D) follow.

CONTINUE

21

As used in line 22, "determine" most nearly means

A) regulate.
B) direct.
C) impose.
D) learn.

22

According to the passage, Hilton and his team climbed into the *mazuku* in order to

A) determine what was killing the local animals.
B) gather rocks that contained primordial gases.
C) study the causes of past volcanic eruptions.
D) measure the sizes of the two plateaus.

23

It can most reasonably be inferred from the passage that Hilton evaluated multiple characteristics of the samples he gathered because

A) the presence of helium-3 in the samples is insufficient to show whether the plateaus the samples came from were formed by the same plume.
B) isotopes of helium found in the samples are also found in rocks that are younger than the plateau on which the samples were found.
C) initial data from the samples suggested that the samples originated from a single plateau despite having been collected from separate plateaus.
D) the samples initially appeared to be more similar in composition to olivines than to rocks formed through plume activity.

24

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

A) Lines 32-35 ("He was . . . core")
B) Lines 35-38 ("Hilton . . . them")
C) Lines 38-40 ("The readings . . . helium-3")
D) Lines 40-42 ("But Hilton . . . plumes")

25

Which statement best expresses an assumption that allowed Hilton to reach the main conclusion he drew from the data?

A) If the rocks from the Ethiopian and Kenyan plateaus contain high amounts of helium-3 and neon-22, they must have been created by a single superplume.
B) If the Ethiopian and Kenyan plateaus are the same age, they were likely once part of the same tectonic plate that has since split in two.
C) If the mantle beneath the Ethiopian and Kenyan plateaus is releasing an extensive amount of carbon, that carbon was likely captured from the surface early in Earth's history.
D) If the plumes beneath the Ethiopian and Kenyan plateaus have similar compositions and formed at the same time, they are likely the same plume.

26

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

A) Lines 43-44 ("To answer . . . neon-22")
B) Lines 48-51 ("That meant . . . superplume")
C) Lines 63-67 ("Hilton . . . ago")
D) Lines 67-71 ("This . . . split")

CONTINUE

27

Burnard's remarks in the fifth paragraph (lines 53-59) suggest that there are some people who

A) do not believe that mantle plumes can have any noticeable effects on surface features.

B) argue that the theory advanced by geophysicists is essentially identical to the theory advanced by geochemists.

C) reject the basic point of agreement between the geophysicists and geochemists studying the African rift.

D) question whether there is a connection between mantle plumes and the primordial gases preserved in olivines.

28

The last paragraph primarily serves to

A) explain the process by which superplumes may form in other parts of Africa.

B) acknowledge some objections to Hilton's claims about the African superplume.

C) review the evidence proving the existence of the African superplume.

D) indicate future research possibilities regarding the African superplume.

Questions 29-38 are based on the following passages.

Passage 1 is adapted from Frank La Rue, "Report of the Special Rapporteur on the Promotion and Protection of the Right to Freedom of Opinion and Expression." ©2011 by United Nations. Passage 2 is adapted from Vinton G. Cerf, "Internet Access Is Not a Human Right." ©2012 by The New York Times Company.

Passage 1

Unlike any other medium of communication, such as radio, television and printed publications based on one-way transmission of information, the Internet represents a significant leap forward as an interactive medium. By enabling individuals to exchange information and ideas instantaneously and inexpensively across national borders, the Internet allows access to information and knowledge that was previously unattainable. This, in turn, contributes to the discovery of the truth and progress of society as a whole.

Indeed, the Internet has become a key means by which individuals can exercise their right to freedom of opinion and expression, as guaranteed by article 19 of the Universal Declaration of Human Rights and the International Covenant on Civil and Political Rights. The latter provides that:

(a) Everyone shall have the right to hold opinions without interference;

(b) Everyone shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of his choice;

(c) The exercise of the rights provided for in paragraph 2 of this article carries with it special duties and responsibilities. It may therefore be subject to certain restrictions, but these shall only be such as are provided by law and are necessary:

(d) for respect of the rights or reputations of others;

(e) for the protection of national security or of public order (*ordre public*), or of public health or morals.

By explicitly providing that everyone has the right to express him- or herself through any media, the Special Rapporteur underscores that article 19 of the Universal Declaration of Human Rights and the Covenant was drafted with foresight to include and to accommodate future technological developments

CONTINUE

through which individuals can exercise their right to freedom of expression. Hence, the framework of international human rights law remains relevant today and equally applicable to new communication technologies such as the Internet.

Passage 2

Over the past few years, courts and parliaments in countries like France and Estonia have pronounced Internet access a human right.

But that argument, however well meaning, misses a larger point: technology is an enabler of rights, not a right itself. There is a high bar for something to be considered a human right. Loosely put, it must be among the things we as humans need in order to lead healthy, meaningful lives, like freedom from torture or freedom of conscience. It is a mistake to place any particular technology in this exalted category, since over time we will end up valuing the wrong things. For example, at one time if you didn't have a horse it was hard to make a living. But the important right in that case was the right to make a living, not the right to a horse. Today, if I were granted a right to have a horse, I'm not sure where I would put it.

The best way to characterize human rights is to identify the outcomes that we are trying to ensure. These include critical freedoms like freedom of speech and freedom of access to information—and those are not necessarily bound to any particular technology at any particular time. Indeed, even the report by the United Nations' special rapporteur, which was widely hailed as declaring Internet access a human right, acknowledged that the Internet was valuable as a means to an end, not as an end in itself.

What about the claim that Internet access is or should be a *civil right*? The same reasoning above can be applied here—Internet access is always just a tool for obtaining something else more important—though the argument that it is a civil right is, I concede, a stronger one than that it is a human right. Civil rights, after all, are different from human rights because they are conferred upon us by law, not intrinsic to us as human beings.

Yet all these philosophical arguments overlook a more fundamental issue: the responsibility of technology creators themselves to support human and civil rights. The Internet has introduced an enormously accessible and egalitarian platform for creating, sharing and obtaining information on a global scale. As a result, we have new ways to allow people to exercise their human and civil rights.

In this context, engineers have not only a tremendous obligation to empower users, but also an obligation to ensure the safety of users online.

29

The author of Passage 1 regards the Internet as a medium of communication that is

A) invaluable, because it spurs the ongoing development of international human rights laws.

B) underutilized, because it is rarely employed to spread information about individuals' guaranteed freedoms.

C) intriguing, because it requires a radically new interpretation of existing legal frameworks.

D) beneficial, because it supports the overall improvement of global society.

30

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

A) Lines 1-5 ("Unlike . . . medium")

B) Lines 5-11 ("By enabling . . . whole")

C) Lines 12-17 ("Indeed . . . Rights")

D) Lines 43-46 ("Hence . . . Internet")

31

As used in line 17, "provides" most nearly means

A) supplies.

B) acquires.

C) states.

D) accepts.

CONTINUE

32

Over the course of Passage 2, the main focus shifts from

A) an argument about how Internet access should be categorized to an assertion of the responsibilities of technology creators.

B) an explanation of why access to the Internet has been deemed a human right to a rejection of claims that it is either a human or a civil right.

C) a discussion of the personal freedoms enabled by Internet use to a warning about how the Internet might be exploited to limit such freedoms.

D) a summary of recent developments in two governments' approaches to technology and human rights to a forecast of likely future developments.

33

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

A) crucial.

B) instant.

C) demanding.

D) precise.

34

Which potential objection to his argument does the author of Passage 2 address?

A) Technology creators have already demonstrated their commitment to supporting rights on the Internet.

B) People may be entitled to Internet access according to a standard other than that of human rights.

C) France and Estonia are not the only countries to proclaim Internet access a human right.

D) Most definitions of human rights are too subjective to be useful in determining whether or not Internet access is a right.

35

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

A) Lines 53-56 ("Loosely . . . conscience")

B) Lines 56-62 ("It is . . . to a horse")

C) Lines 75-82 ("The same . . . beings")

D) Lines 83-90 ("Yet . . . rights")

36

Passage 1 and Passage 2 characterize the Internet as

A) a communications medium unlike any that has come before it.

B) a tremendous opportunity for information sharing.

C) a potential instrument of repression as well as freedom.

D) an unrivaled source of wisdom and insight.

CONTINUE

37

Passage 1 and Passage 2 suggest that the Internet can be a political tool used primarily for

A) strengthening national solidarity.

B) promoting civic engagement.

C) safeguarding domestic security.

D) practicing essential freedoms.

38

Which choice best identifies a way in which the author of each passage uses evidence to develop and support his ideas?

A) Passage 1 cites international laws to argue that such laws should continue to be enforced; Passage 2 paraphrases the United Nations report to highlight the appeal of a particular point of view.

B) Passage 1 cites early reactions to radio, television, and print to demonstrate the impact of new communication mediums; Passage 2 invokes broad philosophical principles as the basis of its argument for a change in policy.

C) Passage 1 cites a legal decision to demonstrate how certain rights should be enforced; Passage 2 summarizes the standard definition of a human right in order to contest it.

D) Passage 1 cites a section of an international agreement to demonstrate the agreement's applicability; Passage 2 uses a hypothetical example to illustrate a key point about outmoded technology.

CONTINUE

Questions 39-47 are based on the following passage and supplementary material.

This passage is adapted from Terrence McCoy, "The Surprisingly Simple Way Egyptians Moved Massive Pyramid Stones without Modern Technology." ©2014 by The Washington Post.

Few have traveled to the pyramids of Egypt and not wondered how an ancient civilization without modern technology could have constructed structures so large they can be viewed from space.

Perhaps the most confounding mystery of all involves how incredibly large stones made their way to the middle of the desert without massive mechanical assistance.

The truth, researchers at the University of Amsterdam announced in a study published in the journal *Physical Review Letters*, may actually be quite simple. It has long been believed that Egyptians used wooden sleds to haul the stone, but until now it hasn't been entirely understood how they overcame the problem of friction. It amounts to nothing more, scientists say, than a "clever trick."

They likely wet the sand. According to the study authors, "Research . . . revealed that the Egyptians probably made the desert sand in front of the sledge wet."

It has to do with physics. The sort of sledges the Egyptians used to transport the two-ton loads of stone were pretty rudimentary. They were wooden planks with upturned edges. Dragging something that heavy through hot sand would—unsurprisingly—dig into the grains, creating a sand berm that would make progress nearly impossible. It "was perhaps observed by the Egyptians that in [a] dry case, a heap of sand forms in front of the sled before it can really start to move," says the study, authored by a team of eight researchers led by Daniel Bonn.

The only way around that problem would be to constantly clear the sand out of the way, making a tedious process even more tedious.

Damp sand, however, operates very differently. According to the research, "sliding friction on sand is greatly reduced by the addition of some—but not that much—water." So, researchers placed a laboratory version of an Egyptian sledge in a bin of sand that had been dried in the oven. Then they threw down some water, and measured the grains' stiffness. If the water had the appropriate level of wetness, something called "capillary bridges"—extremely small droplets of water that glue together individual grains of sand—would form.

These bridges not only stopped the sled from forming sand berms but also cut by half the amount of force required to move the cart. "I was very surprised by the amount the pulling force could be reduced—by as much as 50 percent—meaning that the Egyptians needed only half the men to pull over wet sand as compared to dry," Bonn told *The Washington Post*.

Indeed, he says the experiments showed the required force decreased in proportion to the sand's stiffness. "In the presence of the correct quantity of water, wet desert sand is about twice as stiff as dry sand," the university says. "A sledge glides far more easily over firm desert sand simply because the sand does not pile up in front of the sledge as it does in the case of dry sand."

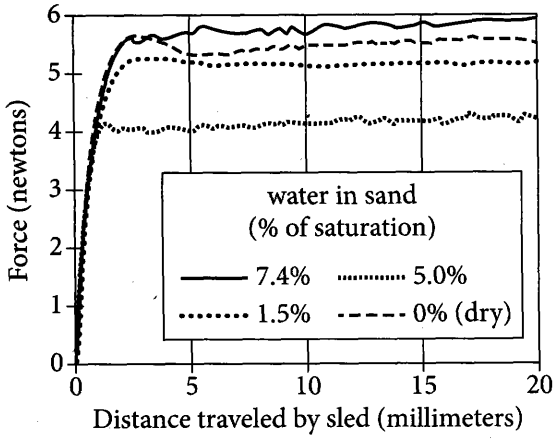
Adding more evidence to the conclusion that Egyptians used water is a wall painting in the tomb of Djehutihotep. A splash of orange and gray, it appears to show a person standing at the front of a massive sledge, pouring water onto the sand just in front of the progressing sled. What this man was doing has been a matter of great debate and discussion.

"This was the question," Bonn wrote in an e-mail to *The Post*. "In fact, Egyptologists had been interpreting the water as part of a purification ritual, and had never sought a scientific explanation."

He said the experiment not only solved "the Egyptian mystery, but also shows, interestingly, that the stiffness of sand is directly related to the friction force."

CONTINUE

Force Required to Move Sled over Wet and Dry Sand



Adapted from A. Fall et al., "Sliding Friction on Wet and Dry Sand." ©2014 by American Physical Society.

39

Which choice best represents the meanings of "massive" as used in line 7 and line 67, respectively?

A) Prominent; bulky
B) Extreme; rough
C) Considerable; huge
D) Tiresome; grand

40

As described in the passage, the researchers primarily regard the ancient Egyptians' method of dealing with friction as

A) inconsistent in that it likely failed as often as it succeeded.
B) strongly indicative of sophisticated scientific knowledge.
C) forward thinking in its use of technology to overcome a physical impediment.
D) ingeniously straightforward in solving a fundamental problem.

41

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

A) Lines 12-16 ("It has . . . trick")
B) Lines 24-27 ("Dragging . . . impossible")
C) Lines 37-41 ("According . . . oven")
D) Lines 43-46 ("If the . . . form")

42

When the author writes that damp sand "operates very differently" (line 36), he most nearly means that it

A) exerts unusual power.
B) exhibits rare properties.
C) functions another way.
D) has other uses.

43

It can most reasonably be inferred that before the completion of the research discussed in the passage, Bonn had expected to observe a

A) direct correlation between the stiffness of sand and the friction acting on the sled.
B) strong link between Egypt's ancient structures and its rituals involving pouring water onto sand.
C) disproportionate relationship between the actual and perceived effort required to drag an object through sand.
D) comparatively small effect of dampness in sand on the amount of pulling force needed.

44

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

A) Lines 28-32 ("It . . . Bonn")
B) Lines 49-54 ("I was . . . *Post*")
C) Lines 55-57 ("Indeed . . . stiffness")
D) Lines 75-78 ("He said . . . force")

CONTINUE

45

The passage states that the wall painting in the Djehutihotep tomb had been understood by many Egyptologists as illustrating a

A) common domestic activity.

B) famous philosophical debate.

C) particular spiritual rite.

D) transformative historical event.

46

According to the figure, the force on the sled at 10 millimeters in sand at 5.0% saturation is closest to

A) 3.5 newtons.

B) 4 newtons.

C) 5 newtons.

D) 5.5 newtons.

47

Which statement about the force on the sled in relation to distance traveled by the sled best reflects the data presented in the figure?

A) The force remained fairly constant between 5 and 20 millimeters when the sled was traveling over sand in any of the conditions evaluated.

B) The greatest change in force required to move the sled over sand with a saturation level of 5.0% occurred between 10 and 15 millimeters.

C) The force at 5 millimeters was the greatest force required when the sled was traveling over dry sand.

D) The force increased sharply between 0 and 5 millimeters when the sled was traveling over wet sand only.

STOP

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

No Test Material On This Page

Writing and Language Test

35 MINUTES, 44 QUESTIONS

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

DIRECTIONS

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

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

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

Questions 1-11 are based on the following passage.

The Secret Lives of Salamanders

Though they have a seemingly inconspicuous presence in deciduous forests, salamanders 1 actually play a significant role in the global carbon cycle. Salamanders, a type of amphibian, are the most common vertebrates in North American forests. They are typically small, measuring only a few inches and 2 weigh less

1

The writer wants to introduce the main idea of the passage. Which choice best accomplishes this goal?

A) NO CHANGE
B) are disappearing from forest landscapes at a disturbing rate.
C) have been described as the top predator in woodland areas.
D) are in fact more easily studied than many other forest-dwelling species.

2

A) NO CHANGE
B) weighed
C) in weight
D) weighing

CONTINUE

than an 3 ounce. They have voracious appetites: a salamander eats, on average, the equivalent of twenty ants, one beetle, and two beetle larvae per day. The consumption of so many insects not only satisfies a salamander's appetite but also is good for the forest environment.

Beetles, ants, and other insects that inhabit the forest floor break down dead organic matter like leaf litter, which contains carbon. 4 Decomposition of the leaf litter begins when insects shred the leaves into tiny pieces, 5 they are digested by microbes in the soil. As the microbes convert the carbon in the leaves into an energy source for their own needs, they release either carbon dioxide or methane (both are greenhouse 6 gases, depending on the concentration of oxygen in the soil. Increasing concentrations of these greenhouse gases in the atmosphere are well known to be harmful for the environment, so keeping carbon sequestered in leaves on the forest floor may lead to healthier forest ecosystems.

3

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

A) ounce, but they have
B) ounce after they have
C) ounce because they have
D) ounce, which leads to having

4

The writer is considering adding the following sentence.

> Several species of fungi undergo a similar process using decaying wood as their source of organic matter.

Should the writer make this addition here?

A) Yes, because it provides a second example of the carbon cycle.
B) Yes, because it underscores the need to understand a salamander's forest environment.
C) No, because it distracts from the discussion of the role insects play in releasing carbon.
D) No, because it makes a claim that is better placed in the previous paragraph.

5

A) NO CHANGE
B) which are then digested
C) then these are digested
D) digestion then occurs

6

A) NO CHANGE
B) gases),
C) gases—
D) gases

CONTINUE

To study how salamanders affect carbon sequestration, a team led by Dr. Hartwell Welsh Jr., a herpetologist at the USDA Forest Service, 7 set up an experiment on a patch of forest floor in Northern California. The patch was 8 even separated into enclosures—some with salamanders and some without—with equal amounts of leaf litter and insects initially. After a year, the enclosures with salamanders had fewer insects and roughly 13 percent more leaf litter than those without. Thus, by preying on insects, salamanders decreased the overall level of leaf shredding taking place on the forest floor and increased the amount of carbon remaining there.

7

A) NO CHANGE
B) put forth
C) put up
D) set on

8

A) NO CHANGE
B) also
C) thus
D) DELETE the underlined portion.

CONTINUE

The large population sizes of the many species of salamanders in a forest and **9** they're high rate of daily insect consumption make salamanders one of the most effective organisms on the planet at sequestering carbon before it escapes as greenhouse gases. Unfortunately, many species of salamanders are declining in numbers, primarily because of habitat **10** knockdown through deforestation. The discovery of salamanders' ability to keep extra carbon from entering the atmosphere **11** ensures that research will continue into diverse ways of reducing harmful greenhouse gases and mitigating the damage they cause.

9

A) NO CHANGE
B) their
C) its
D) DELETE the underlined portion.

10

A) NO CHANGE
B) demolition
C) destruction
D) bashing

11

The writer wants a conclusion to the passage that responds to the information in the previous sentence. Which choice best accomplishes this goal?

A) NO CHANGE
B) could lead to greater interest in the complex process of breaking down organic matter into nourishment for microbes.
C) will hopefully inspire scientists to intensify their investigations into why other animal populations have been diminishing in certain regions of the United States.
D) highlights the importance of conserving the forest habitats of salamanders so that they can continue to perform this vital function for many years to come.

CONTINUE

Questions 12-22 are based on the following passage.

From Artist to Archaeologist

[1] Though having little formal education, 12 a standout talent was possessed by young Howard Carter: he could draw. [2] He sometimes accompanied his father, a well-respected illustrator and 13 painter on visits to his clients, including the well-connected Amherst family, who had an amateur interest in Egyptian archaeology. [3] These sketches so 14 impressed and affected the Amhersts that they recommended him to the Egyptologist Percy Newberry, who hired him as a member of his expedition to the tombs of Egypt. [4] Carter fell in love with the Amhersts' collection of Egyptian artifacts and began sketching them in his free time. [5] In 1891, seventeen-year-old Howard Carter left his native England for the Egyptian desert. 15

12

A) NO CHANGE
B) one of young Howard Carter's talents stood out:
C) the young Howard Carter had one standout talent:
D) there was one talent that stood out for the young Howard Carter:

13

A) NO CHANGE
B) painter,
C) painter—
D) painter;

14

A) NO CHANGE
B) amazed, impressed, and astounded
C) amazed and astounded
D) impressed

15

To make this paragraph most logical, sentence 4 should be placed

A) where it is now.
B) after sentence 1.
C) after sentence 2.
D) after sentence 5.

CONTINUE

Carter worked closely with Newberry that first year on the expedition, and he learned quickly. The expedition team lived in the excavation site of Beni Hasan, where Carter spent much of his time making tracings of wall art. He found that Newberry's method of reproducing Egyptian drawings— **16** the results of which Newberry later intended to publish in a book about his expedition— resulted in poor copies of the art that Carter so loved. Inevitably, dirt, decay, and other imperfections within the tombs made tracings **17** erratic and often ugly. But the teenage Carter was in no position to argue with his superior. Despite his misgivings about this method, he dutifully followed the instructions of Newberry and other supervisors at various locations during his first two years in Egypt.

16

Which choice provides the most effective supporting detail regarding Newberry's method of reproduction?

A) NO CHANGE
B) carried out by a team of artists and their apprentices—
C) tracing the lines on large sheets of paper and sending the tracings to England to be inked in—
D) the principal aim of which was to create copies of the drawings that could be distributed to interested scholars—

17

A) NO CHANGE
B) fickle
C) temperamental
D) unsettled

CONTINUE

18 If Carter was homesick for England after being away for two years, he did not show it. This was his big chance to change things. As a draftsman, Carter was tasked with producing highly accurate and technically 19 detailed: illustrations and sketches, of both dig sites and finds. During this time, he began to replace 20 that method of tracing wall art with a more naturalistic mode of representation based on his skill as a sketch artist. His line drawings and watercolor illustrations were considered so much better than the tracings that they were featured prominently in the official publications of the expedition's findings.

18

Which choice provides the best transition from the previous paragraph?

A) NO CHANGE
B) After his third year with Newberry, Carter was assigned to work as a draftsman during the excavation of the Temple of Hatshepsut.
C) One of the other supervisors Carter worked under was the Egyptologist Flinders Petrie, who was considered a pioneer in the preservation of artifacts.
D) In the late nineteenth century, many Europeans became interested in Egyptology, but Carter was one of the few who got to participate in an expedition.

19

A) NO CHANGE
B) detailed, illustrations, and sketches,
C) detailed—illustrations and sketches
D) detailed illustrations and sketches

20

A) NO CHANGE
B) a
C) Newberry's
D) this

CONTINUE

Over the next six years, Carter's artistic ability gained him so much 21 respect, at the young age of twenty-five he was appointed chief inspector of the Antiquities Service of Upper Egypt. 22 Percy Newberry later became a professor of ancient history and archaeology at Cairo University. In the years that followed, the reputation Carter earned enabled him to participate in many important expeditions and, later in his career, make perhaps the most famous archaeological find of the twentieth century: the tomb of King Tut.

21

A) NO CHANGE
B) respect to where
C) respect that
D) respect, thus

22

Which choice is most pertinent to the development of the passage?

A) NO CHANGE
B) The Antiquities Service was part of the Egyptian Ministry of Culture, but it has since become an independent organization now known as the Ministry of State for Antiquities.
C) This post legitimized him as an Egyptologist and put him in a position of authority.
D) A few years later, Carter would transfer to become chief inspector of Lower Egypt.

CONTINUE

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

Small Farming Is a Growing Field

In 1900, 90 out of every 100 American workers were 23 farmers today the figure is closer to 1 out of 100, according to Farm Aid, a nonprofit organization supporting family farming. The last century has also seen industrial farms 24 largely supplant modest family farms by taking their place. However, particularly among those 25 beneath 35 years, small farming has enjoyed a resurgence over the last few decades. This recent change to the established demographics of agriculture is a big reason small farming deserves attention as a possible career choice.

23

A) NO CHANGE
B) farmers; today
C) farmers, today,
D) farmers: today—

24

A) NO CHANGE
B) supplant modest family farms, which are not industrial.
C) largely supplant modest family farms.
D) supplant and replace modest family farms.

25

A) NO CHANGE
B) under the age of 35,
C) not yet attaining 35,
D) aging less than 35 years,

CONTINUE

Chris and Annie Newman are part of the burgeoning crop of young farmers, a group that's growing faster than nearly all other segments of the farming population. The couple left jobs in computer science and the arts to pursue 26 "guerrilla farming." This is a set of practices designed to facilitate self-sustaining agriculture, promote public health, and 27 encouraging environmental stewardship. Inspired by the customs of Chris's Piscataway Indian ancestors, 28 growing food without chemicals or costly equipment is what the Newmans have done. For those wishing to enrich themselves and their surroundings, guerrilla farming can be an ideal fit: practitioners farm in environmentally responsible ways, establish bonds with members of their community, and renew centuries-old agricultural methods.

26

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

A) "guerrilla farming," a set of practices
B) "guerrilla farming," which, as a set of practices, is
C) "guerrilla farming"; this is a set of practices
D) a set of practices—otherwise known as "guerrilla farming"—

27

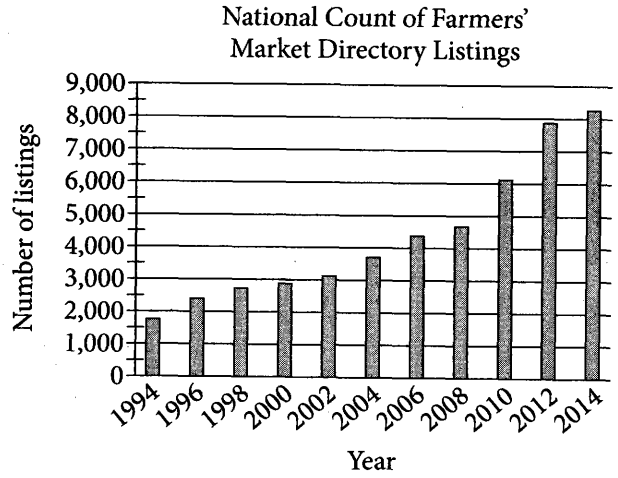
A) NO CHANGE
B) to encourage environmental stewardship as well.
C) by encouraging environmental stewardship.
D) encourage environmental stewardship.

28

A) NO CHANGE
B) food has been grown by the Newmans without chemicals or costly equipment.
C) the Newmans have been growing food without chemicals or costly equipment.
D) chemicals and costly equipment have not been used by the Newmans in growing food.

CONTINUE

For many such small farmers, an appealing result of this return to historical practices 29 are a marked increase in 30 prices of fruit at farmers' markets over the last several years. Direct-to-consumer approaches also include community-supported agriculture (CSA), in which customers purchase shares in a future harvest. 31 Indubitably, farmers bypass grocery stores to reach their customers, who can buy products on the spot (in a farmers' market) or pledge money to receive regular distributions of products (in a CSA). The evidence suggests these alternative business models are 32 unpopular. For one, the number of farmers' markets more than quadrupled between 1994 and 2014, rising from 1,755 to 8,268. There are now also 6,000 CSAs nationwide, and annual revenue for direct-to-consumer agricultural sales exceeds $1.2 billion.



Adapted from USDA Agricultural Marketing Service, Marketing Services Division, "National Count of Farmers Market Directory Listing Graph: 1994–2014."

29

A) NO CHANGE
B) is
C) have been
D) had been

30

Which choice most effectively leads into the central discussion in the paragraph?

A) NO CHANGE
B) the number of farm stands and farmers' markets near big cities and major metropolitan areas.
C) opportunities to offer products directly to buyers, often at local farm stands and farmers' markets.
D) distances people are willing to travel to visit a farm stand or farmers' market.

31

A) NO CHANGE
B) However,
C) Nevertheless,
D) In effect,

32

Which choice is best supported by the information in the graph?

A) NO CHANGE
B) declining.
C) stagnating.
D) flourishing.

CONTINUE

33 Despite these auspicious statistics, those who decide to become small farmers face considerable obstacles. Nearly 80 percent of young farmers today did not grow up on farms, according to the National Young Farmers Coalition. The tasks they face of purchasing land, acquiring capital, and learning skills can be onerous. Still, as the Newmans and many others point out, small farming can bring a sense of belonging and purpose. On his Sylvanaqua Farms in rural Virginia, Chris reflects, "Farming's not simple. You've got to be smart to do it. But people are really attached to us being here."

33

Which choice most logically connects the information from the previous paragraph with what follows in this paragraph?

A) NO CHANGE
B) Even though the number of young farmers is rising,
C) In addition to the environmental benefits of small farming,
D) Since small farming is a complex profession,

CONTINUE

Questions 34-44 are based on the following passage.

The Russian Folklorist

Because they exhibit the values prized within a culture, 34 folktales have long been considered among the most representative forms of national literature. One man who 35 saw his work censored by the government was the nineteenth-century Russian scholar Alexander Afanasyev. He was deeply interested in Russian culture and 36 history. This was at a time in Russia when oral storytelling traditions were in decline. Recognizing that the oral tales of his native Russia were in peril, and inspired by folktale preservationists such as the Brothers Grimm in Germany, Afanasyev was determined to preserve Russia's rich folktales.

34

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

folktales—stories passed down orally—

Should the writer make this revision?

A) Yes, because it sets up an argument that is made in the paragraph.
B) Yes, because it provides clarification of a term used throughout the passage.
C) No, because it introduces information that is not supported by evidence.
D) No, because it includes information unrelated to the main topic of the paragraph.

35

Which choice provides the best transition to the information that follows in the paragraph?

A) NO CHANGE
B) studied law at Moscow University
C) produced studies of Romantic literature
D) recognized the importance of the genre

36

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

A) history in Russia
B) history at a time
C) history, and this was
D) history: at the time in Russia, this was

CONTINUE

From 1855 to 1863, Afanasyev compiled and published *Russian Fairy* 37 *Tales.* An immense collection containing over 600 tales. In it, he disseminated versions of tales such as "The Frog Princess" and "The Golden Slipper." The work 38 savored immediate popularity: 39 the first publication of *Russian Fairy Tales* sold out completely. Several years later, in 1870, Afanasyev published *Russian Children's Tales*, a collection of 61 of his tales in which he adapted the stories to appeal to children and replaced some of the more difficult words with easier ones. This work, too, was well received and, like Afanasyev's other collections, 40 have been reprinted and translated numerous times. Many other Russian folktale collections would be published in the century that followed, but none attained the popularity of Afanasyev's work.

37

A) NO CHANGE
B) *Tales*, it was an
C) *Tales*, an
D) *Tales*; being an

38

A) NO CHANGE
B) tasted
C) relished
D) enjoyed

39

Which choice best supports the claim made in the first part of the sentence?

A) NO CHANGE
B) *Russian Fairy Tales* was published in eight small books, or fascicles.
C) literary and historical scholars still study *Russian Fairy Tales* today.
D) Afanasyev said that *Russian Fairy Tales* contained "morality, truth, and human love."

40

A) NO CHANGE
B) were
C) has been
D) were being

CONTINUE

In addition to being popular, Afanasyev's work was 41 innovative. Whenever possible, Afanasyev provided the sources of the tales, the places where the tales were originally told, and any other relevant background information. Such details helped ground 42 each tale in their specific cultural context. He also did not give preference to any one version of a tale; if he was told several versions of the same tale, he included all of them. By doing so, Afanasyev maintained the integrity and authenticity of the tales and captured their roots in the oral storytelling tradition, which had given rise to many different versions of a single tale. What Afanasyev chose to 43 include: ultimately distinguished his tales from those of other European folklorists of the time.

While folktales help characterize and even define a particular country or culture, they also, perhaps paradoxically, contain messages that are universally appealing and relatable. Afanasyev not only immortalized an important part of Russian history and 44 culture but also helped transmit the tales and their messages to readers worldwide. Indeed, Afanasyev's folktales are still beloved by children and adults alike and continue to communicate the importance of cultural pride and preservation.

41

Which choice best introduces the main idea of the paragraph?

A) NO CHANGE
B) cherished by many.
C) occasionally controversial.
D) accessible.

42

A) NO CHANGE
B) each tale in its
C) each tale in their own
D) all the tales in its own

43

A) NO CHANGE
B) include
C) include,
D) include;

44

A) NO CHANGE
B) culture and helped
C) culture, but helping
D) culture, also helping

STOP

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

No Test Material On This Page

Math Test – No Calculator

25 MINUTES, 17 QUESTIONS

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

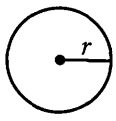
DIRECTIONS

For questions 1-13, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 14-17**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 14 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

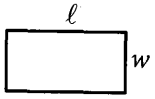
NOTES

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

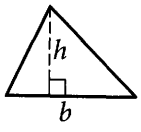
REFERENCE



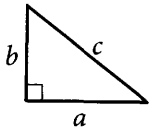
$A = \pi r^2$
$C = 2\pi r$



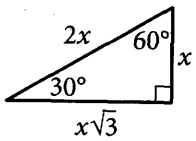
$A = \ell w$

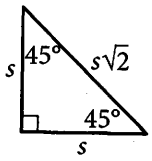


$A = \frac{1}{2}bh$

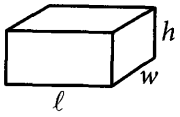


$c^2 = a^2 + b^2$

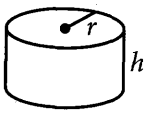




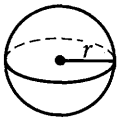
Special Right Triangles



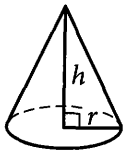
$V = \ell wh$



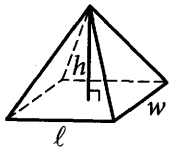
$V = \pi r^2 h$



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



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



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

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

$$6y + 3 = 9$$

What value of y satisfies the equation above?

A) -2

B) -1

C) 1

D) 2

2

$$2x + y = 0$$
$$x - y = -3$$

Which of the following ordered pairs (x, y) satisfies the system of equations above?

A) $(-1, 2)$

B) $(-1, -2)$

C) $(1, 2)$

D) $(1, -2)$

3

$$f(x) = 9 - 2x$$

The function f is defined above. What is the value of $f(2)$?

A) 3.5

B) 5

C) 7

D) 9

4

A software engineer must run a new piece of software several times to determine whether it performs correctly. The function s models the number of attempts, $s(t)$, to run the software t minutes after the start of one 8-hour workday. Which of the following is the best interpretation of $s(6) = 2$?

A) After 6 minutes have passed, there have been 2 attempts to run the software.

B) After 2 minutes have passed, there have been 6 attempts to run the software.

C) After 6 attempts to run the software, there are 2 attempts remaining.

D) After 2 attempts to run the software, there are 6 attempts remaining.

CONTINUE

5

A small town only allows a few new houses to be built each year. As a result, the equation $P = 1{,}200 + 50t$ can model the population P of the town t years after 2010. In the model, what does the number 50 represent?

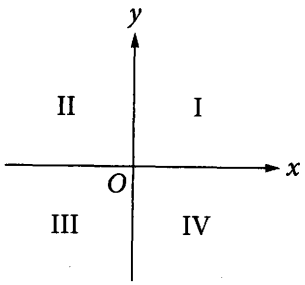
A) The population of the town in 2010

B) The population of the town t years after 2010

C) The increase in the population of the town each year after 2010

D) The percent increase in the population of the town each year after 2010

6



When $y = 4x - 8$ is graphed in the xy-plane above, which quadrant does NOT contain any points on the line?

A) Quadrant I

B) Quadrant II

C) Quadrant III

D) Quadrant IV

7

x	0	1	2
$h(x)$	1	5	25

The table above gives the values of the function h for some values of x. Which of the following equations could define h ?

A) $h(x) = 5^x$

B) $h(x) = 5^{x+1} - 4$

C) $h(x) = 5x^2$

D) $h(x) = 4x^2 + 1$

CONTINUE

8

A club sponsored a chess tournament that started with 64 participants. At the end of each round of play, half the participants were eliminated. How many participants remained in the tournament at the end of the third round?

A) 2

B) 4

C) 8

D) 16

9

Which of the following is a solution to the equation $(25 - 3x)(x + 16) = 0$?

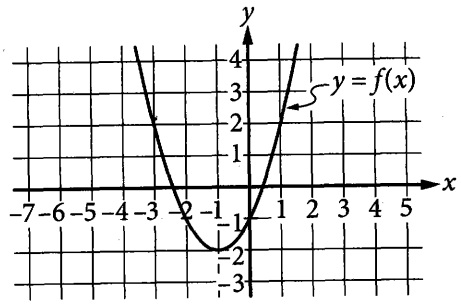
A) $-\frac{400}{3}$

B) $\frac{25}{3}$

C) 16

D) $\frac{400}{3}$

10



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

A) $f(x) = (x - 2)^2 + 1$

B) $f(x) = (x + 2)^2 + 1$

C) $f(x) = (x - 1)^2 - 2$

D) $f(x) = (x + 1)^2 - 2$

CONTINUE

11

The kinetic energy E, in joules, of an object of mass m, in kilograms, traveling at a speed v, in meters per second, is given by the equation $E = \frac{1}{2}mv^2$. Which of the following correctly expresses the object's mass, in kilograms, in terms of E and v ?

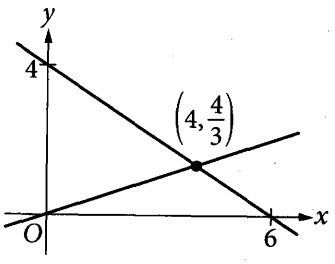
A) $\frac{\sqrt{E}}{2v}$

B) $\frac{\sqrt{2E}}{v}$

C) $\frac{E}{2v^2}$

D) $\frac{2E}{v^2}$

12



The graphs in the xy-plane above represent the equations in which of the following systems?

A) $x - 3y = 0$
$6x + 4y = 8$

B) $x + 3y = 0$
$4x + 6y = 8$

C) $x - 3y = 0$
$4x + 6y = 24$

D) $x + 3y = 0$
$6x + 4y = 24$

13

The expression $10x^2 + 6y^2 - 16xy$ can be rewritten as $2(x - y)(ax + by)$, where a and b are constants. What is the value of $a + b$?

A) 1

B) 2

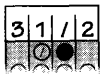
C) 3

D) 5

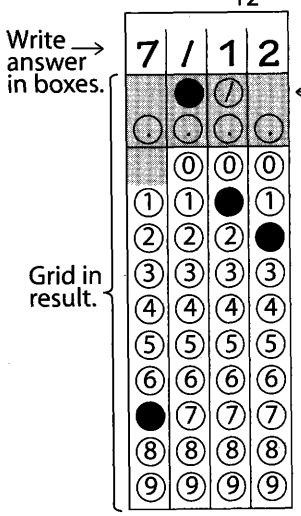
CONTINUE

DIRECTIONS

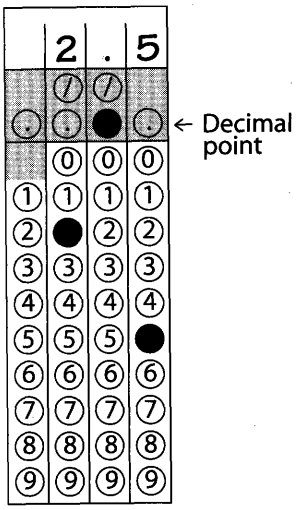
For questions 14-17, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. 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  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.

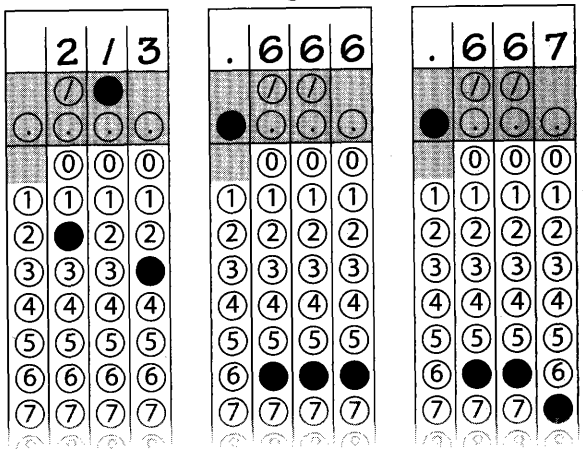
Answer: $\frac{7}{12}$



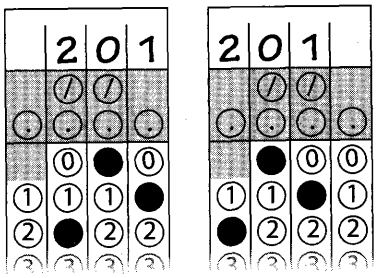
Answer: 2.5



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



Answer: 201 – either position is correct



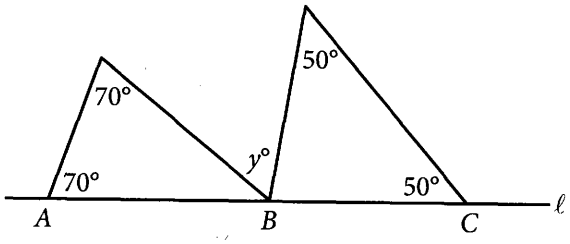
NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

14

Employees at a local bookstore earn $12 per hour plus a $5 bonus for opening the store for business. On a day when Heidi opened the store for business, she earned a total of $101. How many hours did she work that day?

15



In the figure above, points A, B, and C lie on line ℓ. What is the value of y ?

16

$$(2x + 1)(2x + 5)$$

The expression above is equivalent to $4x^2 + ax + 5$, where a is a constant. What is the value of a ?

17

The graph of the equation $y = mx + 1$ is a line in the xy-plane, where m is a constant. If the line contains the point $(1, 12)$, what is the value of m ?

STOP

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

No Test Material On This Page

Math Test – Calculator

45 MINUTES, 31 QUESTIONS

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

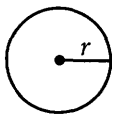
DIRECTIONS

For questions 1-27, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 28-31**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 28 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

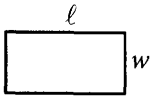
NOTES

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.

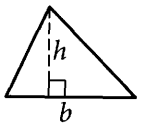
REFERENCE



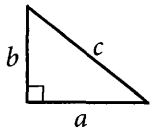
$A = \pi r^2$
$C = 2\pi r$



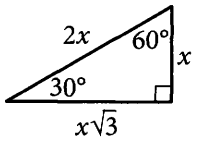
$A = \ell w$

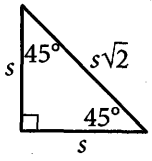


$A = \frac{1}{2}bh$

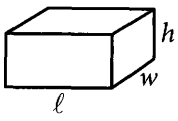


$c^2 = a^2 + b^2$

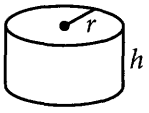




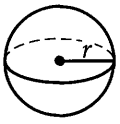
Special Right Triangles



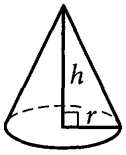
$V = \ell wh$



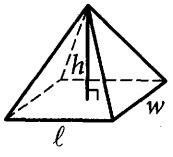
$V = \pi r^2 h$



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



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



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

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

The value of y is directly proportional to the value of x. If $y = 8$ when $x = 16$, what is the value of y when $x = 24$?

A) 12

B) 16

C) 32

D) 48

2

Miguel made multiple batches of a juice recipe that requires 4 cups of water and 2 cups of fruit juice concentrate. If Miguel followed the recipe for each batch and used a total of 6 cups of fruit juice concentrate, how many total cups of water did he use?

A) 4 cups

B) 8 cups

C) 12 cups

D) 18 cups

3

Two equations are equivalent if they have the same solution. Which of the following equations is equivalent to $16x - 2 = 12x + 9$?

A) $28x = 7$

B) $14x = 21x$

C) $4x = 7$

D) $4x = 11$

4

$$m = 165w$$

The equation above can be used to determine the total amount of money m, in dollars, that Stephanie will be paid for w weeks of work at her new job. Which of the following is the best interpretation of the number 165 in the equation?

A) The number of hours that Stephanie will work w weeks after starting the job

B) The rate, in dollars per hour, at which Stephanie will be paid

C) The amount of money, in dollars, that Stephanie will be paid each week

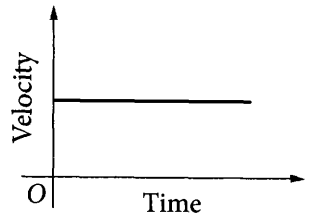
D) The total amount of money, in dollars, that Stephanie will be paid for w weeks of work

CONTINUE

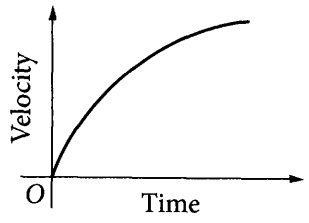
5

The velocity of a space shuttle increases at an approximately constant rate during the first five minutes after launch. Of the following graphs, which best represents the velocity of the shuttle during the first five minutes after launch?

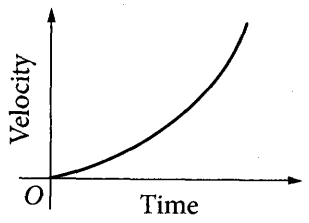
A)



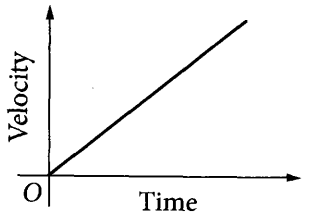
B)



C)



D)



6

Carl's expenses for making a product are \$4.50 per piece. He will make a profit of between \$1.00 and \$2.50 per piece, depending on the final sale price. If Carl sells 50 pieces, which of the following inequalities represents the total profit, x, he will make?

A) $\$100 \leq x \leq \$250$

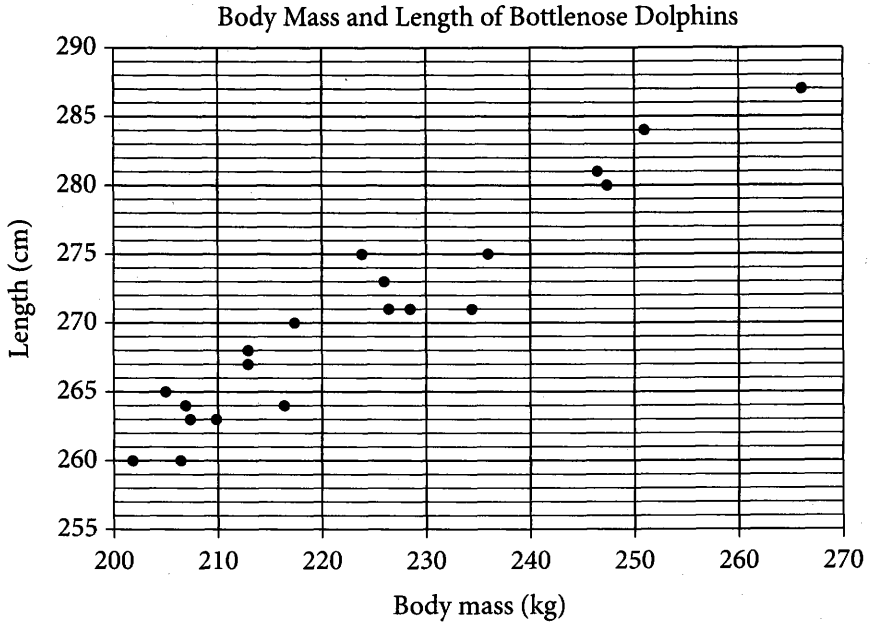
B) $\$100 \leq x \leq \$125$

C) $\$50 \leq x \leq \$75$

D) $\$50 \leq x \leq \$125$

CONTINUE

Questions 7 and 8 refer to the following information.



The scatterplot above shows the body mass m, in kilograms (kg), and the length d, rounded to the nearest centimeter (cm), of 20 bottlenose dolphins. The equation of the line of best fit (not shown) for these data is $d = 0.43m + 176$.

7

Based on the line of best fit, which of the following statements is true?

A) As the body mass of a dolphin increases, the length of the dolphin decreases.

B) As the body mass of a dolphin increases, the length of the dolphin increases.

C) As the body mass of a dolphin increases, the length of the dolphin remains constant.

D) There is no correlation between the body mass of a dolphin and the length of the dolphin.

8

What is the median length, in centimeters, of the 7 longest dolphins?

A) 275

B) 278

C) 280

D) 281

CONTINUE

9

A biologist is studying the sizes of ostrich eggs. After weighing a random sample of eggs, the biologist determines with a high level of confidence that the average weight of an ostrich egg is 1.4 kilograms, with a margin of error of ±0.1 kilogram. Which of the following inequalities represents an interval of weights, in kilograms, that the biologist can be confident contains the true average weight w of all ostrich eggs?

A) $w \leq 1.3$

B) $1.2 \leq w \leq 1.4$

C) $1.3 \leq w \leq 1.5$

D) $1.4 \leq w \leq 1.6$

10

$$(x^2 - 2x + 3) - (2x^2 + 4x - 5)$$

The expression above is equivalent to which of the following?

A) $-x^2 - 6x + 8$

B) $-x^2 - 6x - 2$

C) $-x^2 + 2x - 2$

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

11

$$x + y = c$$
$$3x + 3y = 6$$

In the system of equations above, c is a constant. If the system has infinitely many solutions, what is the value of c ?

A) 2

B) 3

C) 4

D) 6

CONTINUE

Questions 12-14 refer to the following information.

Monique has several bank and investment accounts. The amount of money, in dollars, in three of these accounts on January 1st of each of four years is shown in the partially completed table below.

Year	Account A	Account B	Account C
2010	$700.00	$700.00	$360.00
2011	$714.00	$714.00	$442.80
2012	$728.28	$728.00	x
2013	$742.85	$742.00	$357.45

Monique does not deposit or withdraw any money from these accounts for the four years shown in the table. Account A earns 2% interest compounded annually, Account B earns $14 in interest annually, and Account C is an investment account that does not earn interest but can gain or lose value.

12

At the beginning of 2013, Monique considered transferring some of her money to an account in Japan. If the currency exchange rate on January 1, 2013, was 86.72 Japanese yen = 1 US dollar, which of the following is closest to the value of Account C that same day, in Japanese yen?

A) 4.12

B) 270.73

C) 444.17

D) 30,998

13

Monique has a fourth account, Account D. If the average value of Accounts A, B, C, and D on January 1, 2011, was $603.00, what was the value of Account D on January 1, 2011?

A) $541.20

B) $623.60

C) $629.94

D) $652.00

14

The amount of money in Account C increased by 9% between January 1, 2012, and January 1, 2013. What is the value of x in the table?

A) $325.28

B) $327.94

C) $389.62

D) $402.95

CONTINUE

15

What is the complete list of solutions to the equation $(2x+1)(x-3)(x+1)=0$?

A) $-1, -\frac{1}{2}$

B) $-1, 3$

C) $-2, -1, 3$

D) $-1, -\frac{1}{2}, 3$

16

$$2x+y=5$$
$$x-y=-2$$

Based on the system of equations above, what is the value of $x+2y$?

A) -3

B) $-\frac{3}{2}$

C) 3

D) 7

17

Course Registration at a University

		Science	
		Yes	No
History	Yes	60	120
	No	40	30

The table above shows course-registration data for 250 first-year students selected at random from a university. Assuming that the students in the sample are representative of all first-year students at the university, which of the following best estimates the probability that a first-year student who will be selected at random from the university has registered for a history course, a science course, or both during the first year?

A) $\frac{6}{25}$

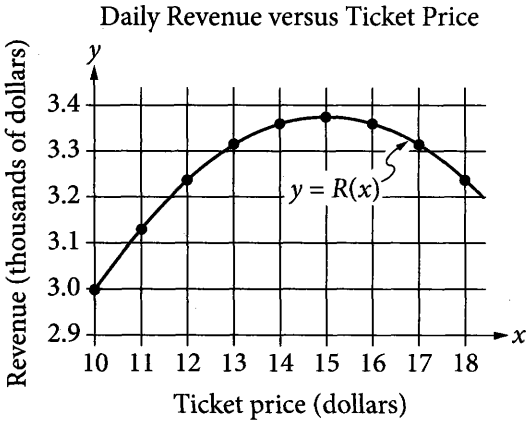
B) $\frac{10}{25}$

C) $\frac{18}{25}$

D) $\frac{22}{25}$

CONTINUE

18



For a ferry service, the manager estimates that the daily revenue R, in dollars, can be modeled by the function $R(x) = 450x - 15x^2$, where each ticket is priced at x dollars. According to the graph of R above, for how many ticket prices is the manager's estimate of the daily revenue equal to \$3,315 ?

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

19

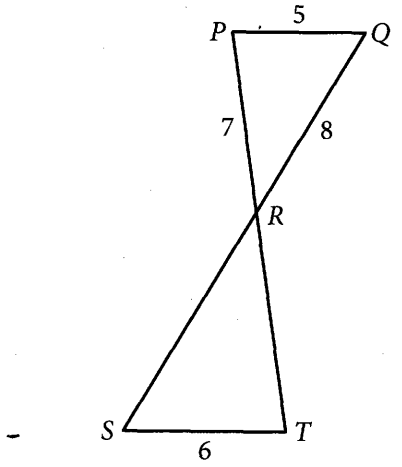
Number of trips to grocery store in a given week	Frequency
One	4
Two	17
Three	5
Four	7
Five	4
Six	2
Seven	1

The frequency table above shows the number of trips made by 40 heads of household to a grocery store in a given week. Which statement is an accurate analysis of these data?

A) The median number of weekly trips to a grocery store is 1 more than the mean.
B) The median number of weekly trips to a grocery store is equal to the mean.
C) The median number of weekly trips to a grocery store is 1 less than the mean.
D) The median number of weekly trips to a grocery store is about 4 less than the mean.

CONTINUE

20



In the figure above, $PR = 7$, $PQ = 5$, $QR = 8$, $ST = 6$, and $\overline{PQ}$ is parallel to $\overline{ST}$. What is the length of $\overline{RT}$?

A) 7

B) 8.4

C) 9

D) 9.6

21

Sam wants to buy a jacket that is discounted by 40% off of the original price. If the discounted price of the jacket is \$38.70, what was the original price of the jacket?

A) \$54.18

B) \$61.92

C) \$64.50

D) \$96.75

22

In the xy-plane, the parabola with equation $y = x^2 + 2$ intersects the line $x - y = -4$ at two points. What is the sum of the x-coordinates of the two points of intersection?

A) -1

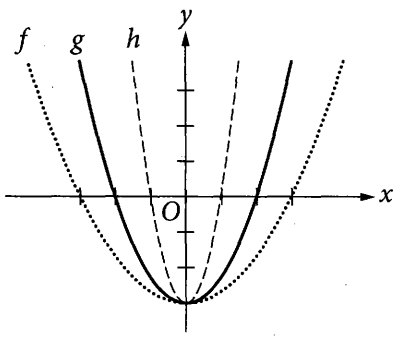
B) 1

C) 2

D) 5

CONTINUE

23



The graphs of the functions f, g, and h are shown in the xy-plane above. If $f(x) = ax^2 - 3$, $g(x) = bx^2 - 3$, and $h(x) = cx^2 - 3$, where a, b, and c are constants, which of the following is true?

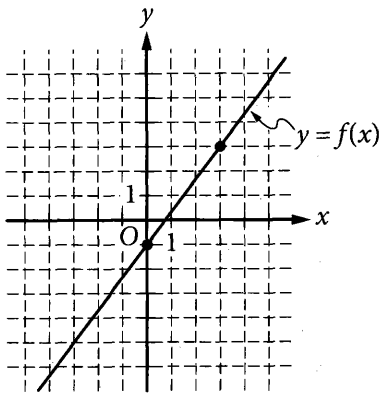
A) $a < b < c$

B) $a < c < b$

C) $b < c < a$

D) $c < b < a$

24



The graph of the linear function f is shown in the xy-plane above. The graph of the function g (not shown) is a line that is perpendicular to $y = f(x)$ and passes through $(8, 0)$. Which of the following defines g?

A) $g(x) = \frac{4}{3}x + 8$

B) $g(x) = \frac{3}{4}x - 6$

C) $g(x) = -\frac{3}{4}x + 8$

D) $g(x) = -\frac{3}{4}x + 6$

CONTINUE

25

Maya buys a sweater and a shirt from a department store. The store offers the following discounts on each item.

Item	Discount
Sweater	$\frac{1}{4}$ off original price
Shirt	20% off original price

The sweater Maya buys is originally priced at $40.00. She pays a 6% tax on the total discounted cost of both items. If the total cost of Maya's purchase, including tax, is $53.00, what is the original price, in dollars, of the shirt?

A) $25.00

B) $24.00

C) $20.00

D) $16.00

26

$$\frac{1}{x^{\frac{b}{3}}}$$

In the expression above, b is a nonzero constant. If the expression is equivalent to x^2 for $x > 0$, what is the value of $\frac{2b}{3}$?

A) -6

B) -4

C) 1

D) 6

27

In the xy-plane, the graph of line ℓ has slope 2 and intercepts $(a, 0)$ and $(0, b)$. If b is 3 more than a, what is the value of $a + b$?

A) -1

B) 1

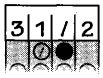
C) 2

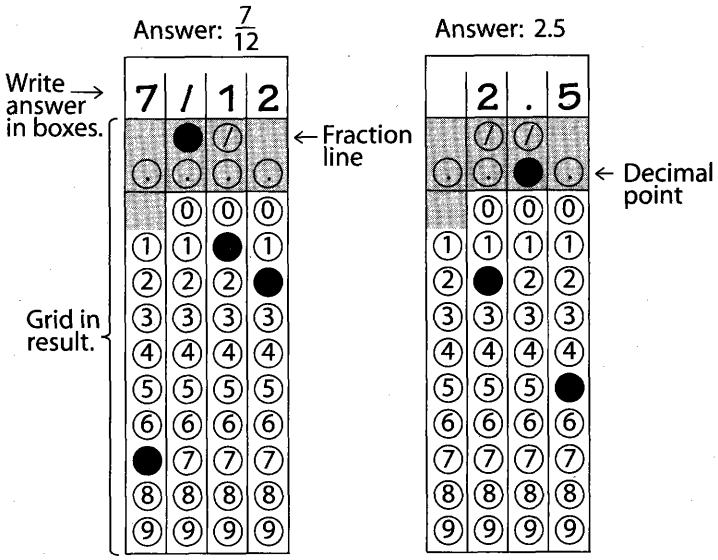
D) 3

CONTINUE

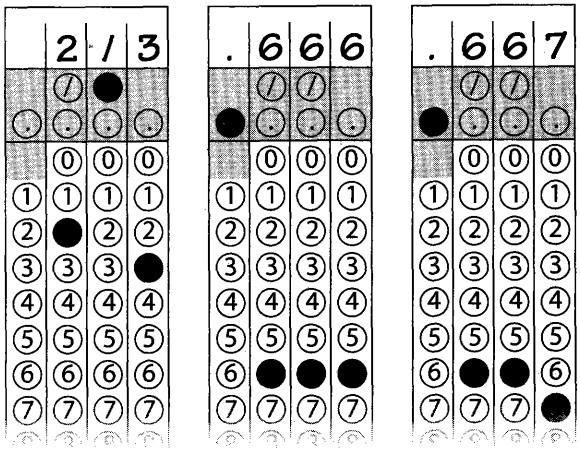
DIRECTIONS

For questions 28-31, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

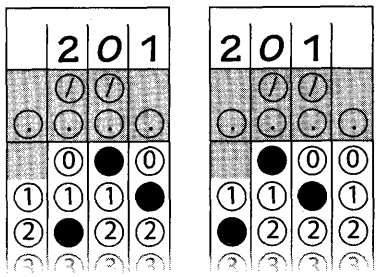
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. 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  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.



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



Answer: 201 – either position is correct



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

CONTINUE

28

An electrician purchases one type of electrical outlet and one type of outlet cover for a job. It costs $357 to purchase 21 electrical outlets and 21 outlet covers. If the outlet covers cost $2 each, how much would it cost the electrician to purchase 88 electrical outlets? (Disregard the $ sign when gridding your answer.)

29

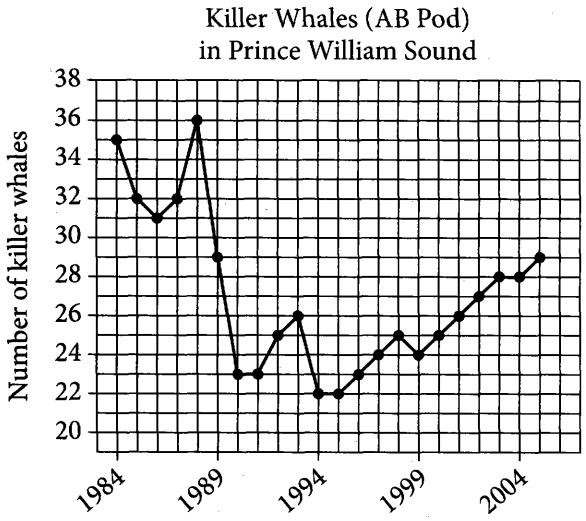
College Employment Survey

	Year in school				
Job status	1st	2nd	3rd	4th	Total
None	25		23	30	
Part-time	21	32	31	23	107
Full-time	4	8	6	7	25
Total	50		60	60	

The incomplete table above shows the results of a survey of 240 college students who each reported their year in school and identified one of the three categories as their job status. If one of the 240 students is to be selected at random, what is the probability that the selected student is a 2nd-year student who does not have a job?

CONTINUE

Questions 30 and 31 refer to the following information.



The AB Pod is a group of killer whales in Prince William Sound. The number of killer whales in the AB Pod from 1984 through 2005 is shown in the line graph above.

30

For the five years 1984 through 1988, what was the mean number of killer whales in the AB Pod, rounded to the nearest whole number?

31

What was the average rate of change, in whales per year, of the killer whale population in the AB Pod from 1995 through 2005?

STOP

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