

The SAT[®]

IMPORTANT REMINDERS

1

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Do not use a mechanical pencil or pen.

2

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Reading Test

65 MINUTES, 52 QUESTIONS

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

DIRECTIONS

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

Questions 1-10 are based on the following passage.

This passage is adapted from Nathaniel Hawthorne, *The Blithedale Romance*. Originally published in 1852.

Five-and-twenty years ago, there dwelt in one of the middle states, a man whom we shall call Fauntleroy; a man of wealth, and magnificent tastes, *Line* and prodigal expenditure. His home might almost 5 be styled a palace; his habits, in the ordinary sense, princely. His whole being seemed to have crystallized itself into an external splendor, wherewith he glittered in the eyes of the world, and had no other life than upon this gaudy surface. He had married a lovely 10 woman, whose nature was deeper than his own. But his affection for her, though it showed largely, was superficial, like all his other manifestations and developments; he did not so truly keep this noble creature in his heart, as wear her beauty for the most 15 brilliant ornament of his outward state. And there was born to him a child, a beautiful daughter, whom he took from the beneficent hand of God with no just sense of her immortal value, but as a man already rich in gems would receive another jewel. If he loved her, 20 it was because she shone.

After Fauntleroy had thus spent a few empty years, coruscating continually an unnatural light, the source of it—which was merely his gold—began to grow more shallow, and finally became exhausted. He 25 saw himself in imminent peril of losing all that had heretofore distinguished him; and, conscious of no innate worth to fall back upon, he recoiled from this

calamity, with the instinct of a soul shrinking from annihilation. To avoid it—wretched man!—or rather 30 to defer it, if but for a month, a day, or only to procure himself the life of a few breaths more amid the false glitter which was now less his own than ever—he made himself guilty of a crime. It was just the sort of crime, growing out of its artificial state, which society 35 (unless it should change its entire constitution for this man's unworthy sake) neither could nor ought to pardon. More safely might it pardon murder. Fauntleroy's guilt was discovered. He fled; his wife perished, by the necessity of her innate nobleness, 40 in its alliance with a being so ignoble; and betwixt her mother's death and her father's ignominy, his daughter was left worse than orphaned.

There was no pursuit after Fauntleroy. His family connections, who had great wealth, made such 45 arrangements with those whom he had attempted to wrong as secured him from the retribution that would have overtaken an unfriended criminal. The wreck of his estate was divided among his creditors. His name, in a very brief space, was forgotten by the multitude 50 who had passed it so diligently from mouth to mouth. Seldom, indeed, was it recalled, even by his closest former intimates. Nor could it have been otherwise. The man had laid no real touch on any mortal's heart. Being a mere image, an optical delusion, 55 created by the sunshine of prosperity, it was his law to vanish into the shadow of the first intervening cloud. He seemed to leave no vacancy; a phenomenon which, like many others that attended his brief career, went far to prove the illusiveness of his existence.

60 Not, however, that the physical substance of Fauntleroy had literally melted into vapor. He had fled northward to the New England metropolis, and had taken up his abode, under another name, in a squalid street or court of the older portion of the city. There
65 he dwelt among poverty-stricken wretches, sinners, and forlorn good people, Irish, and whomsoever else were neediest. Many families were clustered in each house together, above stairs and below, in the little peaked garrets, and even in the dusky cellars.
70 The house where Fauntleroy paid weekly rent for a chamber and a closet had been a stately habitation in its day. An old colonial governor had built it, and lived there, long ago, and held his levees in a great room where now slept twenty Irish bedfellows; and died
75 in Fauntleroy's chamber, which his embroidered and white-wigged ghost still haunted. Tattered hangings, a marble hearth, traversed with many cracks and fissures, a richly carved oaken mantelpiece, partly hacked away for kindling-stuff, a stuccoed ceiling,
80 defaced with great, unsightly patches of the naked laths—such was the chamber's aspect, as if, with its splinters and rags of dirty splendor, it were a kind of practical gibe at this poor, ruined man of show.

1

- The main idea of the passage is that Fauntleroy
- A) committed a crime and was punished by the judicial system.
 - B) was a superficial man who was ruined by his own weaknesses.
 - C) spent too much money and eventually went bankrupt.
 - D) was a guilt-ridden outcast who realized the error of his ways.

2

As used in line 5, “styled” most nearly means

- A) designed.
- B) called.
- C) fashioned.
- D) resembled.

3

The narrator would most likely agree with which statement about Fauntleroy's daughter?

- A) She had no unique or special qualities.
- B) She was underappreciated by her father.
- C) She was very much like her father.
- D) She made both of her parents proud of her.

4

Which choice best describes the narrator?

- A) Surprised by Fauntleroy's behavior
- B) Sympathetic toward Fauntleroy's plight
- C) Pleased with Fauntleroy's suffering
- D) Insightful regarding Fauntleroy's character

5

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

- A) Lines 1-4 (“Five-and-twenty . . . expenditure”)
- B) Lines 24-29 (“He saw . . . annihilation”)
- C) Lines 38-42 (“He fled . . . orphaned”)
- D) Lines 76-83 (“Tattered . . . show”)

6

The passage implies that Fauntleroy was not pursued after his crime because his family connections

- A) used their money to satisfy claims against him.
- B) begged his victims to forgive him.
- C) arranged for him to alter his identity.
- D) paid a fine greater than the amount that was stolen.

7

The narrator indicates that the main reason the name “Fauntleroy” was forgotten was that Fauntleroy

- A) made very little impression on others because of his lack of depth.
- B) was shunned by his former friends, who felt betrayed by him.
- C) embarrassed his wealthy family, who encouraged him to move away.
- D) changed his name to hide from his creditors and avoid arrest.

8

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

- A) Lines 43-47 (“His family . . . criminal”)
- B) Lines 51-52 (“Seldom . . . intimates”)
- C) Lines 53-54 (“The man . . . heart”)
- D) Lines 61-64 (“He had . . . city”)

9

In the context of the passage, the statement “Not, however, that the physical substance of Fauntleroy had literally melted into vapor” (lines 60-61) suggests that

- A) the narrator’s first impression of Fauntleroy was incorrect.
- B) the narrator was not surprised that Fauntleroy had escaped.
- C) the narrator did not approve of Fauntleroy’s response to the situation.
- D) the narrator’s preceding description of Fauntleroy was figurative.

10

What is the most likely reason that the narrator refers to Fauntleroy’s room as “a kind of practical gibe” (lines 82-83)?

- A) The room was haunted by a ghost, just as Fauntleroy was haunted by events of the past.
- B) Fauntleroy used to live with his wealthy wife and daughter but now shared a room with poor men.
- C) Fauntleroy’s greed had caused him to deface the room, just as he had once destroyed his family.
- D) Like its occupant, the room had once been magnificent but had fallen on hard times.

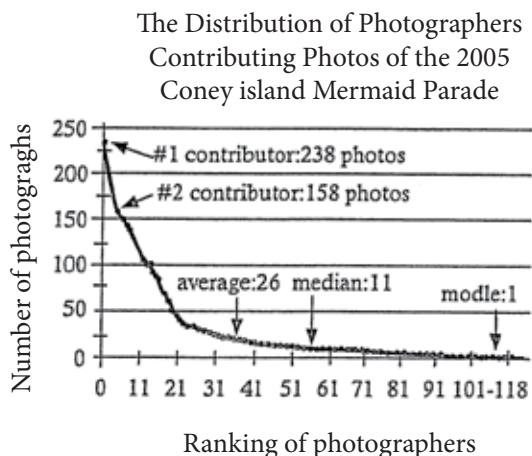
Questions 11–20 are based on the following passage and supplementary material.

This passage is adapted from Clay Shirky, *Here Comes Everybody: The Power of Organizing without Organizations* ©2008 by Clay Shirky. The author is discussing websites such as Wikipedia and Flickr to which users contribute content.

Given that everyone now has the tools to contribute equally, you might expect a huge increase in equality of participation. You'd be wrong.

Line Wikipedia articles for asphalt had

5 129 contributors making 205 total edits, but the bulk of the work was contributed by a small fraction of participants, and just six accounted for about a quarter of the edits. A similar pattern appears on Flickr: 118 photographers contributed over three 10 thousand photos of the 2005 Coney Island Mermaid Parade to Flickr, but the top tenth contributed half of those, and the most active photographer, Czarina, contributed 238 photos (about one in twelve) working alone. This shape, called a power law distribution, is 15 shown below.



Five points are shown on this graph. The two leftmost data points are the most and second-most active photographers. The most active photographer is far more active than the second most active and, they are both far more active than most of the rest of the photographers. The average number of photos taken (all photos divided among all photographers) is twenty-six, while the median (the middle photographer) took eleven photos, and the 20 mode (the number of photos that appeared most frequently) is a single photo. 25

Note the sharp drop-off in the number of photos between the top few contributors and most of the participants. Notice too that because 30 of the disproportionate contributions of these few photographers. Three-quarters of the photographers contributed a below-average number of pictures. This pattern is general to social media: on mailing lists with more than a couple dozen participants, the 35 most active writer is generally much more active than the person in the number-two slot, and far more active than average. The longest conversation goes on much longer than the second-longest one, and much longer than average, and so on. Bloggers,

40 Wikipedia contributors, Photographers, people conversing on mailing lists, and social participation in many other large-scale systems all exhibit a similar pattern.

There are two big surprises here. The first is that 45 the imbalance is the same shape across a huge number of different kinds of behaviors. A graph of the distribution of photo labels (or “tags”) on Flickr is the same shape as the graph of readers-per-weblog and contributions-per-user to Wikipedia. The 50 general form of a power law distribution appears in social settings when some set of items—users, pictures, tags—is ranked by frequency of occurrence. You can rank a group of Flickr users by the number of picture they submit. You can rank a collection of 55 pictures by the number of viewers. You can rank tags by the number of pictures they are applied to. All of these graphs will be in the rough shape of a power law distribution.

The second surprise is that the imbalance drives 60 large social systems rather than damaging them.

Fewer than two percent of Wikipedia users ever contribute, yet that is enough to create profound value for millions of user. And among those contributors, no effort is made to even out their

65 contributions. The spontaneous division of labor driving Wikipedia wouldn't be possible if there were concern for reducing inequality. On the contrary, most large social experiments are engines for harnessing inequality rather than limiting it.

70 Though the word “ecosystem” is overused as a way to make simple situations seem more complex, it is merited here, because large social systems cannot be understood as a simple aggregation of the behavior of some nonexistent “average” user.

11

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

- A) an argument in favor of equal participation to an acknowledgment of the benefits of inequality.
- B) a discussion of people who edit Wikipedia articles to a discussion of people who submit photographs to Flickr.
- C) a review of the data presented in a graph to an investigation of the reasons behind the data.
- D) an analysis of two examples of a power law distribution to an examination of the general phenomenon.

12

As used in line 6, “bulk” most nearly means

- A) fiber.
- B) stuff.
- C) magnitude
- D) majority.

13

As used in line 33, “general” most nearly means

- A) vague.
- B) superior.
- C) common.
- D) all-purpose.

14

The author assumes that his readers believe that inequality

- A) hurts the average person.
- B) is a natural outgrowth of a competitive society.
- C) is harmful to complex social systems.
- D) benefits those with great resources.

15

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

- A) Lines 1-3 (“Given . . . participation”)
- B) Lines 32-37 (“This pattern . . . average”)
- C) Lines 59-60 (“The second . . . them”)
- D) Lines 67-69 (“On the . . . limiting it”)

16

Which choice best supports the claim that provides the claim that unequal participation in social systems can be beneficial?

- A) Lines 4-5 (“Wikipedia . . . edits”)
- B) Lines 29-32 (“Notice . . . pictures”)
- C) Lines 49-52 (“The general . . . occurrence”)
- D) Lines 63-67 (“And . . . inequality”)

17

The discussion of the term “ecosystem” in lines 70-74 mainly serves to

- A) argue that the term “ecosystem” has been traditionally misused by researchers.
- B) highlight the complexity of social media systems.
- C) suggest that researchers need a new framework for understanding social media.
- D) show that large social systems and ecosystems are clearly distinct entities.

18

According to the graph, a photographer who submitted twenty photographs of the Mermaid Parade to Flickr would have

- A) been in the top half of photographers as ranked by the number of photographs submitted.
- B) submitted fewer than the median number of photographs.
- C) submitted more than the average number of photographs.
- D) submitted the same number of photographs as the middle-ranking photographer.

19

According to the graph, the number of photographs submitted by the “#2 contributor” of Mermaid Parade photographs to Flickr was

- A) less than the average.
- B) greater than that of the photographer ranked one spot ahead.
- C) closer to that of the photographer ranked one spot behind than to that of the photographer ranked one spot ahead.
- D) closer to that of the photographer ranked two spots behind than to that of the photographer ranked one spot behind.

20

According to the graph, the number of Mermaid Parade photographs submitted to Flickr by the 11 th-ranking photographer was between

- A) 1-5.
- B) 35-40.
- C) 55-60.
- D) 85-90.

Questions 21-30 are based on the following passage .

Passage 1 is adapted from Lucas Laursen, "Scientists Use Faux Fossils to Lean How Insect Colors Evolved" ©2013 by Scientific American, Inc. Passage 2 is adapted from "The Photonic Beetle." ©2008 by The University of Utah.

Passage 1

On its way from flight to fossil, an ancient beetle's wings lost their color and then their form. Slow-baked and squished by sand, the glittering green ^{Line} wings darkened and turned blue, then indigo, then black.

That tale of an insect's life, death and fossilization sounds simple enough, but it took paleobiologist Maria McNamara years of painstaking work to piece together. The University of Bristol researcher wanted to know how ancient insects' warning signals, camouflage and mating displays evolved. Studying ordinary fossils tells only part of the story, since most fossilized insects are black today, probably because they lost their colors while buried underground.

McNamara and her team decided to work backward. They artificially aged modern beetle (shown above) and weevil wings to figure out how fossilization might affect color. They reported their results in Geology in April.

Fossilization is not a gentle process. To simulate it, McNamara left the insect wings in pond water for 18 months, then baked them at temperatures as high as 518 degrees Fahrenheit, hotter than most home ovens, and pressures almost 500 times the atmosphere's to simulate the crushing and heat that converts mud-trapped debris into subterranean stone fossils. The team found that the process broke up and thinned out the beetles' reflective shells, changing the wavelength of light that they reflect, from green to blue to black.

More important, they found that the weevils maintained color-producing structures known as photonic crystals, which could mean any fossil without these structures probably never had them. McNamara concludes that photonic crystals must have evolved recently, at least in weevils, because she examined three-million-year-old weevils that lacked them.

Some scientists disagree. Andrew Parker, an entomologist at the Natural History Museum in London, notes that "every fossil goes through a completely different process," so it will be difficult to

generalize lessons from one species or fossil to others. But he finds the idea tantalizing: "We can start to add up a picture and put together scenes of what life ⁴⁵ would have been like in color."

Passage 2

Researchers are seeking photonic crystals as they aim to develop optical computers that run on light (photons) instead of electricity (electrons). Right now, light in near-infrared and visible wavelengths can carry data and communications through fiberoptic cables, but the data must be converted from light back to electricity before being processed in a computer.

The goal—still years away—is an ultrahigh-speed computer with optical integrated circuits or chips that run on light instead of electricity.

"You would be able to solve certain problems that we are not able to solve now," Michel Bartl, assistant professor of chemistry at The University of Utah says. "For certain problems, an optical computer could do ⁶⁰ in seconds what regular computers need years for."

Researchers also are seeking ideal photonic crystals to amplify light and thus make solar cells more efficient, to capture light that would catalyze chemical reactions, and to generate tiny laser beams ⁶⁵ that would serve as light sources on optical chips.

"Photonic crystals are a new type of optical materials that manipulate light in non-classic ways," Bartl says. Some colors of light can pass through a photonic crystal at various speeds, while other ⁷⁰ wavelengths are reflected as the crystal acts like a mirror.

Bartl says there are many proposals for how light could be manipulated and controlled in new ways by photonic crystals, "however we still lack the proper ⁷⁵ materials that would allow us to create ideal photonic crystals to manipulate visible light. A material like this doesn't exist artificially or synthetically."

The ideal photonic crystal—dubbed the "champion" crystal—was described by scientists elsewhere in 1990. ⁸⁰ They showed that the optimal photonic crystal—one that could manipulate light most efficiently—would have the same crystal structure as the lattice of carbon atoms in diamond. Diamonds cannot be used as photonic crystals because their atoms are packed too tightly together to manipulate visible light.

When made from an appropriate material, a diamond-like structure would create a large

“photonic bandgap,” meaning the crystalline structure prevents the propagation of light of a certain range of wavelengths. Materials with such bandgaps are necessary if researchers are to engineer optical circuits that can manipulate visible light.

21

The author of Passage 1 states that McNamara and her team simulated the process of fossilization to determine

- A) the atmospheric pressure three million years ago.
- B) how long a fossil had been buried underground.
- C) whether fossilization affects the original color of an organism.
- D) whether the warning signals displayed by ancient beetles are still displayed by modern beetles.

22

What is the most likely reason that the author of Passage 1 includes the phrase “hotter than most home ovens” (line 23)?

- A) To describe how much hotter temperatures were three million years ago than they are today
- B) To suggest the temperature at which photonic crystals lose their color
- C) To provide a familiar point of comparison to the temperature at which the fossilization simulation took place
- D) To warn readers that fossilization studies should not be conducted in the home

23

As used in line 31, “maintained” most nearly means.

- A) supported.
- B) asserted.
- C) defended.
- D) retained.

24

According to Passage 1. Parker questions McNamara’s conclusions from the fossilization simulation for which of the following reasons?

- A) It has subsequently been discovered that color is not involved in a beetle’s mating displays.
- B) The fossilized remains of an organism living more than three million years ago have not yet been found.
- C) The wing color of beetles and weevils has not changed in the past three million years.
- D) Not all species of beetles or weevils are likely to undergo fossilization in the same way.

25

Passage 2 suggests that today’s computers are slower than an optical computer could be because

- A) today’s computers are still made from nonoptimal photonic crystals.
- B) photons must be converted to electrons even in today’s fastest computers.
- C) photonic bandgaps in today’s computers are still too large to properly manipulate light.
- D) the photonic crystals in today’s computers are made of inefficient natural substances.

26

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

- A) Lines 48-52 (“Right . . . computer”)
- B) Lines 59-60 (“For certain . . . for”)
- C) Lines 61-65 (“Researchers . . . chips”)
- D) Lines 90-92 (“Materials . . . light”)

27

The photonic crystals discussed in each passage have what feature in common?

- A) They are made of the same type of material.
- B) They reflect visible light.
- C) They are structural components of living organisms.
- D) They are being studied to better understand fiber optics.

28

What inference can most reasonably be drawn from the passages about the relationship between the atoms in a weevil’s photonic crystals and the atom in a diamond?

- A) The atoms in a weevil’s photonic crystals are packed together less tightly than are the atoms in a diamond.
- B) The atoms in a weevil’s photonic crystals are packed together less tightly than are the atoms in a diamond.
- C) The atoms in a weevil’s photonic crystals are arranged randomly, whereas the atoms in a diamond are arranged in a lattice pattern.
- D) The atoms in a weevil’s photonic crystals manipulate light less efficiently than do the atoms in a diamond.

29

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

- A) Lines 68-71 (“Some . . . mirror”)
- B) Lines 72-76 (“Bartl . . . light”)
- C) Lines 80-83 (“They . . . diamond”)
- D) Lines 83-85 (“Diamonds . . . light”)

30

According to Passage 1, McNamare believes that a lack of photonic crystals in an ancient weevil fossil would most likely mean that the weevil

- A) once had wings that were blue.
- B) never had the structures in its wings.
- C) had not been subjected to high heat during fossilization.
- D) lived around one million years ago.

Questions 31-41 are based on the following passage.

This passage is adapted from a letter by Benjamin Franklin, originally published in 1766. Franklin wrote the letter to the royal governor of Massachusetts William Shirley.

December 4, 1754

Sir:

I mentioned it yesterday to your Excellency as my opinion, that excluding the people of the colonies from all share in the choice of the grand council
^{Line} would probably give extreme dissatisfaction, as well as the taxing them by act of Parliament where they have no representative. In matters of general concern to the people, and especially where burthens are to be laid upon them, it is of use to consider as well what they will be apt to think and say, as what they ought to think. I shall, therefore, as your Excellency requires it of me, briefly mention what of either kind occurs to me, on this occasion.

First, they will say, and perhaps with justice, that the body of the people in the colonies are as loyal and as firmly attached to the present constitution and reigning family as any subjects in the king's dominions.

That there is no reason to doubt the readiness and willingness of their representatives they may choose to grant, from time to time, such supplies, for the defense of the country, as shall be judged necessary, so far as their abilities will allow.

That the people in the colonies, who are to feel the immediate mischiefs of invasion and conquest by an enemy, in the loss of their estates, lives and liberties, are likely to be better judges of the quantity of forces necessary to be raised and maintained, forts to be built and supported, and of their own abilities to bear the expense, than the Parliament of England at so great a distance.

That governors often come to the colonies merely to make fortunes, with which they intend to return to Britain, are not always men of the best abilities and integrity, have many of them no estates here, nor any natural connections with us, that should make them heartily concerned for our welfare; and might possibly be sometimes fond of raising and keeping up more forces than necessary, from the profits accruing to themselves, and to make provision for their friends and dependents.

That the councillors in most of the colonies being appointed by the crown, on the recommendation of governors, are often of small estates, frequently dependent on the governors for offices, and therefore too much under influence.

That there is therefore great reason to be jealous of a power in such governors and councils, to raise such sums as they shall judge necessary, by draft on the ⁵⁰ colonies by act of Parliament, and paid by the people here; since they might abuse it by projecting useless expeditions, harassing the people, and taking them from their labor to execute such projects, merely to create offices and employments, and gratify their dependents and divide profits.

That the Parliament of England is at a great distance, subject to be misinformed and misled by such governors and councils, whose united Interests might probably secure them against the effect of any ⁶⁰ complaints from hence.

That it is supposed an undoubted right of Englishmen not to be taxed but by their own consent given through their representatives.

That the colonies have no representatives in ⁶⁵ Parliament.

That to propose taxing them by Parliament, and refusing them the liberty of choosing a representative council to meet in the colonies, and consider and judge of the necessity of any general tax and the ⁷⁰ quantum, shows a suspicion of their loyalty to the crown, or of their regard for their country, or of their common sense and understanding, which they have not deserved.

That compelling the colonies to pay money ⁷⁵ without their consent would be rather like raising contributions in an enemy's country, than taxing of Englishmen for their own public benefit.

That it would be treating them as a conquered people, and not as true British subjects...

⁸⁰ Perhaps I am too apprehensive in this matter; but having freely given my opinion and reasons, your Excellency can better judge better than I whether there be any weight in them, and the shortness of the time allowed me will, I hope, in some degree, excuse ⁸⁵ the imperfections of this scrawl.

Your Excellency's most obedient and most humble servant.

B. Franklin

31

- The central purpose of Franklin's letter is to
- A) convince Shirley of the colonists' loyalty to Britain.
 - B) protest American colonists being taxed without being given Parliamentary representation.
 - C) appeal to the British government for extra funds to help the struggling colonists.
 - D) warn Parliament that the colonists may someday revolt.

32

- A significant distinction that Franklin draws in the passage is that between
- A) what people ought to do and what people are capable of doing.
 - B) ways that people genuinely feel and ways that people are expected to feel.
 - C) laws that are harmful to people and laws that are merely irritants.
 - D) problems that people can solve individually and problems requiring collective effort.

33

- Which choice provides the best evidence for the answer to the previous question?
- A) Lines 6-10 ("In matters . . . think")
 - B) Lines 18-22 ("there . . . allow")
 - C) Lines 34-36 ("have . . . welfare")
 - D) Lines 41-45 ("the councillors . . . influence")

34

- Franklin's main purpose in the second paragraph (lines 13-17) is to
- A) highlight a contrast between the colonists in America and those in other colonies.
 - B) introduce his reason for writing to Shirley.
 - C) reassure the governor of the colonists' allegiance to Britain.
 - D) suggest that Shirley's view of the colonists is flawed.

35

- Franklin's remarks about the "governors" (line 31) indicate that these individuals are often not suitable because they are
- A) greedy.
 - B) lazy.
 - C) timid.
 - D) brutal.

36

- As used in line 35, "natural" most nearly means
- A) unconstrained.
 - B) spontaneous.
 - C) unsettled.
 - D) inherent.

37

- Franklin indicates that colonial governors may create an overly large military force because they
- A) fear the people they govern.
 - B) must ensure the security of the king's holdings.
 - C) wish to employ their friends.
 - D) are too far away from the colonies to know what is needed.

38

- Franklin refers to a “great distance” in lines 56-57 in order to emphasize which claim?
- A) Parliament only has access to partial and unreliable information about the situation of the colonies.
 - B) The cultural distance between Britain and the colonies is more significant than the physical distance between them.
 - C) Governor Shirley could greatly allay colonists’ concerns by traveling to North America periodically to address them.
 - D) The distance between Britain and the colonies would be irrelevant if the colonies could establish their own Parliament.

39

- According to the passage, the policies proposed by the British government in the American colonies would have which effect?
- A) They would reduce the colonists to the condition of citizens of an occupied nation.
 - B) They would force the colonists to pay more taxes than do other British subjects.
 - C) They would create division among the colonists.
 - D) They would suppress colonists’ initiative and made them dependent on institutions.

40

- Which choice provides the best evidence for the answer to the previous question?
- A) Lines 51-55 (“they . . . profits”)
 - B) Lines 61-63 (“it is . . . representatives”)
 - C) Lines 66-73 (“to propose . . . deserved”)
 - D) Lines 74-77 (“compelling . . . benefit”)

41

- As used in line 83, “weight” most nearly means
- A) merit.
 - B) heaviness.
 - C) majority.
 - D) burden.

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

This passage is adapted from Robert Kunzig, "Perennial Solution." ©2011 by National Geographic Society. A perennial plant lives for several years; an annual plant grows for one year or season.

Humans made an unwitting but fateful choice 10,000 years ago as we started cultivating wild plants: We chose annuals. All the grains that feed billions *Line* of people today—wheat, rice, corn, and so on—
 5 come from annual plants, which sprout from seeds, produce new seeds, and die every year. "The whole world is mostly perennials," says USDA geneticist Edward Buckler, who studies corn at Cornell University. "So why did we domesticate annuals?"
 10 Not because annuals were better, he says, but because Neolithic farmers rapidly made them better—enlarging their seeds, for instance, by replanting the ones from thriving plants, year after year. Perennials didn't benefit from that kind of selective breeding,
 15 because they don't need to be replanted. Their natural advantage became a handicap. They became the road not taken.

Today an enthusiastic band of scientists has gone back to that fork in the road: They're trying to breed 20 perennial wheat, rice, and other grains. Wes Jackson, co-founder and president of the Land Institute in Salina, Kansas, has promoted the idea for decades. It has never had much money behind it. But plant breeders in Salina and elsewhere are now crossing 25 modern grains with wild perennial relatives; they're also trying to domesticate the wild plants directly. Either way the goal is crops that would tap the main advantage of perennials—the deep, dense root systems that fuel the plants' rebirth each spring and that
 30 make them so resilient and resource efficient without sacrificing too much of the grain yield that millennia of selection have bred into annuals.

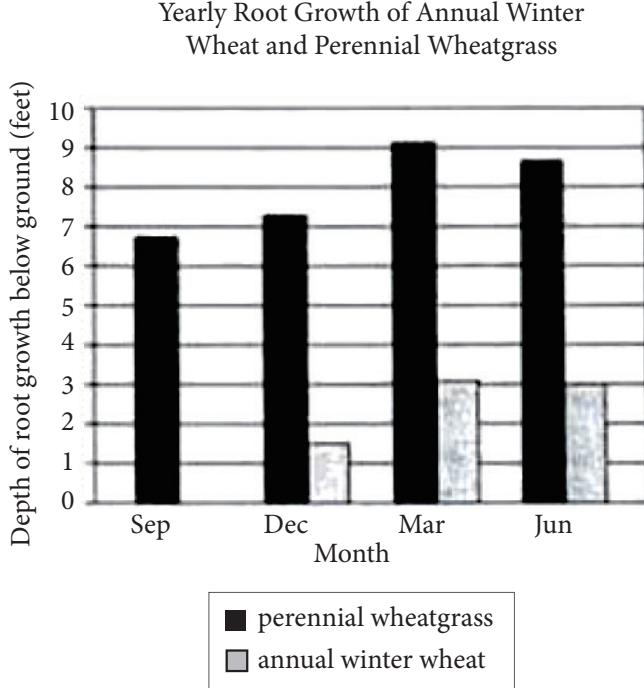
We pay a steep price for our reliance on high yields and shallow roots, says soil scientist—and National 35 Geographic emerging explorer—Jerry Glover of the Land Institute. Because annual root crops mostly tap into only the top foot or so of soil, that layer gets depleted, forcing farmers to rely on large amounts of fertilizers to maintain high yields. Annuals also 40 promote heavy use of pesticides or tillage because they leave the ground bare much of the year. That allows weeds to invade.

Above all, leaving the ground bare after harvest and plowing it in planting season erodes the soil.

45 No-till farming and other conservation practices have reduced the rate of soil loss in the U.S. by more than 40 percent since the 1980s, but it's still around 1.7 billion tons a year. Worldwide, one estimate put the rate of soil erosion from plowed fields at ten to a
 50 hundred times the rate of soil production.

Perennial grains would help with all these problems. They would keep the ground covered, reducing erosion and the need for pesticides, and their deep roots would stabilize the soil and make the
 55 grains more suitable for marginal lands. "Perennials capture water and nutrients 10 or 12 feet down in the soil, 11 months of the year," Glover says. The deep roots and ground cover would also hold on to fertilizer—reducing the cost to the farmer as well as
 60 to the environment.

The perennial wheat-wheatgrass hybrid now growing at the Land Institute can already be made into flour. Yields are too low to compete with annual wheat in Kansas—but maybe not in Nepal, which
 65 has steeper slopes and a harsher climate, and where a researcher is now testing perennial hybrids in small plots. Amber waves of perennial grain may be decades away, but the emergence of cheap DNA sequencing is allowing plant breeders to work much faster than they
 70 used to. Buckler thinks that for a tiny fraction of the billions spent annually on corn research, one could create field-testable perennial corn in as little as ten years. "I think we should take a shot at revolutionizing agriculture," he says.



42

- The main purpose of the passage is to
- explore better harvesting systems to use with annual crops
 - discuss why farmer should mix perennial crops with their annual crops.
 - outline the breeding processes of different plant seeds.
 - explain the advantages of growing perennial crops instead of annual crops.

43

- According to the passage, Neolithic farmers improved annuals plants by
- using the same seeds every year.
 - combining annuals with perennials.
 - planting the seeds from the most successful plants every year.
 - remembering which plants grow the best.

44

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

- assistance
- authority.
- favorable trail.
- noticeable gain.

45

As used in line 33, “steep” most nearly means

- difficult.
- high.
- vertical.
- sharp.

46

One central idea in the passage is that

- farmers usually get a high yield from perennial crops.
- annual crops can be very costly to grow year after year.
- conservation practices have reduced the rate of soil loss in the United States.
- perennial crops may grow better than annual crops in Nepal’s harsh climate.

47

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

- Lines 1-3 (“Humans . . . annuals”)
- Lines 33-36 (“We pay . . . Institute”)
- Lines 45-48 (“No-till . . . year”)
- Lines 63-67 (“Yields . . . plots”)

48

Which choice best supports the conclusion that perennials' root systems would benefit farmers financially?

- A) Lines 15-17 ("Their . . . taken")
- B) Lines 36-39 ("Because . . . yields")
- C) Lines 48-50 ("Worldwide . . . production")
- D) Lines 57-60 ("The deep . . . environment")

49

The main purpose of the last paragraph is to

- A) discuss the progress being made in studies of perennial plants.
- B) persuade farmers to begin growing perennial plants.
- C) illustrate how perennial plants can help feed people in Nepal.
- D) outline the positive characteristics of perennial plants.

50

The main purpose of the information in the graph is to show the

- A) time of year that plant roots grow the longest.
- B) average height of annual and perennial plants.
- C) best weather conditions for root growth.
- D) difference between annual and perennial root growth.

51

The data in the graph support the author's point about perennial plants and soil stabilization by showing.

- A) How much perennial plants replenish nutrients in the soil.
- B) Which perennial plants grow the deepest roots.
- C) That perennial plants have deep roots all year.
- D) That perennial plants should be grown alongside annual plants.

52

Based on the data from the graph and the information in the passage, what can be inferred about annual winter wheat in September.

- A) Its seeds have recently been planted.
- B) It is about to be harvested.
- C) It is being treated with fertilizer.
- D) Its roots are growing very rapidly.

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.

A Fearless Flyer

The years between the First and Second World Wars saw 1 aviators setting records. The record-setting aviators became international celebrities. Jean Batten, 2 she won world fame by flying from England to Australia in just under fifteen days in 1934, was one of the preeminent celebrity pilots of the period. Nicknamed Garbo of the Skies after legendary actress Greta Garbo,

1

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

- A) aviators setting records, and the public made international celebrities of them.
- B) international celebrities being made out of aviators for the records those aviators set.
- C) record setting aviators become international celebrities.
- D) records being set by aviators and they became international celebrities.

2

- A) NO CHANGE
- B) who won world fame
- C) it was world fame she won
- D) world-fame winner

Batten made numerous attempts at record breaking flights. 3 Her successful career illustrates the combination of preparation, luck and resolve required of long-distance pilots during the interwar years.

Batten's first try at making the England-to-Australia flight—a distance of 10,500 miles—began on April 9, 1933. that same day, eight other planes, several of which would not reach their destinations, were also attempting record breaking flights. Planes like Batten's Gipsy Moth biplane were delicate machines made of wood and linen. Breakdowns and mechanical failures were inevitable.

4 Batten a careful planner modified her plane with an additional propeller and fuel tank, 5 and even these changes were not enough to guarantee a successful flight. A sandstorm in what is now

3

The writer wants to end the paragraph with a sentence that states the central idea of the passage. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) Those early days of experimentation laid the groundwork for today's aviation industry.
- C) In the 1930s, pilots routinely achieved even greater fame than that of film stars and were eagerly followed and celebrated.
- D) During the interwar period female pilots often faced negative attitudes about their nonconformity to traditional gender roles.

4

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

However, given that automobiles of the time also tended to break down, most people were unfazed about making basic repairs to their vehicles.

Should the writer make this addition here?

- A) Yes, because it provides facts in support of the paragraph's main claim.
- B) Yes, because it explains Batten's perseverance.
- C) No, because it weakens the focus by diverging from the paragraph's main discussion.
- D) No, because it undermines the claim in the next sentence that Batten was a careful planner.

5

- A) NO CHANGE
- B) but
- C) or
- D) when

A sandstorm in what is now Pakistan drove her plane nose first into the ground, breaking the first

6 propeller, a second crash shortly thereafter put an end to the difficult flight.

7 As a result, Batten was not discouraged.

Even among early pilots, Batten was known for her determination to set world records and for her 8 bravery, even reckless, pursuit of a goal. She took chances that other pilots would not, pushing the limits of 9 her plane's capabilities. On her second attempt to fly from England to Australia, Batten tried to cover the one thousand miles from England to Rome on the first day. Although she had been able to travel that distance on her first trip, she had nearly run out of fuel. This time, heavy winds caused her to 10 fatigue her fuel supply completely, requiring her to glide to an unplanned landing during a storm.

6

- A) NO CHANGE
- B) propeller: a second crash
- C) propeller; a second crash
- D) propeller, a second crash,

7

Which choice provides the most logical transition from the previous paragraph?

- A) NO CHANGE
- B) Inevitably
- C) On the other hand
- D) Despite the setback

8

- A) NO CHANGE
- B) braving.
- C) bravely.
- D) brave.

9

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

10

- A) NO CHANGE
- B) exhaust
- C) decimate
- D) delete

Batten's perseverance was rewarded on her third attempt. **11** Although her plane endured a cracked air-intake pipe on its engine and a storm that flooded the cockpit, Batten successfully completed the journey. She touched down in Darwin, Australia, on May 23, 1934, beating a record set three years earlier by fellow pilot Amy Johnson by four days. This was the first of many record-breaking flights for Batten. Her career culminated in a twelve-day solo flight from England to New Zealand in 1936, a record that remained unbroken for forty-four years.

11

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

- A) Kept, because it answers a question raised earlier in the passage.
- B) Kept, because it adds details that support the Paragraph's main discussion.
- C) Deleted, because it shifts the focus of the paragraph from Batten to her plane.
- D) Deleted, because it introduces information that is irrelevant to the paragraph.

Questions 12–22 are based on the following passage.

The Costs of Unpaid Internships

Although some unpaid internships are important precursors to successful careers, many others require interns—generally college students with little 12 power, to do work not relevant to the occupation in which they are ostensibly receiving on-the-job training. 13 Both for the good of participants and out of self-interest. United States companies must ensure their internship programs provide participants with genuine career development.

By definition, 14 it requires financial sacrifice, as participants must 15 say good-bye to any new opportunity for the weeks or months long training period. Even for those students who can afford to do so their hardship by no means assures them a future occupation. A 2012 study by the National Association of Colleges and Employers showed that while 60 percent of college graduates who completed paid internships received job offers, only 37 percent of unpaid interns received offers. That is just 1 percent more than graduates who had not completed any internships.

12

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

13

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

- A) Kept, because it introduces the main points of the passage's argument.
- B) Kept, because it provides a valid counterclaim to the passage's argument.
- C) Deleted, because it does not explain how the participants would benefit.
- D) Deleted, because it undermines the primary assertion of the paragraph.

14

- A) NO CHANGE
- B) they require
- C) such things require
- D) unpaid internships require

15

- A) NO CHANGE
- B) throw away
- C) ditch
- D) forgo

This poor conversion rate for unpaid interns may be a sign of the lack of [16] seriousness with which companies sometimes take such positions. Under the current legal framework, unpaid internships must be beneficial training experiences rather than cost-saving devices for employer [17] to use to reduce expenses. Evidence exists, however, that some companies see internship programs simply as sources of free labor that can be used indiscriminately. In June 2013, a federal court ruled in favor of two interns who [18] are working without pay for a film production company. The judge determined that their job responsibilities, which included ordering lunch, answering phones, and emptying the trash, did not have educational value for individuals pursuing careers in the film industry. With numerous lawsuits like this one underway, companies would be wise to adhere to the law.

16

- A) NO CHANGE
- B) seriousness, with which
- C) seriousness, with which,
- D) seriousness with, which,

17

- A) NO CHANGE
- B) to use in reducing expenses.
- C) as a way to reduce expenses.
- D) DELETE the underlined portion and end the sentence with a period.

18

- A) NO CHANGE
- B) was working
- C) had worked
- D) will work

Many students themselves are aware of the pitfalls associated with unpaid internships and, in some instances, are speaking out. [19] Conversely, in 2013, a pair of students at New York University created a petition asking the school's career center to remove advertisements for unpaid internships from its [20] website the university's career center serves students in all disciplines. Within a few days, they collected over one thousand [21] students' signatures.

19

- A) NO CHANGE
- B) However,
- C) For example,
- D) Moreover,

20

- Which choice best maintains the paragraph's focus?
- A) NO CHANGE
 - B) website, and the pair supports filing lawsuits to change the internship system.
 - C) website, though it is not always clear whether the advertisements are legitimate.
 - D) website.

21

- A) NO CHANGE
- B) students signatures.
- C) student's signatures.
- D) students signature's.

These various challenges raise the possibility that some companies may do away with internship programs altogether. That would be a shame because many internships do provide participants with important experience and training. 22 Companies need to offer a variety of opportunities, from administrative duties to fieldwork, to support the various skills and interests that students have and that they want to pursue after they graduate.

22

Which concluding sentence best reflects the development of the passage's argument?

- A) NO CHANGE
- B) Rather than eliminate their programs, companies should make sure they respect both the letter and the spirit of the law by creating intern positions only when they are willing and able to offer real educational opportunities.
- C) Although students who participate in internships deserve the chance to accrue relevant experience, they need to realize that there is no requirement for a company to offer them a job after the internship is over.
- D) It may be necessary to conduct further research into which disciplines offer the most valuable internships; such information may influence students' choices of college majors and professional fields.

Questions 23–33 are based on the following passage.

A Crash Course in Cymbals

Since the early 1600s, Zildjian cymbals have been made by a 23 secret, undisclosed process—treating an alloy of copper, tin, and silver—24 it was developed by an alchemist called Avedis. When Avedis's distinctive cymbals began to be used by military bands in the Ottoman Empire, they caught the attention of the sultan, who gave Avedis eighty gold pieces to start his own cymbal foundry. He also gave Avedis a new last name Zildjian, Armenial for “cymbal smith.” The company Avedis founded is now one of the oldest family-owned.

23

- A) NO CHANGE
- B) secret and unknown
- C) secret and covert
- D) secret

24

- A) NO CHANGE
- B) developed
- C) its development was
- D) development

businesses based in the United States and continues to supply cymbals for orchestras, marching bands, **25** jazz ensembles, also rock bands around the world. **26** While the company owes its longevity in part to its closely guarded secret alloy and method, Zildjian's real secret to success may lie in its ability **27** of adapting to changes in the market as music styles change.

A growing market for Zildjian products emerged when European classical music composers began incorporating cymbals into their works. **28** A steady market for Zildjian cymbals continued to develop throughout the next two centuries, but the company

25

- A) NO CHANGE
- B) as well as jazz ensembles and
- C) jazz ensembles, and groups such as
- D) jazz ensembles, and

26

- A) NO CHANGE
- B) Although this instrument is not the most popular instrument by any means,
- C) Despite a decline in attendance at orchestral concerts in the past couple of decades,
- D) Even though there are older family-owned businesses in the United States,

27

- A) NO CHANGE
- B) to adaptation in
- C) in its adaptations for
- D) to adapt to

28

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

The German composer Nicolaus Adam Strungk's use of cymbals in the 1680 opera Esther is the first known example.

Should the writer make this addition here?

- A) Yes, because it helps explain why Zildjian cymbals were more popular than other cymbals.
- B) Yes, because it provides a specific starting point for the trend described in the previous sentence.
- C) No, because it interrupts the discussion about the use of Zildjian cymbals in European classical music.
- D) No, because the passage does not provide any additional information about Strungk's opera.

experienced a surge in demand after nineteenth century composers Hector Berlioz and Richard Wagner requested that only Zildjian cymbals be used in performances of their works **29** instead of any other cymbals. Other composers followed **30** suit, the cymbals became a regular fixture in orchestral percussion sections. **31** The percussion section of a classical orchestra includes such instruments as the timpani, the snare drum, and the bass drum.

29

- A) NO CHANGE
- B) rather than others.
- C) exclusively.
- D) DELETE the underlined portion and end the sentence with a period.

30

- A) NO CHANGE
- B) suit, thus
- C) suit, and
- D) DELETE the underlined portion.

31

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

- A) Kept, because it makes an important distinction between the cymbal and other percussion instruments.
- B) Kept, because it establishes a context for understanding what kind of instrument the cymbal is.
- C) Deleted, because it contains information that interrupts the discussion of the use of the cymbal.
- D) Deleted, because it contradicts a statement made earlier in the paragraph about the role of the cymbal in percussion sections.

Zildjian's next major opportunity for growth came when the company responded to the market in the United States, which, by the early twentieth century, had become the largest consumer of musical instruments in the world. The Zildjian company moved its base of operations from Turkey to the United States in 1929 — just in time to capitalize on the jazz Era. Because the needs of jazz composers and musicians differed from those of classical musicians, Zildjian worked with drummer Gene Krupa to adapt cymbals for a drum kit. **32** For example, they designed some smaller **33** cymbals, paired the downsized cymbals; and rigged them with a pedal mechanism to produce one of the most popularly used models of hi-hat cymbals in jazz ensembles.

In this same spirit of adaptability, Zildjian continued to respond to the needs of musicians in emerging styles of music, such as rock and roll, heavy metal, and punk rock. In 2011 Zildjian launched a digital percussion product called Gen 16, which was named after the sixteen generations of the Zildjian cymbal family and signaled that this long-standing company has more innovations to come.

32

- A) NO CHANGE
- B) However.
- C) Therefore.
- D) Instead,

33

- A) NO CHANGE
- B) cymbals; paired the downsized cymbals,
- C) cymbal, paired the downsized cymbals,
- D) symbols-paired the downsized cymbals,

Questions 34–44 are based on the following passage and supplementary material.

The Call of Spring?

Spring **34** peepers; or *Pseudacris crucifer*, are nocturnal frogs no larger than a postage stamp, difficult to spot but easy to hear. When darkness falls, their call rises as a series of high-pitched peeping sounds. For people of the northeastern United States and lower regions of eastern **35** Canada, the nighttime sound of these frogs, is a harbinger of spring.

As their common name suggests, spring peepers do not call year-round. After hibernating in logs, loose bark, and leaf litter throughout winter, peepers typically move to ponds and vernal pools in March or early April when temperatures rise above 50 degrees Fahrenheit warm enough for mating. Male peepers call to attract females and breeding season begins, **36** it often lasts through June. As temperatures rise, the calls grow **37** more intense than before and on particularly humid nights, the peeps become so powerful they can be heard from as far as a half mile away.

34

- A) NO CHANGE
- B) peepers—
- C) peepers
- D) peepers,

35

- A) NO CHANGE
- B) Canada, the nighttime sound of these frogs
- C) Canada; the nighttime sound of these frogs,
- D) Canada; the nighttime sound of these frogs

36

- A) NO CHANGE
- B) often lasting
- C) which it often lasts
- D) DELETE the underlined portion.

37

- A) NO CHANGE
- B) and increase in intensity;
- C) to an enlarged degree of intensity, and
- D) more intense;

38 Additionally, in many of these regions the populations of amphibians, including *Pseudacris crucifer*, have decreased. Because multiple factors may have contributed to the declines, including disease, habitat loss, pesticides and other pollutants and climate change, it is difficult to pinpoint the cause. Biologists do know, however, that the porous skin and unshelled eggs of amphibians make them particularly vulnerable to changes in temperature and moisture. To track how these changes are affecting spring peepers, biologists have been recording peepers' date of first call (DFC) over a period of several years and comparing the data with records from other regions and historical periods.

38

Which choice, if added here, would serve as the most effective introduction to this paragraph?

- A) One threat to amphibians worldwide is the chytrid fungus, which has destroyed more than a hundred species in less than fifteen years and infected an additional hundred.
- B) In recent years, under rising global temperatures, the date when spring peepers begin to sound their mating call has occurred earlier in some northeastern regions.
- C) Outside of the mating season, spring peepers may be found in some woodland ponds, but in general they are not seen during the winter.
- D) The peepers' calls may be interrupted by late-season freezes; however, the frogs can survive freezing temperatures and will simply resume calling once the weather warms again.

A study in Michigan conducted from 1967 to 1994 showed no significant change in the DFC of spring peepers, whereas one conducted in upstate New York found that the average DFC of spring peepers. **39** changed less drastically from 1900 to 1999 than did the average DFC of gray tree frogs (as determined by the mean change). The shift parallels a warming trend of daily maximum temperatures over the same period and **40** has caused speculation as to whether **41** they will be heard on progressively earlier dates if global temperatures continue to rise.

Average DFC for Six Species of Amphibians Near Ithaca, NY

Frog type	Average DFC 1900-1912	Average DFC 1990-1999	Mean change (days)
Spring peeper	April 4	March 20	-13.6
Wood frog	April 9	March 29	-13.0
Bullfrog	June 5	May 22	-11.4
Gray tree frog	May 4	April 14	-10.5
American toad	April 18	April 11	-1.5
Green frog	May 10	May 16	5.5

Adapted from James P. Gibbs and Alvin R. Breisch. "Climate Warming and Calling Phenology of Frogs Near Ithaca, New York 1900-1999." ©2001 by John Wiley & Sons Inc.

29

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

- A) NO CHANGE
- B) for the period 1990-1999 occurred over thirteen days earlier than it had in 1900-1912
- C) changed less from 1900 to 1999 than did the average DFC of any of the live other amphibian species
- D) in 1990-1999 occurred more than a month later than did the average DFC of the green frog

40

- A) NO CHANGE
- B) have been causing
- C) have caused
- D) are causing

41

- A) NO CHANGE
- B) it
- C) peepers
- D) any of them

42 In a surprising twist, the writer of a March 2013

Washington Post article, referring wittily to scientist Priya Nanjappa's experience of hearing spring peepers on 50-plus-degree days in December, 43 quipped, "Perhaps 'winter peeper' is a more apt name." 44

42

- A) NO CHANGE
- B) Despite all of this evidence,
- C) On a similar note,
- D) By contrast,

43

Which choice is most consistent with the idea that the writer of the article was "referring wittily" to the scientist's experience?

- A) NO CHANGE
- B) mocked,
- C) scoffed,
- D) joshed,

44

The writer wants an effective conclusion that reflects on a key implication of the study. Which choice best accomplishes this goal?

- A) Though we might be hearing the spring peepers earlier each year, we can still rely on other environmental phenomena to signal the true arrival of spring.
- B) In fact, we may need to rethink whether it is appropriate to name an animal after a season, considering that its relationship to the season may change.
- C) However, we should keep in mind that seasons change at different times and in different ways depending on location.
- D) Indeed, the spring peepers' advancing DFC might move us to consider how environmental changes could alter how we define and experience the seasons.

STOP

If you finish before time is called, you may check your work on this section only.

Do not need to turn to any other section.



Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

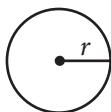
DIRECTIONS

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

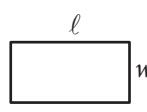
NOTES

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

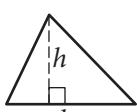
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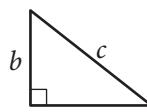
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



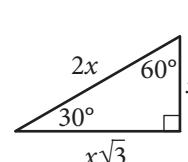
$$A = \ell w$$



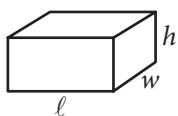
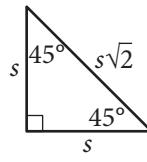
$$A = \frac{1}{2}bh$$



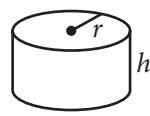
$$c^2 = a^2 + b^2$$



Special Right Triangles



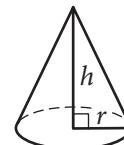
$$V = \ell wh$$



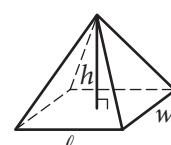
$$V = \pi r^2 h$$



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



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



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

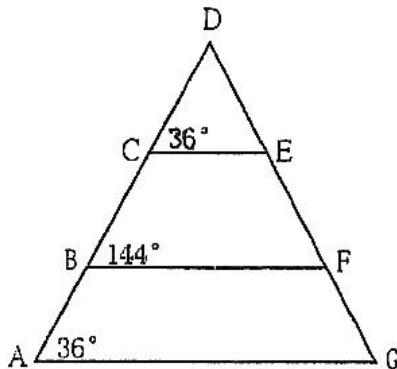
The number of degrees of arc in a circle is 360.

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

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



1



Note: Figure not drawn to scale.

Which of the following statements is (are) true based on the diagram above?

- I. $\triangle ADG$ is similar to $\triangle BDF$.
 - II. $\triangle ADG$ is similar to $\triangle CDE$.
 - III. $\triangle BDF$ is similar to $\triangle CDE$.
- A) II only
 B) I and II only
 C) I and III only
 D) I, II, and III

3

A contractor needs to purchase plywood boards and nails for a job. The contractor will buy p plywood boards for \$16.99 each and one box of nails for \$12.99. Which of the following equations shows the cost, c , of the plywood boards and nails that the contractor will buy?

- A) $c = 16.99p + 12.99c$
 B) $c = (12.99 + 16.99)p$
 C) $p = 16.99c + 12.99$
 D) $p = (12.99 + 16.99)c$

4

$$3ax - 7 = 6x - 7$$

In the equation above, a is a constant. For what value of a does the equation have infinitely many solutions?

- A) 0
 B) 2
 C) 6
 D) 7

2

$$2x - 2 = y$$

$$x + 2y = -21$$

What is the solution (x, y) of the system of equations above?

- A) $(-6, -15)$
 B) $(-3, 9)$
 C) $(3, -12)$
 D) $(4, 5)$



3

3

5

$$\sqrt{(x+9)} = 4$$

Which of the following sets consists of all values of x that satisfy the equation above?

- A) $\{-11, -7\}$
- B) $\{-25, 7\}$
- C) $\{-7\}$
- D) $\{7\}$

6

In January 2005, a ranger began monitoring the deer population in an area. The function P , defined by $P(t) = 650(1.02)^t$, where $0 \leq t \leq 5$, models the number of deer in the area t years after January 2005. What does the 650 represent in the model?

- A) The number of deer in the area in January 2005
- B) The number of deer in the area in January 2010
- C) The increase in the number of deer per year in the area in January 2010
- D) The decrease in the number of deer per year in the area from January 2005 to 2010

7

A soccer team needs new supplies. The team will buy x soccer balls at \$19.50 each and y pairs of shin guards at \$12.25 per pair. The soccer team cannot spend more than \$350. Every player needs guards, so the team will buy at least 11 pairs. Which of the following systems of inequalities gives the possible numbers of soccer balls and pairs of guards the team can buy and meet the given conditions?

- A) $12.25x + 19.50y \geq 350$
 $x \geq 11$
- B) $12.25x + 19.50y \leq 350$
 $x \geq 11$
- C) $19.50x + 12.25y \geq 350$
 $x \geq 11$
- D) $19.50x + 12.25y \leq 350$
 $x \geq 11$

8

Which of the following expressions is equivalent to

- $$x^{\frac{1}{3}} + y^{\frac{1}{3}}$$
- A) $\sqrt[3]{x} + \sqrt[3]{y}$
 - B) $\sqrt[3]{(x+y)}$
 - C) $\sqrt[3]{xy}$
 - D) $\frac{1}{3}xy$



9

Which of the following expressions is equivalent to

$$\frac{x^2 - 5x - 6}{x^2 - 2x - 3}, \text{ where } x \neq -1, 3?$$

A) $\frac{x-6}{x-3}$

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

C) $\frac{x+2}{x-1}$

D) $\frac{x+6}{x+3}$

10

For a car driving m miles on a highway, Toll A's cost, in dollars, can be modeled by the function $f(m) = 0.15m + 1.25$. For a car driving m miles on a highway, Toll B's cost, in dollars; can be modeled by the function $g(m) = 0.20m + 0.50$. How much greater is $g(40)$ than $f(40)$?

A) \$3.60

B) \$2.40

C) \$1.25

D) \$0.75

11

$$f(p) = 7,000 - 30p$$

A manufacturer of DVD players developed the function f above, where $f(p)$ represents the number of DVD players retailers are likely to purchase each week when the DVD players cost p dollars each. What is the best interpretation of the number 30 in the function?

- A) For every 1 dollar increase in price, 30 fewer DVD players are likely to be purchased each week.
- B) For every 1 dollar increase in price 30 more DVD players are likely to be purchased each week.
- C) For every 30 dollar increase in price, 1 fewer DVD players are likely to be purchased each week.
- D) For every 30 dollar increase in price, 1 more DVD players are likely to be purchased each week.

12

In the xy -plane, the graph of the function, f is a parabola with vertex at $(1, 1)$ and y -intercept $(0, -1)$. Which of the following define f ?

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

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

C) $f(x) = -\frac{1}{2}(x-1)^2 + 1$

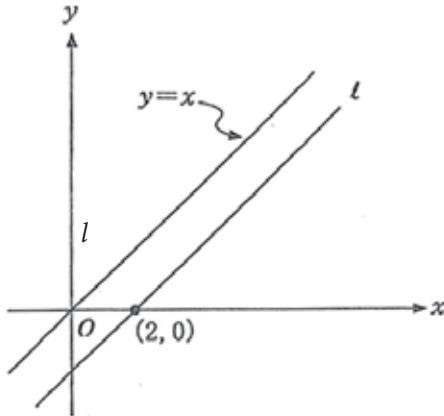
D) $f(x) = \frac{1}{2}(x+1)^2 - 1$



3

3

13



In the xy -plane above, line l is parallel to the line $y = x$. Which of the following is an equation of line l ?

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

14

$$x^2 + y^2 + 2x - 10y + 17 = 0$$

The graph of the equation above in the xy -plane is a circle. What are the coordinates of the center of the circle?

- A) $(1, -5)$
- B) $(1, 5)$
- C) $(-1, -5)$
- D) $(-1, 5)$

15

$$f(x) = a(x - b)(x - c)$$

For the quadratic function f above, a , b , and c are constants. In the xy -plane, the graph of f is a parabola that opens downward, and the coordinates of its vertex are both positive. Which of the following could be true?

- A) $a > 0, b > 0, c > 0$
- B) $a > 0, b < 0, c > 0$
- C) $a < 0, b > 0, c > 0$
- D) $a < 0, b < 0, c < 0$

**DIRECTIONS**

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

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write →
answer
in boxes.

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

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

Grid in result.

Fraction line

Answer: 2.5

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

Decimal point

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

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

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

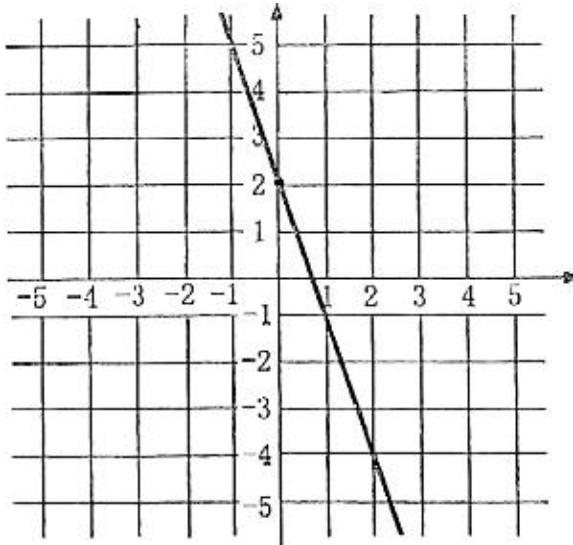
.	6	6	7
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8

Answer: 201 – either position is correct

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

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

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

3**3****16**

The line graphed in the xy -plane above can be described by the equation $y = -3(x + t) + 5$, where t is a real number. What is the value of t ?

17

If $(x - 1)(x - 2)(x + 3)(x + 4) = x^4 + ax^3 + bx^2 + cx + d$ for all values of x , what is the value of a ?

18

$$2x^2 - 17x + 36 = 0$$

What is a solution to the equation above?



3

3

19

The measure or angle A is $\frac{5}{12}\pi$ radians greater than the measure of angle B . How much greater is the measure of angle A than the measure of angle B .

in degrees? (Disregard the degree symbol when gridding your answer.)

20

A supply room clerk at an office orders more reams of paper on Monday if the supply is 50 reams or less. This Monday, the supply of paper is 325 reams. The office uses an average of 15 reams of paper per week. At this rate, in how many weeks will the supply room clerk order more paper on Monday?

STOP

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



Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

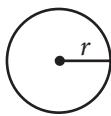
DIRECTIONS

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

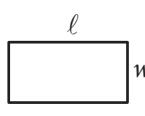
NOTES

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

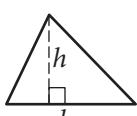
REFERENCE



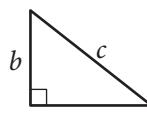
$$\begin{aligned}A &= \pi r^2 \\C &= 2\pi r\end{aligned}$$



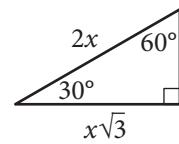
$$A = \ell w$$



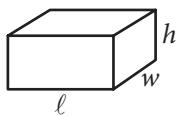
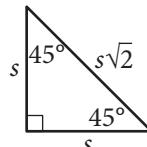
$$A = \frac{1}{2}bh$$



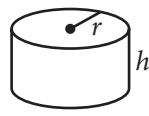
$$c^2 = a^2 + b^2$$



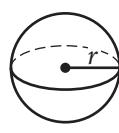
Special Right Triangles



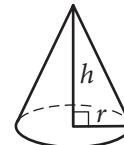
$$V = \ell wh$$



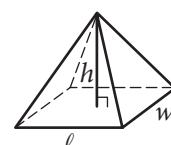
$$V = \pi r^2 h$$



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



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



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

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

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

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

4



4

1

A production manager sets a conveyor belt of an assembly line to move at a rate 1 foot per second, what rate does the conveyor belt move in feet per minute?

- A) 5
- B) 12
- C) 60
- D) 120

2

If $\frac{3x}{4y} = \frac{9}{8}$, what is the value of $\frac{x}{y}$?

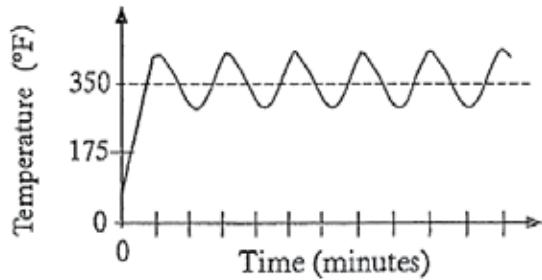
A) $\frac{2}{3}$

B) $\frac{3}{4}$

C) $\frac{27}{32}$

D) $\frac{3}{2}$

3



The graph above represents the temperature of an oven t minutes after the oven temperature is set to 350°F . Based on the graph, which of the following best describes the oven temperature?

- A) The oven temperature rises and falls periodically around a temperature of 350°F .
- B) The oven temperature rises at a positive exponential growth rate until it reaches a maximum temperature of 350°F .
- C) The oven temperature rises to 350°F , and then it varies periodically between room temperature of 350°F .
- D) The oven temperature reaches 350°F and remains constant.

4



4

4

A serving of apple provides 52 calories and 14 grams of carbohydrates, while a serving of banana provides and 23 grams of carbohydrates. Which of the following combinations of apple and banana serving contains more than 250 calories but less than 75 grams of carbohydrates?

- A) 2 apple servings and 1 banana serving
- B) 2 apple servings and 2 banana servings
- C) 3 apple servings and 2 banana servings
- D) 4 apple servings and 1 banana serving

5

Mode of Transportation to School

Grade	Walk	Bike	Bus	Car	Total
9th	24	16	46	18	104
10th	20	8	40	24	92
11th	11	8	32	38	89
12th	12	11	18	46	87
Total	67	43	136	126	372

The table above displays the results of a survey given to 372 students at a high school regarding their typical mode of transportation to school. What is the probability that a student selected at random uses a bus or car as his or her mode of transportation to school, given that the student is in the 11th grade?

A) $\frac{32}{89}$

B) $\frac{70}{89}$

C) $\frac{89}{372}$

D) $\frac{262}{372}$

4



4

6

$$2(10ax - 5) = 2ax + 26$$

Based on the equation above, what is the value of $1 - ax$?

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

7

A fabric salesperson receives 5 percent of the amount of each sale as commission. What is the salesperson's commission on a sale of 400 square yards of fabric selling for \$8 per square yard?

- A) \$160
- B) \$200
- C) \$320
- D) \$1,600

4**4****8**

For their practical exam in binary fission, a biology class at Central High School placed 50 bacteria cells in a culture dish in their laboratory –The number of cells of these bacteria doubles every 20 minutes. How many bacteria cells will be in the culture dish when 1 hour has passed?

- A) 800
- B) 400
- C) 200
- D) 150

9

Ellen would like to find the proportion of all houses in a large city that have a garage. Of the following, which sampling method would be the best in estimating this proportion?

- A) Research the 100 houses most recently sold in the city
- B) Randomly select a small area within the city and research the houses in that area
- C) Randomly select 10 houses from all of the houses in the city
- D) Randomly select 100 houses from all of the houses in the city

10

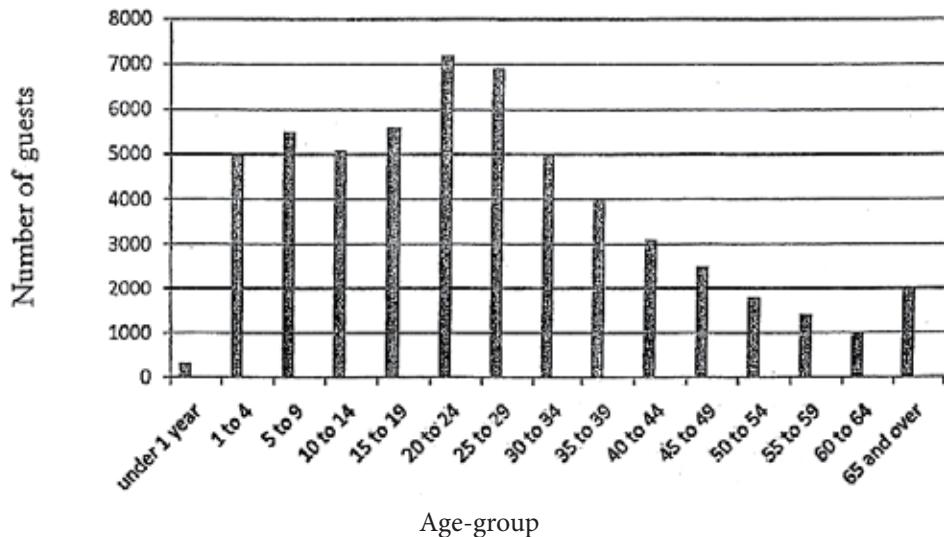
A radar gun was used to measure the speed of vehicles traveling along a highway. After all of the data were collected, it was found that the radar gun had been calibrated incorrectly and was reporting each speed as 3.9 miles per hour lower than the actual speed of the vehicles. Which of the following statistics will NOT change if the speeds are reported at their actual values?

- A) Mean
- B) Median
- C) Minimum
- D) Standard deviation



Questions 11 – 13 refer to the Following information.

Guests Who Rode the Boat Ride in 2011 by Age



In 2011, the total number of guests who rode the boat ride at a small amusement park was 56,384. The bar graph above shows the distribution of the guests by age.

4**4****11**

Of the following, which is closest to the ratio of the number of guests who rode the boat ride aged 60 to 64 to the number of guests who rode the boat ride aged 65 and over?

- A) 1 to 4
- B) 2 to 5
- C) 1 to 2
- D) 2 to 1

12

Which of the following age-groups is approximately 25% larger in number than the 65 and over group?

- A) 5 to 9
- B) 20 to 24
- C) 35 to 39
- D) 45 to 49

13

Which of the following ages could be the median age of the group of guests who rode the boat ride in 2011?

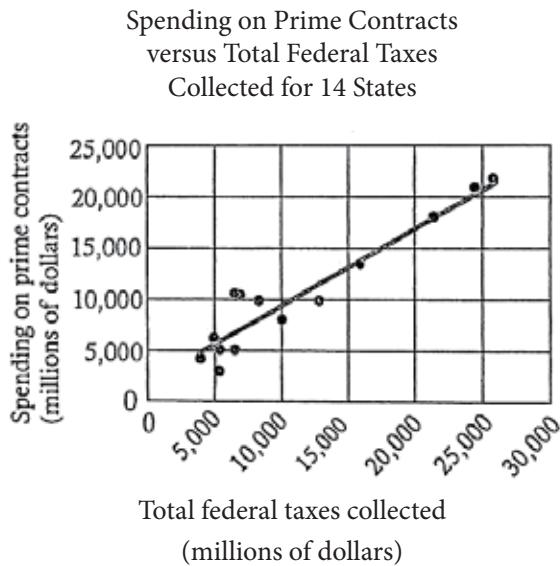
- A) 23
- B) 27
- C) 31
- D) 35



4

4

14



The scatterplot above shows data for each of 14 states in 2013 as well as a line of best fit. In Utah (which is not one of the 14 states represented in the scatterplot), a total of 17,658 million dollars in federal taxes was collected in 2013, of which of the following is the best prediction, in millions of dollars, for the amount spent on prime contracts in Utah in 2013?

- A) 21,000
- B) 18,000
- C) 15,000
- D) 12,000

15

Kevin, Shania, and Travis surveyed three groups of randomly selected students from the 9th-grade class at their school, asking about the favorite sandwich of each student. No student was surveyed more than once. The results of the survey are shown in the table below.

Sandwich type	Kevin's results	Shannia's results	Travis's results
Ham	2	3	2
Roast beef	2	2	2
Tuna	1	3	1
Turkey	2	3	5
Veggie	4	2	2
Other	1	2	1
Total	12	15	13

There are a total of 250 students in the 9th-grade class at their school. Based on the data in the table, which of the following is the best estimate of the number of students in the 9th-grade class who would choose tuna as their favorite sandwich?

- A) 25
- B) 30
- C) 50
- D) 125

4**4****Questions 16–19 refer to the following information.**

Mount Everest is the highest mountain on the planet. In 1999, the highest point on the mountain was measured to be 29,035 feet above sea level. Scientists believe that Mount Everest is still growing and estimate that the height of the mountain is increasing between 0.16 and 2.4 inches every year. (Note: 1 foot = 12 inches)

16

Based on the scientists' estimate, which of the following inequalities represents the height h , in feet, of Mount Everest 12 years after 1999?

- A) $29,035 + 0.16 < h < 29,035 + 2.4$
- B) $29,035 + 0.16 > h > 29,035 + 2.4$
- C) $29,035 + 0.16h < 29,035 + 2.4h$
- D) $29,035 + 0.16h > 29,035 + 2.4h$

17

Which of the following expressions represents the difference between the maximum and minimum predicted heights, in inches, of Mount Everest t years after 1999?

- A) $2.24t$
- B) $\frac{2.24t}{12}$
- C) $29,035 + \frac{2.24t}{12}$
- D) $29,035 + \frac{2.56t}{12}$

18

If the height of Mount Everest increases by 2.4 inches each year, how many years after 1999 would the mountain be expected to have a maximum height 6 miles above sea level? (Note: 1 mile = 5,280 feet)

- A) 2,645 years
- B) 13,225 years
- C) 31.740 years
- D) 76.176 years

19

The base camp for Mount 17,598 feet above sea level. The fastest anybody has climbed from base camp to the highest point on the mountain is 8 hours and 10 minutes. If T is the time, in minutes, it took this person to reach the highest point on the mountain from the base camp, what are the value and meaning of m in the equation $17,298 + mT = 29,035$?

- A) The climbing distance from the base camp to the highest point on the mountain is 11,437 feet.
- B) The person took 490 minutes to make the climb.
- C) The person's height above sea level increased at an average rate of approximately 23 feet per minute.
- D) The slope of the mountain is about 11 vertical feet for every horizontal foot closer to the highest point.



20

Mandy is riding her bicycle at 44 feet per second. She reaches a downhill slope and accelerates at a constant rate, increasing her speed by 2 feet per second every 10 seconds. Which of the following expressions gives Mandy's speed, in feet per second, t seconds after she started accelerating?

- A) $44 + 2t$
- B) $44 - 5t$
- C) $44 + \frac{t}{5}$
- D) $44 - \frac{t}{5}$

21

$$2x - \frac{1}{4}y = 15$$

$$\frac{1}{4}x + y = 8$$

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

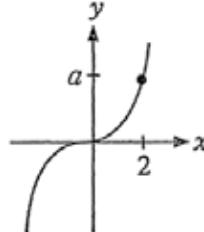
- A) 2
- B) 6
- C) 8
- D) 10

22

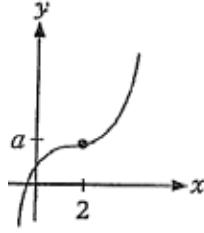
Which of the following could be the graph of

$y = \frac{1}{4}(x-2)^3 + a$ in the xy -plane, where a is a positive constant?

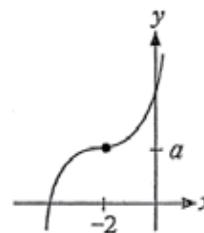
A)



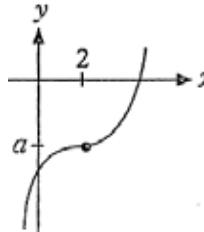
B)



C)



D)



4



4

23

A company sells each phone it produces for \$200. The company has a fixed cost of \$800,000 to produce the phones plus a cost of \$80 for each phone produced. Which of the following functions best models the profit P , in dollars, made by the company for producing and selling n phones? (Profit is total sales minus total cost.)

- A) $P(n) = 120n - 800,000$
- B) $P(n) = 200^n - 80^n - 800,000$
- C) $P(n) = 120n - 800,000$
- D) $P(n) = 20n - 800,000$

24

Cara has f flasks in her chemistry lab. After discarding one-fourth of the flasks, she orders three new sets of flasks, each containing 4 flasks. After receiving the order, she has n flasks. Which of the following equations gives n in terms of f ?

- A) $n = \frac{1}{4}f + 4$
- B) $n = \frac{1}{4}f + 12$
- C) $n = \frac{3}{4}f + 4$
- D) $n = \frac{3}{4}f + 12$

25

Depth d (feet)	Pressure p (pounds per square inch)
11	20
33	30

The table above gives the pressure on an object at two depths under the surface of a body of water. The formula $p = a + kd$ gives the pressure p , in pounds per square inch, exerted on an object at depth d , in feet, where a and k are constants. What is the value of k ?

- A) $\frac{5}{11}$
- B) $\frac{11}{5}$
- C) 5
- D) 11



26

In the xy -plane, what is the radius of the circle with center $(5, 2)$ and y -intercepts $(0, -10)$ and $(0, 14)$?

- A) 10
- B) 12
- C) 13
- D) 14

27

What are all values of x for which $\sqrt{x^2 - 5}$ a real number?

- A) $|x| \geq \sqrt{5}$
- B) $|x| \leq \sqrt{5}$
- C) $|x| \geq 5$
- D) $|x| \leq 5$

28

The amount of money, A , in a bank account earning simple interest can be determined using the formula $A = P + Prt$, where P is the principal, r is the rate of interest earned, and t is the time in years. Which formula shows the value of the principal in terms of the account balance, rate of interest, and time?

- A) $p = \frac{A}{1+rt}$
- B) $p = \frac{1+rt}{A}$
- C) $p = \frac{A}{2rt}$
- D) $p = A - 2rt$

4



4

29

In a US census, it was reported that 82,921,961 people who were 3 years old or older were enrolled in some type of school. The table below shows the estimated percentages of those people enrolled in schools broken down by type of school and gender.

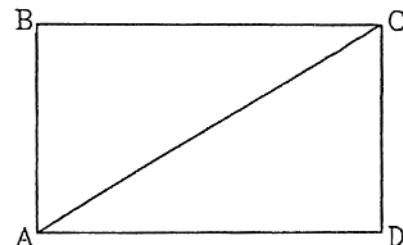
US School Enrollment of People
3 Years Old and Older

	Male	Female
Population	40,806,514	42,115,447
Nursery school or preschool	6.4%	5.8%
Kindergarten through 12th grade	68.1%	62.5%
College, vocational, or graduate school	25.5%	31.7%
Total	100.0%	100.0%

To the nearest tenth of a percent , what percent of the total population enrolled in some type of school were males enrolled in college, vocational, or graduate school?

- A) 12.5%
- B) 12.8%
- C) 25.5%
- D) 44.6%

30



In the figure above, ABCD is a rectangle, which of the following must be true?

- A) $\sin(\angle ABC) = \cos(\angle ADC)$
- B) $\sin(\angle ACB) = \cos(\angle CAD)$
- C) $\sin(\angle BAC) = \cos(\angle ACD)$
- D) $\sin(\angle BAC) = \cos(\angle CAD)$

**DIRECTIONS**

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

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write answer → in boxes.

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

← Fraction line

Grid in result.

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

← Decimal point

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

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

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

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

Answer: 201 – either position is correct

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

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

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

4**4****31**

The Silk Road was a 4000-mile trade route that connected China to Europe. To the nearest league, how long was the Silk Road?
 (Note: 1 league = 3 miles)

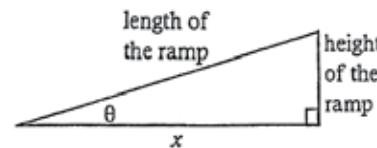
32

What is the slope of the line in the xy -plane with equation $3x - 5y = 18$?

33

$$b^2 - 36 = ab$$

In the equation above, if $a > 0$ and both a and b are integers, what is one possible value of a ?

34

Note: Figure not drawn to scale.

According to a law, ramps for use by the general public must form an angle with level ground such that the tangent of the angle θ is $\frac{1}{12}$. In the figure above, if the ramp conforms to the law and has a height of 1.5 feet, what is the value of x , in feet?

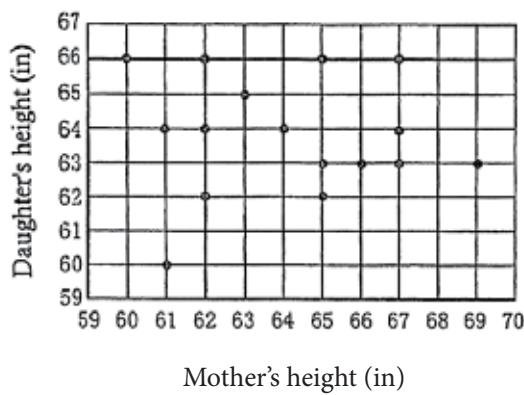
4



4

35

Heights of Mothers
and Their Adult Daughters



The scatterplot above shows the heights, in inches, of 16 randomly selected mothers and their adult daughters. What fraction of the mother-daughter pairs has a difference in height greater than 4 inches?

36

$$y = 0$$

$$y = x^2 + 6x + a$$

In the system of equations above, a is positive constant. For which value of a does the system have exactly one real solution?

4**4****38**

Next year, there will be 25% more pepper plants in the garden. If each plant yields 4 peppers, how many peppers will there be?

Questions 37 and 38 refer to the following information.

In a community garden, the ratio of tomato plants to pepper plants is 1:3, and the ratio of pepper plants to pea plants is 8:1. There are 6 pea plants in the garden.

37

How many tomato plants are in the garden?

STOP

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

JANUARY 2017 INTERNATIONAL ANSWERS

Reading				Writing				Math1		Math2	
Question	Answer	Question	Answer								
1	B	41	A	1	C	41	C	1	D	1	C
2	B	42	D	2	B	42	C	2	B	2	D
3	B	43	C	3	A	43	A	3	A	3	A
4	D	44	C	4	C	44	B	4	B	4	B
5	B	45	B	5	B			5	D	5	B
6	A	46	B	6	C			6	A	6	B
7	C	47	B	7	D			7	D	7	A
8	C	48	D	8	D			8	A	8	B
9	D	49	A	9	A			9	A	9	D
10	D	50	D	10	B			10	C	10	D
11	D	51	C	11	B			11	A	11	C
12	D	52	A	12	B			12	A	12	D
13	C			13	A			13	B	13	A
14	C			14	D			14	D	14	C
15	C			15	D			15	C	15	B
16	D			16	A			16	1	16	A
17	B			17	D			17	4	17	A
18	A			18	C			18	9/2 or 4	18	B
19	C			19	C			19	75	19	C
20	D			20	D			20	19	20	C
21	C			21	A					21	C
22	C			22	B					22	B
23	D			23	D					23	C
24	D			24	B					24	D
25	B			25	D					25	A
26	A			26	A					26	C
27	B			27	D					27	A
28	B			28	B					28	A
29	D			29	D					29	A
30	B			30	C					30	D
31	B			31	C					31	1333
32	B			32	A					32	3/5 or 0.6
33	A			33	C					33	5, 9, 16, or 35
34	C			34	D					34	18
35	A			35	B					35	1/8
36	D			36	B					36	9
37	C			37	D					37	16
38	A			38	B					38	240
39	A			39	B						
40	D			40	A						