April 2019

PSAT™ 10
Test Book

IMPORTANT REMINDERS

1

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

2

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

K-5OPT02

TS910013

Reading Test

60 MINUTES, 47 QUESTIONS

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

DIRECTIONS

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

Questions 1-9 are based on the following passage.

This passage is adapted from Dorothy West, "The Richer, The Poorer." ©1995 by Dorothy West. Originally published in 1958. In the story, Bess returns from Europe following the death of her husband to stay at the home of her sister, Lottie.

Lottie, trapped by the blood tie, knew she would not only have to send for her sister, but take her in when she returned. It didn't seem fair that Bess
Line should reap the harvest of Lottie's lifetime of
5 self-denial.

It took Lottie a week to get a bedroom ready, a week of hard work and hard cash. There was everything to do, everything to replace or paint. When she was through the room looked so fresh and
10 new that Lottie felt she deserved it more than Bess.

She would let Bess have her room, but the mattress was so lumpy, the carpet so worn, the curtains so threadbare that Lottie's conscience pricked her. She supposed she would have to redo
15 that room, too, and went about doing it with an eagerness that she mistook for haste.

When she was through upstairs, she was shocked to see how dismal downstairs looked by comparison. She tried to ignore it, but with nowhere to go to
20 escape it, the contrast grew more intolerable.

She worked her way from kitchen to parlor, persuading herself she was only putting the rooms to rights to give herself something to do. At night she slept like a child after a long and happy day of
25 playing house. She was having more fun than she had ever had in her life. She was living each hour for itself.

There was only a day now before Bess would arrive. Passing her gleaming mirrors, at first with
30 vague awareness, then with painful clarity, Lottie saw herself as others saw her, and could not stand the sight.

She went on a spending spree from specialty shops to beauty salon, emerging transformed into a
35 woman who believed in miracles.

She was in the kitchen basting a turkey when Bess rang the bell. Her heart raced, and she wondered if the heat from the oven was responsible.

She went to the door, and Bess stood before her.
40 Stiffly she suffered Bess's embrace, her heart racing harder, her eyes suddenly smarting from the onrush of cold air.

"Oh, Lottie, it's good to see you," Bess said, but saying nothing about Lottie's splendid appearance.
45 Upstairs Bess, putting down her shabby suitcase, said, "I'll sleep like a rock tonight," without a word of praise for her lovely room. At the lavish table, top-heavy with turkey, Bess said, "I'll take light and dark both," with no marveling at the size of the bird.
50   With the glow of good food in her stomach, Bess began to spin stories. They were rich with places and people, most of them lowly, all of them magnificent. Her face reflected her telling, the joys and sorrows of her remembering, and above all, the love she lived by
55 that enhanced the poorest place, the humblest person.

Then it was that Lottie knew why Bess had made no mention of her finery, or the shining room, or the twelve-pound turkey. She had not even seen them.
60 Tomorrow she would see the room as it really

looked, and Lottie as she really looked, and the warmed-over turkey in its second-day glory. Tonight she saw only what she had come seeking, a place in her sister's home and heart.

65 She said, "That's enough about me. How have the years used you?"

"It was me who didn't use them," said Lottie wistfully. "I saved for them. I saved for them. I forgot the best of them and would go without my ever
70 spending a day or a dollar enjoying them. That's my life story in those few words, a life never lived.

"Now it's too near the end to try."

Bess said, "To know how much there is to know is the beginning of learning to live. Don't count the
75 years that are left us. At our time of life it's the days that count. You've too much catching up to do to waste a minute of a waking hour feeling sorry for yourself."

Lottie grinned, a real wide open grin, "Well, to tell
80 the truth I felt sorry for you. Maybe if I had any sense I'd feel sorry for myself, after all. I know I'm too old to kick up my heels, but I'm going to let you show me how. If I land on my head, I guess it won't matter. I feel giddy already, and I like it."

1

Which choice best supports the idea that Lottie does not completely understand her true motives for behaving the way she does?

A) Lines 3-5 ("It didn't . . . self-denial")

B) Lines 6-7 ("It took . . . cash")

C) Lines 9-10 ("When . . . Bess")

D) Lines 14-16 ("She supposed . . . haste")

2

In the author's description of Lottie's activities in lines 11-20 ("She . . . intolerable"), which pattern is established?

A) With each day that passes, her feelings toward her sister become more ambivalent.

B) With each enhancement she makes to her appearance, her self-confidence increases.

C) With each improvement she makes to her home, she perceives another aspect to be inadequate.

D) With each purchase she makes, her monetary difficulties become more apparent.

3

As used in line 40, "suffered" most nearly means

A) endured.

B) worsened.

C) experienced.

D) grieved.

4

The primary purpose of the tenth paragraph (lines 43-49) is to

A) emphasize the impressive quality of Lottie's home and the dinner she has prepared.

B) indicate a contrast between the response Lottie expects and the one she receives.

C) suggest Bess's conscious disregard for her sister's feelings.

D) illustrate Bess's ability to make the best of a given situation.

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3

CONTINUE →

5

According to the passage, Bess tells stories that focus on

A) fond reminiscences of people she and Lottie . knew during childhood.

B) lavish lodgings she has stayed in and their resemblance to Lottie's home.

C) financial success she once had and her relative unconcern with its loss.

D) meaningful relationships she has had and sights she has seen.

6

As used in line 59, "seen" most nearly means

A) understood.

B) noticed.

C) matched.

D) imagined.

7

The change that Lottie undergoes in lines 67-84 ("It was . . . like it") is best described as one from

A) pained regret to energetic renewal.

B) deep bitterness to willing forgiveness.

C) profound sorrow to restrained optimism.

D) marked distrust to reluctant cooperation.

8

Based on the passage, it can reasonably be inferred that Lottie's behavior in the future will likely be guided by a

A) profound sympathy for the misfortunes of others.

B) sharper focus on her own shortcomings.

C) thorough disregard for personal safety.

D) new receptiveness to her sister's advice. .

9

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

A) Lines 79-80 ("Lottie . . . you")

B) Lines 80-81 ("Maybe . . . all")

C) Lines 81-83 ("I know . . . how")

D) Line 83 ("If I . . . matter")

Questions 10-18 are based on the following passages.

Passage 1 is adapted from a speech delivered in 1965 by US President Lyndon B. Johnson, "Peace without Conquest." Passage 2 is adapted from a speech delivered in 1967 by Martin Luther King Jr., "Beyond Vietnam." In 1954, Vietnam was separated into South Vietnam, which was allied with the United States and other noncommunist nations, and communist North Vietnam.

Passage 1

Why are we in South Viet-Nam?

We are there because we have a promise to keep. Since 1954 every American President has offered
Line support to the people of South Viet-Nam. We have
5 helped to build, and we have helped to defend. Thus, over many years, we have made a national pledge to help South Viet-Nam defend its independence.

And I intend to keep that promise.

To dishonor that pledge, to abandon this small
10 and brave nation to its enemies, and to the terror that must follow, would be an unforgivable wrong.

We are also there to strengthen world order. Around the globe, from Berlin to Thailand, are people whose well-being rests, in part, on the belief
15 that they can count on us if they are attacked. To leave Viet-Nam to its fate would shake the confidence of all these people in the value of an American commitment and in the value of America's word. The result would be an increased unrest and
20 instability, and even wider war.

We are also there because there are great stakes in the balance. Let no one think for a moment that retreat from Viet-Nam would bring an end to conflict. The battle would be renewed in one country
25 and then another. The central lesson of our time is that the appetite of aggression is never satisfied. To withdraw from one battlefield means only to prepare for the next. We must say in southeast Asia—as we did in Europe—in the words of the Bible: "Hitherto
30 shalt thou come, but no further." . . .

There are those who wonder why we have a responsibility there. Well, we have it there for the same reason that we have a responsibility for the defense of Europe. World War II was fought in both
35 Europe and Asia, and when it ended we found ourselves with continued responsibility for the defense of freedom.

Our objective is the independence of South Viet-Nam, and its freedom from attack. We want
40 nothing for ourselves—only that the people of South Viet-Nam be allowed to guide their own country in their own way.

We will do everything necessary to reach that objective. And we will do only what is absolutely
45 necessary.

Passage 2

And as I ponder the madness of Vietnam and search within myself for ways to understand and respond in compassion, my mind goes constantly to the people of that peninsula. I speak now not of the
50 soldiers of each side, not of the ideologies of the Liberation Front, not of the junta in Saigon, but simply of the people who have been living under the curse of war for almost three continuous decades now. I think of them, too, because it is clear to me
55 that there will be no meaningful solution there until some attempt is made to know them and hear their broken cries.

They must see Americans as strange liberators. The Vietnamese people proclaimed their own
60 independence in 1954—in 1945 rather—after a combined French and Japanese occupation and before the communist revolution in China. They were led by Ho Chi Minh. Even though they quoted the American Declaration of Independence in their
65 own document of freedom, we refused to recognize them. Instead, we decided to support France in its reconquest of her former colony. Our government felt then that the Vietnamese people were not ready for independence, and we again fell
70 victim to the deadly Western arrogance that has poisoned the international atmosphere for so long. With that tragic decision we rejected a revolutionary government seeking self-determination and a government that had been established not by
75 China—for whom the Vietnamese have no great love—but by clearly indigenous forces that included some communists. For the peasants this new government meant real land reform, one of the most important needs in their lives.
80 For nine years following 1945 we denied the people of Vietnam the right of independence. For nine years we vigorously supported the French in their abortive effort to recolonize Vietnam. . . .

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5

CONTINUE

We have destroyed their two most cherished
85 institutions: the family and the village. We have
destroyed their land and their crops. . . . We have
supported the enemies of the peasants of Saigon. . . .
   Now there is little left to build on, save bitterness.
Soon the only solid physical foundations remaining
90 will be found at our military bases and in the
concrete of the concentration camps we call "fortified
hamlets." The peasants may well wonder if we plan
to build our new Vietnam on such grounds as
these. . . . We must speak for them and raise the
95 questions they cannot raise. These, too, are our
brothers.

10

In lines 2, 12, and 21, the repetitive declarations "We
are there" and "We are also there" serve primarily to
convey Johnson's

A) certainty regarding the course of action that he
advocates.

B) perplexity regarding the contradictory nature of
a policy.

C) cynicism toward his political opponents'
motives.

D) confidence that his audience is in agreement
with him.

11

Which choice provides the best evidence for the idea
that Johnson believed that removing American
support from South Vietnam would create more
fighting rather than less?

A) Lines 4-7 ("We have . . . independence")

B) Lines 12-15 ("We are . . . attacked")

C) Lines 22-25 ("Let . . . another")

D) Lines 31-34 ("There . . . Europe")

12

In Passage 1, Johnson implies that without the aid of
the United States, South Vietnam would most likely

A) merge its government with that of North
Vietnam.

B) begin to rebuild the physical foundation of its
villages.

C) seek alliances with communist regimes in the
region.

D) be conquered by stronger opponents.

13

As used in line 14, "rests" most nearly means

A) depends.

B) focuses.

C) reclines.

D) ends.

14

King's characterization of Americans as "strange
liberators" (line 58) is best described as

A) disdainful, since King feels that the United States
was tentative in its support of France's efforts.

B) cautionary, since King argues that Vietnam is
ill-equipped for true independence.

C) regretful, since King disapproves of Vietnam's
preference for an alliance with China over one
with the United States.

D) ironic, since King implies that United States
actions have hindered the Vietnamese people's
quest for freedom.

15

In Passage 2, King suggests a contradiction exists between

A) French colonization and Japanese occupation.

B) America's stated principles and its actions.

C) the communist revolution and the goals of Vietnamese peasants.

D) the 1945 revolution and that of 1954.

16

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

A) Lines 49-54 ("I speak . . . now")

B) Lines 58-62 ("They . . . China")

C) Lines 63-67 ("Even . . . colony")

D) Lines 77-79 ("For . . . lives")

17

Based on the passages, Johnson and King would both most likely claim to believe that the South Vietnamese

A) need American assistance to guard against their more powerful adversaries.

B) should be able to decide for themselves what kind of government to form.

C) have seen their country destroyed by their allies.

D) were substantially better off under colonial rule.

18

Based on Passage 2, King would most likely respond to Johnson's intention to "help South Viet-Nam defend its independence" (line 7) by arguing that

A) in attempting to secure South Vietnam's independence, the United States has caused profound damage to Vietnamese society.

B) the United States has never been sincere in its efforts to keep South Vietnam from falling to communism.

C) if the United States continues to defend South Vietnam, the current conflict will likely spread to other countries in Southeast Asia.

D) the United States will never completely secure South Vietnam's independence as long as China remains a power in the region.

1   **1**

Questions 19-28 are based on the following passage and supplementary material.

This passage is adapted from Rachel Nuwer, "Crabby Tenants Defend Corals from Marauding Predators." ©2014 by Smithsonian Institution.

Coral reefs face a plethora of threats, from ocean acidification to coastal development. But at least when it comes to direct assaults, some corals have
Line well-armed defenders: coral guard-crabs. These buff
5 little crustaceans take up residence within pocilloporid corals—the ones that look a bit like cauliflower or loose brains. In exchange for shelter and nutrients, the crabs ferociously defend their hosts from hungry enemies, such as snails and
10 crown-of-thorns sea stars.

While the relationship between coral and crab has been known for a while, researchers have now found that it takes more than just one rank in the guard-crab army to keep a location secure. The
15 discovery highlights the importance of biodiversity not just across an array of animal types, but also within a group of seemingly similar species.

More than 20 coral guard-crab species exist, and they come in many shapes and sizes. Often more
20 than one crab species will occupy a single coral, and the diversity of pincers and claws suggests that the crabs each have unique defensive strategies. To find out for sure, Seabird McKeon and Jenna Moore of the National Museum of Natural History's
25 Smithsonian Marine Station headed to an enviable field site in Mo'orea, an island in French Polynesia where the majority of coral guard-crabs live.

In recent years, Mo'orea coral reefs have suffered a plague of crown-of-thorns sea stars, spiny creatures
30 that can grow to the size of a trash can lid. These voracious animals rove through reefs in groups of up to 200, and booms of these venomous predators have been known to decimate entire reefs.

The scientists performed various experimental
35 trials to tease out the relationship between the crabs, the corals and the predators. They focused their efforts on four species of crabs, and then divided those species into different size classes. They set up tanks that included corals plus one or more of the
40 crab species and size classes. Then they introduced various hungry predators, including crown-of-thorns sea stars and cushion stars (*Culcita novaeguineae*, a type of starfish that looks like an overstuffed pillow).

The results, described in the journal *PeerJ*, show
45 even if other species of smaller crabs were present, without the powerhouse claws of the largest crab, the corals fell victim to the sea stars' prehensile arms. Over a two-week trial period, 64 percent of corals lacking the large guard-crabs were attacked by the
50 sea stars, and they lost 22 percent of their tissue. Just 18 percent of corals with resident large crabs were attacked, and those victims were stripped of only 2 percent of their tissue.

Tinier crustaceans had important roles to play,
55 too. Smaller crabs (*Trapezia punctimanus* and small-sized *Trapezia serenei*) paid the most attention to munching snails (*Drupella cornus*), which the large crabs ignored. Medium-sized crabs (*Trapezia bidentata* and medium-sized *Trapezia serenei*), on
60 the other hand, preferred to defend against cushion stars, but stayed inactive if the larger crown-of-thorns sea stars mounted an attack. In light of these various duties, the authors conclude that the crabs have evolved complementary roles "as well as a
65 hierarchy of defensive effectiveness among different species and sizes."

While clever, this complex strategy puts the corals in danger. Should one species of crab fall—whether due to climate change or another environmental
70 threat—the corals would be left relatively defenseless against the corresponding predator. Increasing numbers of coral enemy outbreaks seem to be triggered by declines in [coral enemies'] predators due to overfishing or habitat destruction. That means
75 attacks on corals could increase in frequency or intensity in the future, potentially overwhelming the guard-crabs.
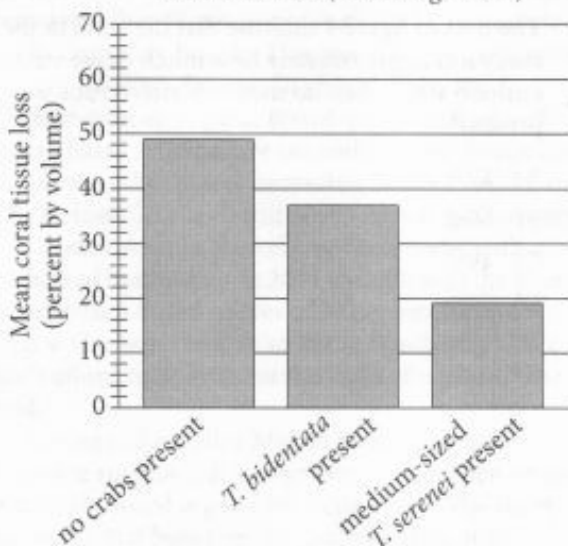
Figure 1

Effect of Small-Sized Crabs on Coral Tissue in the Presence of Snails (*D. cornus*)
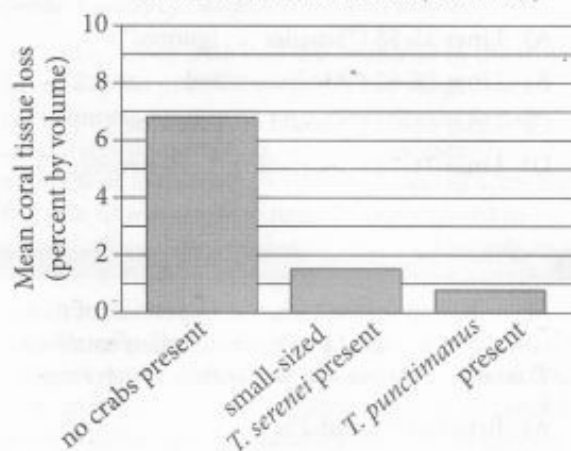
Figure 2

Effect of Medium-Sized Crabs on Coral Tissue in the Presence of Cushion Stars (*C. novaeguineae*)

Adapted from C. Seabird McKeon and Jenna M. Moore, "Species and Size Diversity in Protective Services Offered by Coral Guard-Crabs." ©2014 by C. Seabird McKeon and Jenna M. Moore.

19

As used in line 14, "secure" most nearly means

A) definite.

B) reliable.

C) concealed.

D) protected.

20

It can reasonably be inferred from the passage that McKeon and Moore conducted their study in order to answer which question?

A) How can scientists limit further damage to the coral reefs in Mo'orea?

B) Do coral guard-crab species have distinctive roles in safeguarding coral reefs?

C) Are there additional coral guard-crab species yet to be identified by scientists?

D) What mean volume of coral tissue is lost annually in the Mo'orea coral reefs?

21

The description in the fourth paragraph (lines 28-33) primarily emphasizes which characteristic of the crown-of-thorns sea stars?

A) Their resilience

B) Their destructiveness

C) Their adaptability

D) Their selectivity

22

Which choice best describes the way in which crown-of-thorns sea stars and pocilloporid corals interact, as presented in the passage?

A) Sea stars shelter corals.

B) Sea stars compete with corals for resources.

C) Sea stars are consumed by corals.

D) Sea stars prey on corals.

CONTINUE ➤

23

As used in line 40, "introduced" most nearly means

A) added.

B) initiated.

C) acquainted.

D) announced.

24

Which choice best supports the idea that the emergence of particular characteristics in individual guard-crab species was likely influenced by other species?

A) Lines 44-47 ("The results . . . arms")

B) Lines 54-55 ("Tinier . . . too")

C) Lines 62-66 ("In light . . . sizes")

D) Lines 74-77 ("That means . . . guard-crabs")

25

The passage most strongly implies that the removal of large guard-crabs from a pocilloporid coral reef would affect the ecosystem in which of the following ways?

A) Medium-sized crabs would attack the sea stars formerly targeted by the large crabs.

B) The corals would be more vulnerable to sea stars, endangering the reef as a whole.

C) The corals would develop other defenses, such as camouflage or toxic secretions.

D) Predatory snails would proliferate, eventually attracting higher-order predators.

26

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

A) Lines 55-58 ("Smaller . . . ignored")

B) Lines 58-62 ("Medium-sized . . . attack")

C) Lines 68-71 ("Should . . . predator")

D) Lines 71-74 ("Increasing . . . destruction")

27

According to figure 1, the mean percent of tissue volume loss caused by *D. cornus* when small-sized *T. serenei* were present was within which range?

A) Between 0% and 2%

B) Between 2% and 3%

C) Between 3% and 5%

D) Between 5% and 7%

28

The data in figure 2 indicate that the coral in the study lost approximately how much tissue volume to cushion stars when no medium-sized crabs were present?

A) 19%

B) 36%

C) 49%

D) 70%

10

Questions 29-38 are based on the following passage and supplementary material.

This passage is adapted from Iris Bohnet, *What Works: Gender Equality by Design.* ©2016 by Iris Bohnet.

Today, more than half the countries in the world have adopted political quotas. They range from party quotas—a certain representation of female
Line candidates on party lists, whether voluntarily
5 adopted or mandated by law—to reserved seats for a fraction of women who must be represented in elected office. Some of this reflects the realization that the self-perpetuating effects of discrimination can only be broken if opportunities for the
10 traditionally discriminated-against are created. If people assume women are unsuited to leadership, women invest less in leadership training and seek out fewer leadership opportunities. And when they do seek to become leaders and confront the stereotype,
15 they are less likely to be chosen. Quotas can short-circuit this cycle. Far from elevating the under-qualified, quotas prove in fact to broaden the pool of qualified candidates.

This is perhaps why quotas have started to spread
20 in the business world. In 2003 Norwegian legislation mandated that 40 percent of each sex be represented on its corporate boards. This was followed by similar laws in Belgium, France, Germany, Italy, the Netherlands, and Spain. Board quotas and related
25 target-based schemes are currently under discussion in various other places, including Brazil, Canada, the Philippines, Scotland, and South Africa. In Germany, Chancellor Angela Merkel surprised many with a change of heart when in 2014 she affirmed the plan
30 to introduce board quotas of 30 percent for the largest German companies in the Bundestag:[1] "We can't afford to do without the skills of women," she said.

But was Chancellor Merkel right? Does the
35 evidence suggest that a larger share of women on its corporate board is good for a company? The short answer is that based on the available data, it is almost impossible to prove either way. No study to date has been able to establish a causal relationship
40 between corporate board diversity and company performance. Boards are not created randomly. If there was a relationship between board diversity and firm performance, we would not know whether it was the board that affected the company or whether
45 the company influenced the composition of the board.

Even though causality cannot be established with the available data, much research has gone into understanding whether there is a relationship
50 between board diversity and company performance. Deborah Rhode and Amanda Packel of Stanford University provide an excellent review. The evidence is mixed. A number of studies report positive correlations between the fraction of female directors
55 and company performance. Miriam Schwartz-Ziv's analysis of Israeli companies suggests that critical mass mattered and that companies with at least three female directors had higher ROEs (returns on equity) and net profit margins. Others have found no or
60 negative correlations between gender diversity and performance.

Given the mixed evidence of individual studies, a meta-analysis combining the results of 140 studies is particularly helpful in this context. Across all
65 studies, it finds a small positive relationship between female board representation and company profitability (measured by accounting returns). Market performance, on the other hand, was only positively related to board diversity in countries with
70 greater gender parity and negatively otherwise. Investors' evaluations of a firm's future performance may well be influenced by gender norms prevalent in a given country. In more gender-equal countries, they expected gender diversity on corporate boards
75 to be a good thing; in less gender-equal countries, they saw it as a disadvantage.

[1] Federal government

Various Countries' Representation of Women
on Corporate Boards in 2015
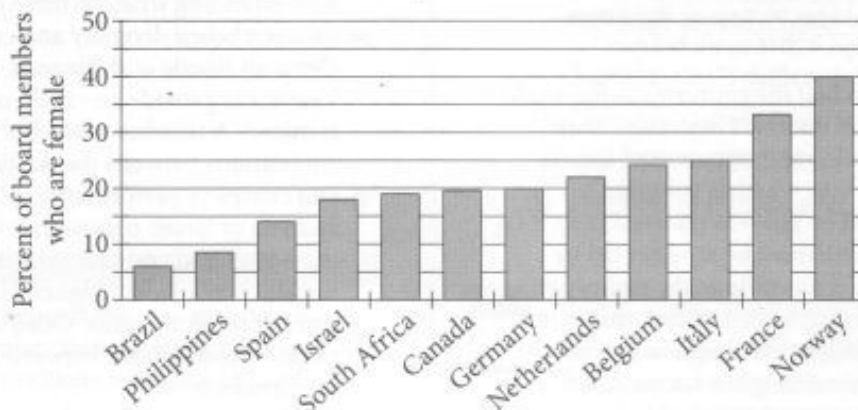
Source: Data from Linda-Eling Lee et al., *Women on Boards: Global Trends in Gender Diversity on Corporate Boards.*
©2015 by MSCI Inc.

29

The passage is written from the perspective of someone who is

A) publishing a research study on corporate performance.

B) knowledgeable about research on the makeup of corporate boards.

C) active on a corporation's board of directors.

D) proposing new regulations mandating quotas for corporate boards.

30

The main effect of the term "short-circuit" in lines 15-16 is to show that quotas can

A) impede the development of an unfair trend.

B) accelerate gains that are already being made.

C) suppress a series of promising outcomes for women.

D) reinforce stereotypes about the effectiveness of leaders.

31

As used in line 43, "firm" most nearly means

A) security.

B) support.

C) compact.

D) organization.

32

The main idea of the fourth paragraph (lines 47-61) is that

A) many researchers have found a negative relationship between board diversity and company performance.

B) the effects of board diversity on company performance have been studied many times with widely varying results.

C) insufficient research has been conducted on the relationship between board diversity and company performance.

D) a majority of researchers have found a positive relationship between board diversity and company performance.

33

In its discussion of corporate board diversity, the passage suggests that, on average, companies with

A) more female board members are more profitable than those with fewer female board members.

B) a majority of female directors are more profitable than companies with a majority of male directors.

C) few female directors are unprofitable but only in countries with greater gender equality.

D) no female directors are profitable but experience poor market performance.

34

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

A) Lines 41-46 ("If there . . . board")

B) Lines 51-52 ("Deborah . . . review")

C) Lines 55-59 ("Miriam . . . margins")

D) Lines 64-67 ("Across . . . returns")

35

The passage suggests that compared with a similar company in a country with a high degree of gender parity, a company with a diverse board of directors in a country with a low degree of gender parity would be more likely to have

A) variable economic performance.

B) weaker market performance.

C) greater profitability.

D) better returns on equity.

36

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

A) Lines 59-61 ("Others . . . performance")

B) Lines 62-64 ("Given . . . context")

C) Lines 68-70 ("Market . . . otherwise")

D) Lines 71-73 ("Investors' . . . country")

37

According to the graph, in 2015 the percent of corporate board members in Italy who were women was approximately

A) 5 percent.

B) 15 percent.

C) 25 percent.

D) 35 percent.

38

Based on the information in the graph, in the countries that the passage lists as having instituted quotas (lines 20-24), in 2015 the percent of corporate board members who were women ranged from approximately

A) 6 percent to 25 percent.

B) 14 percent to 25 percent.

C) 14 percent to 40 percent.

D) 33 percent to 40 percent.

Questions 39-47 are based on the following passage.

This passage is adapted from James Urton, "Researchers Discover How Petunias Know When to Smell Good." ©2015 by University of Washington.

A team of University of Washington biologists has identified a key mechanism plants use to decide when to release their floral scents to attract
Line pollinators. Their findings connect the production
5 and release of these fragrant chemicals to the innate circadian rhythms that pulse through all life on Earth.

The researchers studied these questions in the common garden petunia. This white-flowered hybrid
10 releases an aromatic, sweet-smelling fragrance in the evening to attract insect pollinators, such as hawk moths.

"Plants emit these scents when they want to attract their pollinators," said Takato Imaizumi, UW
15 associate professor of biology and senior author on the paper. "It makes sense that they should time this with when the pollinators will be around."

Imaizumi's team discovered a major gene that controls when the petunia releases its fragrance. The
20 gene—known by its acronym LHY—is found in many plant species and is a key component of the plant "circadian clock."

Biologists have long recognized that creatures like plants, humans and even tiny bacteria all have
25 circadian clocks—genes that keep their cells synchronized to the 24-hour cycle of life on Earth. These genes regulate cellular activities based on the time of day. Researchers had previously shown that LHY is a component of the circadian clock in other
30 flowering plants, but this paper marks the first time biologists have connected LHY activity to flower scent.

"Now we're finding out what the bridge is between the circadian clock and scent production
35 and release," said Myles Fenske, a UW doctoral student in biology and one of three lead authors on the paper.

Since no one had ever studied the LHY gene in petunias, Fenske and his fellow researchers gathered
40 basic information about LHY to show that it has the same circadian functions as it does in other plant species. Many circadian clock genes are only active at specific times of the day, when they influence the activity of other genes that control what cells are

45 doing. The researchers in Imaizumi's lab discovered that the petunia LHY gene is most active in the morning, at the opposite time of day from when the petunia releases its fragrant evening scent.

Imaizumi and his team hypothesized that LHY's
50 morning activity might repress the production of scented chemicals. When they prolonged LHY's activity into the evening, the petunias didn't release their fragrant chemicals at all.

"That was perfect," said Imaizumi. "It is exactly
55 what I would hope to see."

If LHY's activity truly did have a negative effect on scent production, then petunia plants that lacked the LHY gene's burst of morning activity might produce and release their scents earlier in the day.
60 Fenske and his colleagues created petunia plants with reduced LHY activity. Those plants produced and released fragrant chemicals four to eight hours earlier in the day.

Imaizumi's team even discovered how LHY
65 represses floral scent production. It interferes with the activity of ODO1, another petunia gene that promotes the production and release of floral scents. By repressing ODO1 activity early in the day, LHY stops the floral scent assembly line in its tracks.
70 When the LHY gene becomes less active later in the day, ODO1 is able to ramp up production of the fragrant chemicals just in time for the evening aromatic release.

Since genes like LHY and ODO1 are present in
75 most—if not all—flowering plants, Imaizumi and his team believe that the interactions between these two genes may be a common mechanism for a plant's circadian clock to influence or control the production of fragrant floral scents. If so, then
80 changes to the strength or timing of the LHY-ODO1 bridge may explain how flowers change the timing of scent production as they evolve.

39

The main purpose of the passage is to discuss the discovery of

A) factors that alter the chemical composition of fragrance in garden petunias.

B) genes that influence the timing of scent release in garden petunias.

C) a relationship between pollination rates and fragrance release in garden petunias.

D) the processes that regulate the onset of flowering in garden petunias.

40

As used in line 2, "key mechanism" most nearly means

A) crucial process.

B) unusual tool.

C) fundamental doctrine.

D) efficient device.

41

As used in line 30, "marks" most nearly means

A) grades.

B) signifies.

C) heeds.

D) blots.

42

The scientists discussed in the passage confirmed the negative effect of LHY on scent release in garden petunias by

A) analyzing differences between the volume of scent released by unaltered garden petunias and those with increased LHY activity.

B) tracking the number of visits from insect pollinators in both unaltered and reduced-LHY garden petunias over a 24-hour period.

C) identifying the length of time pollinators visit garden petunias with unaltered and increased LHY activity.

D) comparing the timing of scent release in garden petunias with normal LHY activity and those with reduced LHY activity.

43

It can most reasonably be inferred from the passage that when the scientists altered garden petunias in order to prolong the activity of LHY into the evening, they also

A) inhibited the activity of ODO1 in the altered plants.

B) confirmed the presence of ODO1 in the altered plants.

C) concentrated the fragrance produced by the altered plants.

D) destroyed the ability of the altered plants to produce fragrance.

44

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

A) Lines 4-7 ("Their . . . Earth")

B) Lines 19-22 ("The gene . . . clock")

C) Lines 28-32 ("Researchers . . . scent")

D) Lines 65-67 ("It interferes . . . scents")

45

The author most likely compares floral scent production to an "assembly line" (line 69) because an assembly line suggests a

A) standard procedure ensuring a regular supply of plant nutrients.

B) well-run mechanism in which a plant's genes are easily interchanged.

C) routinely occurring process functioning within a plant's cells.

D) recurring task that is controlled by the introduction of a plant's primary pollinator.

46

As presented in the passage, which choice best expresses the perspective of Imaizumi and his team regarding the LHY and ODO1 genes?

A) The functions of the LHY and ODO1 genes are well understood in flowering plants, but more research is needed in order to determine their role in garden petunias.

B) The importance of the LHY and ODO1 genes in scent production among garden petunias has been overestimated by scientists.

C) The LHY and ODO1 genes most likely interact in similar ways in other flowering plants as they do in garden petunias.

D) The LHY and ODO1 genes most likely exert a greater influence on floral scent in garden petunias than in less aromatic flowering plants.

47

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

A) Lines 49-51 ("Imaizumi . . . chemicals")

B) Lines 68-69 ("By repressing . . . tracks")

C) Lines 70-73 ("When . . . release")

D) Lines 74-79 ("Since . . . scents")

STOP

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

Writing and Language Test

35 MINUTES, 44 QUESTIONS

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

DIRECTIONS

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

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

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

Questions 1-11 are based on the following passage.

Brazil's Favelados Step into the Limelight

In the 2000s, Brazilian films such as *City of God* and *City of Men* brought favelas—densely populated vertical housing communities—to the international stage. Favelas came to be associated with grim depictions of city life in Rio de Janeiro, Brazil, leading to negative stereotypes and generalizations about these communities. The 2010 anthology film *5x Favela, Now by Ourselves* attempted to challenge such **1** depictions. It challenged them by presenting stories written, acted, and directed by a cast

1

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

A) depictions by presenting

B) depictions, and it did so by presenting

C) depictions; this challenge was accomplished through the presentation of

D) depictions, while using the presentation of

and crew of *favelados* (favela residents). **2** When 5x *Favela* was finally released, it received worldwide acclaim, including screenings at the celebrated Cannes Film Festival.

The project began in 2007 when young favelados were invited to attend a series of free, yearlong workshops in directing, **3** editing—acting, and other aspects of filmmaking. **4** During these classes, favelados

---

2

Which choice most effectively introduces the discussion that follows in the passage?

A) NO CHANGE

B) The *5x Favela* project was supported by nongovernmental organizations from across Rio de Janeiro.

C) The origins of *5x Favela* go all the way back to 1993, when noted Brazilian filmmaker Carlos Diegues began working with young actors and directors.

D) Comprising five different short films about daily life in the favelas, *5x Favela* has allowed favelados to bring their own perspective to cinematic portrayals of their neighborhoods.

3

A) NO CHANGE

B) editing

C) editing;

D) editing,

4

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

> The project can be seen as an extension of the *retomada*, the boom in Brazilian film production that occurred in the 1990s.

Should the writer make this addition here?

A) Yes, because it defines a key term that is used later in the passage.

B) Yes, because it places the *5x Favela* project within a larger cultural context.

C) No, because it interrupts the description of the project with a loosely related detail.

D) No, because it does not provide historical information about the *retomada*.

wrote scripts for the five different short **5** films, independent story lines brought together through common cinematography and editing techniques—that would make up the feature-length anthology. **6** By 2009, more than 200 youths had participated in the project, and by the end of the training, 84 of them had been selected for the production.

Carefully balancing tragedy and comedy, **7** conventional cinematic depictions of favelas left unseen the moments of play, camaraderie, and humor that the short films of *5x Favela* bear witness to. For example, in the short film *Let There Be Light*, the audience meets a group of neighbors whose lights go out because of a power outage on Christmas Eve. Through inventive means, favelados restore the power supply. The story ends with a festive scene of the townspeople dancing the samba under a fully lit Christmas tree.

5

A) NO CHANGE
B) films—
C) films;
D) films

6

A) NO CHANGE
B) For instance,
C) Similarly,
D) Regardless,

7

A) NO CHANGE
B) depictions of favelas in conventional cinema did not bear witness to the previously unseen moments of play, camaraderie, and humor in the short films of *5x Favela*.
C) bearing witness to moments of play, camaraderie, and humor previously unseen in conventional cinematic depictions of favelas is what the short films of *5x Favela* do.
D) the short films of *5x Favela* bear witness to moments of play, camaraderie, and humor previously unseen in conventional cinematic depictions of favelas.

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20

CONTINUE ➤

5x Favela not only allowed the favelado cast and crew to help shape the way **8** there neighborhoods are depicted but also **9** had a budget that allowed them to create work of a quality similar to that of other major Brazilian productions. Rising star Juan Paiva, for example, who played a 12-year-old boy motivated to find a birthday present for his father in the short *Rice and Beans*, was new to acting when he joined the cast of *5x Favela*. He has subsequently acted in an award-winning film and earned a recurring role in the TV series *Total Dreamer*. Similarly, Manaíra Carneiro, who **10** had no professional filmmaking experience before directing the *5x Favela* short film *Source of Income*, saw **11** our career take off after the experience. By drawing international attention to the talents of its creators, *5x Favela* has helped ensure that voices from the favelas will be part of world cinema for years to come.

8

A) NO CHANGE
B) they're
C) their
D) its

9

Which choice most effectively presents the main idea of the paragraph?

A) NO CHANGE
B) reflects the collaboration between favela residents and major figures from Brazilian films.
C) provided an opportunity for them to break into the film industry.
D) moves beyond the lackluster portrayals of favelas that are seen in other films.

10

A) NO CHANGE
B) hadn't ever made even a single professional movie
C) was an absolute neophyte in relation to the film industry
D) was a nobody in the movie biz

11

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

Questions 12-22 are based on the following passage.

Planktologists: Studying an Invisible Underwater World

— 1 —

Kim Thamatrakoln was studying to be a medical doctor when she found her true calling: planktology. She had studied biochemistry as an undergraduate, but it was not until she **12** begins working on her master's degree in biology that she realized her true passion was for academic research in marine science. **13** "My first introduction to academic research was as an undergraduate," she says. From there she went on to a doctoral program in marine biology, specializing in phytoplankton. She now works at the Department of Marine and Coastal Sciences at Rutgers University in New Jersey.

— 2 —

Plankton—organisms that drift in the top **14** layers' of oceans—are tiny, but their role in Earth's ecosystems makes them an important subject of study. Phytoplankton (many of which are microscopic) **15** prompt approximately half the oxygen in Earth's atmosphere by photosynthesis, the process by which plants convert light energy into chemical energy. Planktologists, marine biologists like Thamatrakoln who study plankton, analyze the biological processes of these organisms. Their job is to understand the role of plankton in marine environments and how their responses to environmental changes can affect the health of Earth as a whole.

12
A) NO CHANGE
B) began
C) will begin
D) will have begun

13
Which quotation from a profile of Thamatrakoln published on a Rutgers University departmental website most effectively elaborates on the previous sentences?
A) NO CHANGE
B) "I . . . wanted to apply the skills and knowledge I acquired in the biomedical field to an environmentally related one,"
C) "I currently do not teach in a formal classroom, but I mentor and train undergraduates and graduate students,"
D) "After college, I got a job at a biotech company involved in sequencing the first human genome,"

14
A) NO CHANGE
B) layer's of ocean's—
C) layers of oceans'—
D) layers of oceans—

15
A) NO CHANGE
B) generate
C) promote
D) trigger

— 3 —

Thamatrakoln researches the biological and chemical properties of diatoms, a type of phytoplankton. **16** Her team takes research expeditions to collect diatom samples and models how diatoms will react to changes such as viral infection and variability in light and nutrients. One of Thamatrakoln's **17** projects, focused on how diatoms respond to a lack of iron, a nutrient that serves as an important component during photosynthesis.

18 However, she discovered that iron deficiencies in the ocean have a negative impact on the health of diatoms and **19** one's ability to photosynthesize and that they may potentially lead to lower oxygen levels in Earth's atmosphere.

16

Which choice most effectively introduces the information in the next sentence of the paragraph?

A) NO CHANGE

B) Diatoms are unicellular, although they can form colonies of varying shapes and sizes.

C) Diatoms can be found in soil as well as in water.

D) Thamatrakoln and her team have published some of their most important findings in the journal *Environmental Microbiology*.

17

A) NO CHANGE

B) projects

C) projects—

D) projects:

18

A) NO CHANGE

B) Therefore,

C) Next,

D) DELETE the underlined portion, adjusting the capitalization as needed.

19

A) NO CHANGE

B) its

C) their

D) another's

— 4 —

In 2013 an international team of scientists completed a series of global expeditions on the research schooner *Tara*, collecting plankton at 210 sites. The team collected over 35,000 different species of **20** plankton. Most of these different species were previously unknown to science. With only 2 percent of the samples analyzed so **21** far, scientists have already learned that plankton are highly sensitive to changes in ocean temperatures. Further analysis of the data collected is still needed to understand how changes to planktonic ecosystems may affect the future well-being of the planet. Thus, now, more than ever, planktologists are needed to study these tiny and unglamorous, but vitally important, microorganisms.

Question 22 asks about the previous passage as a whole.

20

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

A) plankton: most of these 35,000 species

B) plankton, even though most of them

C) plankton, most of which

D) plankton, just as they

21

A) NO CHANGE

B) far, though

C) far as

D) far, and

Think about the previous passage as a whole as you answer question 22.

22

The writer plans to add the following sentence to the passage.

> Thanks to a recent research effort, scientists now have more data on plankton than ever before.

The most logical placement for this sentence is

A) before the first sentence in paragraph 1.

B) before the first sentence in paragraph 2.

C) before the first sentence in paragraph 3.

D) before the first sentence in paragraph 4.

Questions 23-33 are based on the following passage.

Rails to Trails

Available land is often reserved for commercial and residential use, so communities are creating public spaces from an unlikely **23** source abandoned railroad tracks. The conversion of old rail corridors **24** —linear stretches of land that contain railroad tracks—into public trails **25** offers an array of benefits. It encourages people to adopt a healthier lifestyle by creating areas designated for walking, biking, **26** and for other recreational activities. It also has economic advantages, as communities' local businesses and tourist destinations may flourish due to their proximity to these public trails. With the help of federal and state grants, over 100,000 miles of disused rail corridors stand to be converted into new public spaces.

23

A) NO CHANGE
B) source; abandoned
C) source: abandoned
D) source—abandoned—

24

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

A) Kept, because it acts as a transition to the information that follows in the paragraph.
B) Kept, because it provides a definition of a key term in the passage.
C) Deleted, because it introduces information unrelated to the passage.
D) Deleted, because it repeats information that has already been stated in the paragraph.

25

A) NO CHANGE
B) offer
C) have offered
D) are offering

26

A) NO CHANGE
B) and
C) as well as doing
D) and also

Rail-to-trail conversions in formerly industrial areas are restoring natural landscapes and revitalizing communities. **27** Nonetheless, in Milford, Delaware, the construction of the Mispillion River Greenway in a corridor once used for freight transport has enhanced the area's social and environmental well-being. Providing convenient access to the city's downtown, **28** residents are encouraged by the scenic bicycle and pedestrian path "to maintain healthy lifestyles and use alternative forms of transportation," according to former governor Ruth Ann Minner. The health of the local ecosystem has also been improved as restored areas promote new plant growth and attract a variety of wildlife.

Though the conversion process can be expensive, such trails are a worthwhile investment, and **29** the National Park Service studies their effects on local economies. In the case of the Mispillion River Greenway, for instance, 84 percent of the $1.5 million used to fund the project came from federal grants. The city has seen an ample return on the investment: boosting the local economy, the greenway has attracted new businesses that employ more than 250 people and generate over $200 million **30** each year in annual retail revenue.

27

A) NO CHANGE
B) However,
C) Additionally,
D) For example,

28

A) NO CHANGE
B) residents, with regard to the scenic bicycle and pedestrian path, are encouraged
C) it is the scenic bicycle and pedestrian path that encourages residents
D) the scenic bicycle and pedestrian path encourages residents

29

Which choice best introduces the sentence that follows in the paragraph?

A) NO CHANGE
B) the benefits include more effective monitoring of air and water quality.
C) a variety of funding mechanisms can help offset costs.
D) they attract tourists as well as local residents.

30

A) NO CHANGE
B) in annual
C) annually each year in
D) every year, annually in

While rail trails hold a great deal of promise, new legal obstacles may **31** really confuse the conversion process. A 1983 provision of the National Trails System Act known as railbanking allows railroad companies to transfer old rail corridors to public agencies **32** for the using of as trails; without this provision, ownership of the properties would revert to the adjacent landowners. In March 2014, however, the Supreme Court ruled that railroad companies lose their rights to the land when a corridor is no longer in use. Though the ruling will likely increase litigation over land, as landowners may request compensation or deny permission for public use, these trails are worth fighting for: after all, **33** they are a proven path to healthier, more vibrant communities.

31

A) NO CHANGE
B) throw a wrench in
C) complicate
D) mess up

32

A) NO CHANGE
B) to use for
C) for use
D) used

33

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

A) NO CHANGE
B) there are already at least 15,000 miles of rail trails in the United States.
C) it can cost millions of dollars to convert a rail corridor into a trail.
D) a trail in Leadville, Colorado, helped the town's economy recover from a mine closure.

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

Consolation Behavior in Voles

[34] One of the most diverse orders of mammals, rodents have been shown to possess a wide range of cognitive skills. Indeed, a new study at Emory University has found that prairie [35] voles, social rodents that form lifelong bonds between mates—engage in empathy-based consolation.

The Emory research team [36] hypothesized that: prairie voles engage in sustained consolation behavior to provide comfort when one of them has experienced stress. The team identified grooming, which resembles a caretaking activity that mother voles perform for their young, as a likely consolation behavior. In 13 trials, the team monitored how much time one vole (the "observer") spent grooming its mate (the "demonstrator").

At the outset, a baseline behavior was measured in the absence of stress and prior to separation of the vole pairs; in a span of [37] 20 minutes, observers tended to spend less than 5 total seconds grooming demonstrators. Researchers then separated the voles in each pair for 24 minutes and recorded their behavior upon being reunited. This condition also resulted in little grooming:

34

Which choice most effectively introduces the passage?

A) NO CHANGE

B) In recent years, evidence has mounted that empathy, the ability to understand and respond to the feelings of others, is not unique to humans.

C) Because rodents are frequently used in scientific research, we know a great deal about their capacity for social learning.

D) Scientists have increasingly accepted the idea that animals can use reciprocal grooming for a number of purposes.

35

A) NO CHANGE

B) voles:

C) voles;

D) voles—

36

A) NO CHANGE

B) hypothesized that

C) hypothesized: that

D) hypothesized that,

37

Which choice provides accurate information from the graph?

A) NO CHANGE

B) 10

C) 30

D) 40

observers groomed demonstrators for less than 10 total seconds in a span of 10 minutes. **38** Accordingly, the voles in each pair were separated, and demonstrators were exposed to a stressful stimulus (a low-voltage electric shock). When demonstrators were returned to the cage, observers began to groom them immediately and spent over 10 total seconds grooming them in the first 2 **39** minutes and nearly 40 total seconds in 10 minutes. Moreover, observers mimicked demonstrators' self-grooming, a stress-reducing behavior in voles. Such mimicry may be **40** indicative of the presence of emotional contagion, a recognized feature of empathy in humans.

Vole Grooming Behavior under Control and Stress Conditions
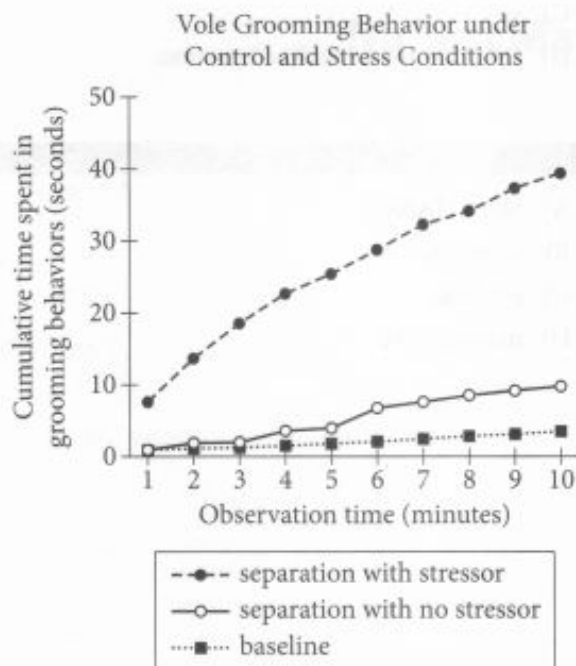
Adapted from James P. Burkett et al., "Oxytocin-Dependent Consolation Behavior in Rodents." ©2016 by American Association for the Advancement of Science.

38

A) NO CHANGE
B) Meanwhile,
C) Consequently,
D) Finally,

39

Which choice most effectively supports the hypothesis introduced earlier in the passage with information from the graph?

A) NO CHANGE
B) minutes and an additional 5 seconds in the next minute.
C) minutes, after grooming the demonstrator for over 5 seconds in the first minute.
D) minutes, with significant changes occurring in the entire 10 minutes.

40

A) NO CHANGE
B) an indication of
C) an indication that shows
D) indicating, or showing,

Researchers also observed how the neurochemical oxytocin, which has been linked to empathy and the recognition of emotions in humans, affected the voles' behavior. They found high levels of stimulation in the anterior cingulate cortex **41** (ACC), a region of the brain that in humans has been shown to be activated by the experience of social stress. When researchers blocked oxytocin signaling in the ACCs of some of the voles, the affected voles did not groom their stressed mates. **42** Those suggest that the same underlying neurological processes control empathy in humans and voles.

Although other researchers had found evidence of animals' consolation behavior in the wild, **43** and they had been unable to **44** install a strong link between this behavior and empathy. Researcher Larry Young notes that consolation among prairie voles "seems like a very specific adaptation to social living." Consolation functions as just such an adaptation in humans as well. Further research will clarify how oxytocin facilitates both species' ability to detect and respond to the emotions of others.

41

A) NO CHANGE
B) (ACC). A
C) (ACC), this is a
D) (ACC); a

42

A) NO CHANGE
B) These
C) These results
D) Any of those results

43

A) NO CHANGE
B) since
C) so
D) DELETE the underlined portion.

44

A) NO CHANGE
B) constitute
C) establish
D) manufacture

STOP

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

No Test Material On This Page

Math Test – No Calculator
25 MINUTES, 17 QUESTIONS

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

DIRECTIONS

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

NOTES

1. The use of a calculator **is not permitted**.

2. All variables and expressions used represent real numbers unless otherwise indicated.

3. Figures provided in this test are drawn to scale unless otherwise indicated.

4. All figures lie in a plane unless otherwise indicated.

5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

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

$A = \ell w$

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

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

Special Right Triangles

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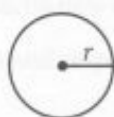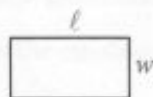
$V = \pi r^2 h$

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

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

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

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

1

The function g is defined by $g(x) = -x + 8$. What is the value of $g(0)$?

A) -8

B) 0

C) 4

D) 8

2

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

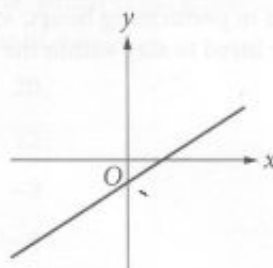Which of the following is equivalent to the given expression?

A) $3x - 2$

B) $3x + 2$
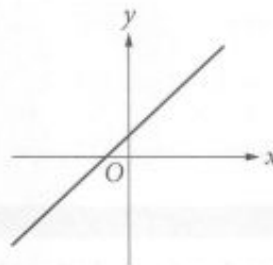
C) $3x - 8$

D) $3x + 8$

3

$$f(x) = \frac{3}{4}x - 2$$

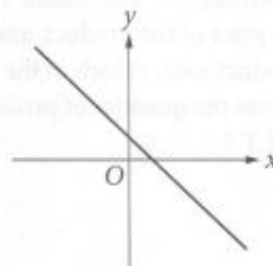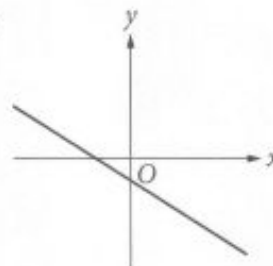Which of the following could be the graph in the xy-plane of the function above?

A)

B)

C)

D)

4

As part of her role on the planning committee for the high school prom, Keisha hired a DJ. The DJ charges $150 per hour for performing plus a $100 flat fee for setup and takedown. The committee budgeted $700 . for a DJ for the prom. Which of the following represents the number of performing hours, x, for which the DJ could be hired to stay within the committee budget?

A) $x \geq 7$

B) $x \leq 7$

C) $x \geq 4$

D) $x \leq 4$

6

$$(b - 2)x = 8$$

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

A) 2

B) 4

C) 6

D) 10

5

The total revenue from sales of a product can be calculated using the formula $T = PQ$, where T is the total revenue, P is the price of the product, and Q is the quantity of the product sold. Which of the following equations gives the quantity of product sold in terms of P and T ?

A) $Q = \dfrac{P}{T}$
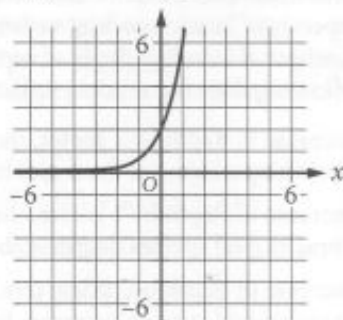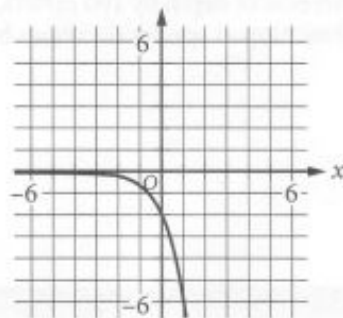
B) $Q = \dfrac{T}{P}$

C) $Q = PT$

D) $Q = T - P$

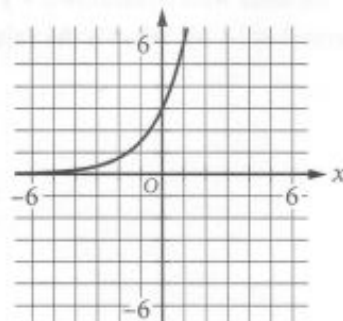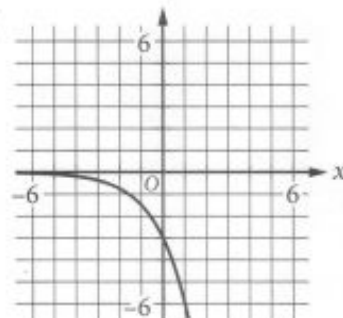Which of the following is the graph of the equation $y = 2(3)^x$ in the xy-plane?

A)

B)

C)

D)

$$y = x - 4$$
$$y = x^2 - 16$$

If (x, y) is a solution to the system of equations above, which of the following could be the value of x ?
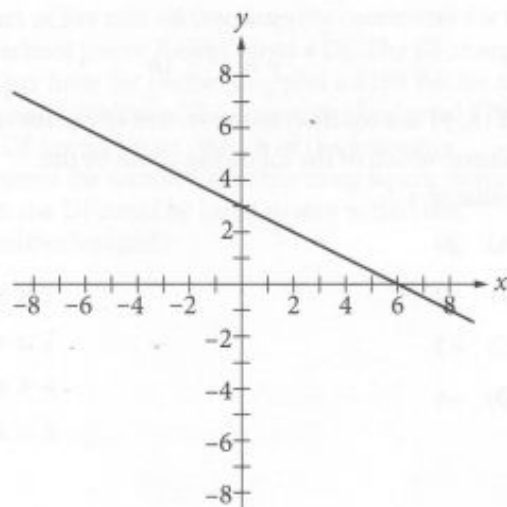
A) 20

B) 12

C) −3

D) −4

9

Which of the following is an equation of the line shown in the xy-plane above?

A) $x + \dfrac{1}{2}y = 3$

B) $x + \dfrac{1}{2}y = 6$

C) $x + 2y = 3$

D) $x + 2y = 6$

10

$$N(d) = 115(0.90)^d$$

The function N defined above can be used to model the number of species of brachiopods at various ocean depths d, where d is in <u>hundreds</u> of meters. Which of the following does the model predict?

A) For every increase in depth by 1 meter, the number of brachiopod species decreases by 115.

B) For every increase in depth by 1 meter, the number of brachiopod species decreases by 10%.

C) For every increase in depth by 100 meters, the number of brachiopod species decreases by 115.

D) For every increase in depth by 100 meters, the number of brachiopod species decreases by 10%.

11

In the xy-plane, the lines with equations $x + y = 15$ and $y = 3x$ intersect at (a, b). What is the value of $b - a$?

A) $\dfrac{1}{4}$

B) $\dfrac{15}{4}$

C) $\dfrac{15}{2}$

D) $\dfrac{45}{2}$

12

To ship a parcel based on its weight, a certain mail-shipping service charges $2.50 for the first pound and $0.50 for each additional pound. If a parcel weighs w pounds, where w is a positive integer, which of the following equations represents the shipping charge c, in dollars, in terms of w ?

A) $c = 2.5 + 0.5(w - 1)$

B) $c = 0.5 + 2.5(w - 1)$

C) $c = 2.5 + 0.5w$

D) $c = 0.5 + 2.5w$

13

The equation $y = 7^x - 1$ is graphed in the xy-plane. What is the y-intercept of the graph?

A) $(0, -1)$

B) $(0, 0)$

C) $(0, 6)$

D) $(0, 7)$

DIRECTIONS

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

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

Answer: $\frac{7}{12}$ Answer: 2.5

Write answer in boxes. → ← Fraction line ← Decimal point

Grid in result.

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

Answer: 201 – either position is correct

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

14

If $5x + 100 = 2100$, what is the value of x ?

15

$$x^2 + 10x + 24$$

When the given expression is rewritten in the form $(x + 4)(x + k)$, where k is a constant, what is the value of k ?

16

$$(x - 7)^2 - 25 = 0$$

What is one value of x that satisfies the given equation?

17
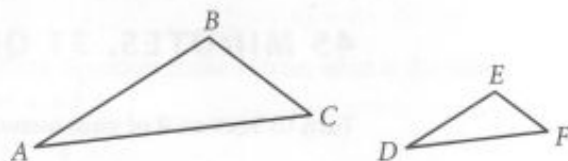
Note: Figures not drawn to scale.

Triangle ABC and triangle DEF are shown. The relationship between the side lengths of the two triangles is such that $\dfrac{AB}{DE} = \dfrac{BC}{EF} = \dfrac{AC}{DF} = 3$.

If the measure of angle BAC is 20°, what is the measure, in degrees, of angle EDF ? (Disregard the degree symbol when gridding your answer.)

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

45 MINUTES, 31 QUESTIONS

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

DIRECTIONS

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

NOTES

1. The use of a calculator **is permitted**.

2. All variables and expressions used represent real numbers unless otherwise indicated.

3. Figures provided in this test are drawn to scale unless otherwise indicated.

4. All figures lie in a plane unless otherwise indicated.

5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.
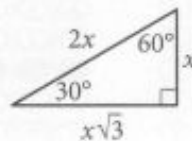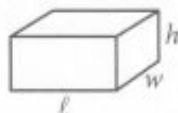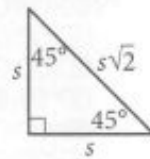
REFERENCE

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

$A = \ell w$

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

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

Special Right Triangles

$V = \ell wh$

$V = \pi r^2 h$

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

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

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

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

CONTINUE ▶
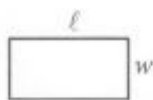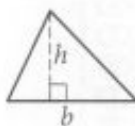
1

The ticket revenue of a movie theater is proportional to the number of tickets the theater sells. The theater sold 300 tickets on Thursday and 600 tickets on Friday. Which of the following is true?

A) The ticket revenue on Thursday was one-quarter the ticket revenue on Friday.

B) The ticket revenue on Thursday was one-half the ticket revenue on Friday.

C) The ticket revenue on Thursday was twice as great as the ticket revenue on Friday.

D) The ticket revenue on Thursday was four times as great as the ticket revenue on Friday.

2

The ratio of t to u is 1 to 2, and $t = 10$. What is the value of u ?

A) 2

B) 5

C) 10

D) 20

3

$$2(x + 3) = 8$$

If the equation above is true, what is the value of $x + 3$?

A) 4

B) 5

C) 13

D) 16

4

A bag contains a total of 60 marbles. A marble is to be chosen at random from the bag. If the probability that a blue marble will be chosen is 0.35, how many marbles in the bag are blue?
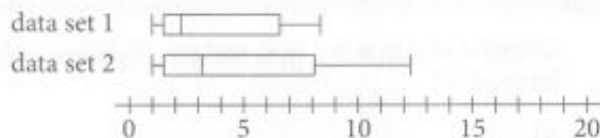
A) 21

B) 25

C) 35

D) 39

5

For a person m miles from a flash of lightning, the length of the time interval from the moment the person sees the lightning to the moment the person hears the thunder is k seconds. The ratio of m to k can be estimated to be 1 to 5. According to this estimate, the person is how many miles from a flash of lightning if the time interval is 25 seconds?
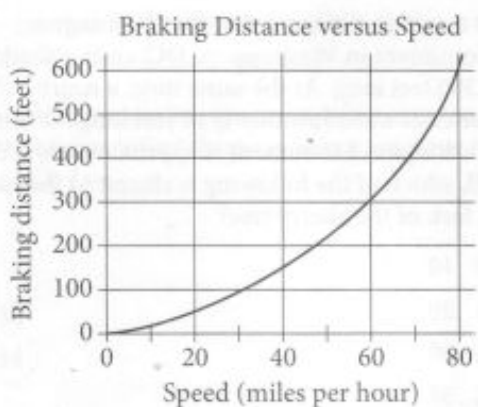
A) 10

B) 9

C) 6

D) 5

6

The box plots above summarize two data sets. Based on the box plots, which of the following must be true?

    I. The range of data set 2 is greater than the range of data set 1.

    II. The median of data set 2 is greater than the median of data set 1.

A) I only

B) II only

C) I and II

D) Neither I nor II

CONTINUE ➤

7

Braking Distance versus Speed

The graph above shows the relationship between the speed of a particular car, in miles per hour, and its corresponding braking distance, in feet. Approximately how many feet greater will the car's braking distance be when the car is traveling at 50 miles per hour than when the car is traveling at 30 miles per hour?
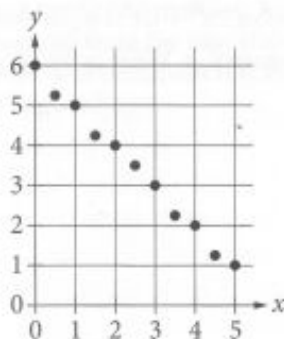
A) 75

B) 125

C) 175

D) 250

8

The expression $2x^2 + ax$ is equivalent to $x(2x + 7)$ for some constant a. What is the value of a ?

A) 2

B) 3

C) 4

D) 7

9

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

A) $y = -x + 6$

B) $y = -x - 6$

C) $y = 6x + 1$

D) $y = 6x - 1$

10

At a certain time and day, the Washington Monument in Washington, DC, casts a shadow that is 300 feet long. At the same time, a nearby cherry tree casts a shadow that is 16 feet long. Given that the Washington Monument is approximately 555 feet tall, which of the following is closest to the height, in feet, of the cherry tree?

A) 10

B) 20

C) 30

D) 35

11

$$2x + 7y = 9$$
$$8x + 28y = a$$

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

A) 4

B) 9

C) 36

D) 54

12

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

Which of the following expressions is equivalent to the expression above?

A) $x^3 + 3x^2 - 6x$

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

C) $x^5 + 2x^2 - 6x$

D) $x^5 + 2x^2 - 3x$

Questions 13 and 14 refer to the following information.

In an experiment, a student uses a thermometer that can read temperatures from −94°F to 172°F. The student also converts measurements from °F to kelvins (K) and degrees Rankine (°R) using the following approximate formulas.

- $T_K = \dfrac{5}{9}x + 255$, where x is the temperature in °F and T_K is the temperature in K.

- $T_R = x + 460$, where x is the temperature in °F and T_R is the temperature in °R.

13

If a temperature was recorded as 500°R, which of the following is closest to the reading of the thermometer?

A) 40°F

B) 120°F

C) 710°F

D) 960°F
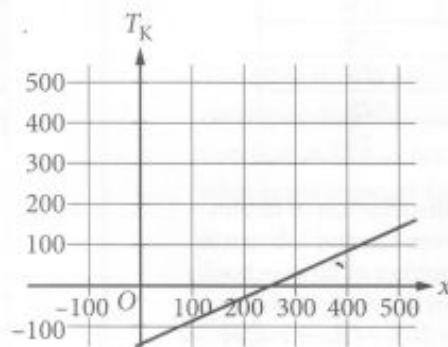
14

Which of the following graphs shows the relationship between T_K, the temperature in K, and x, the temperature in °F?

A)
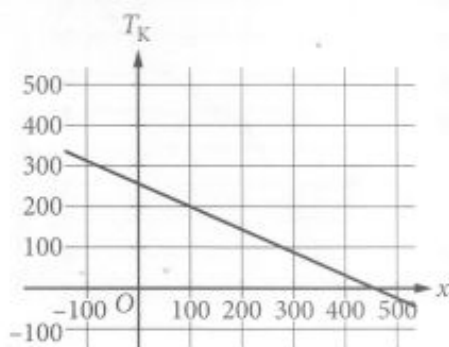
B)

C)

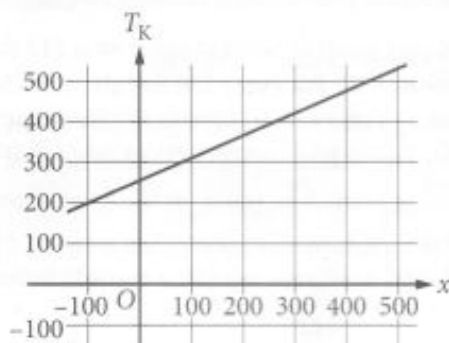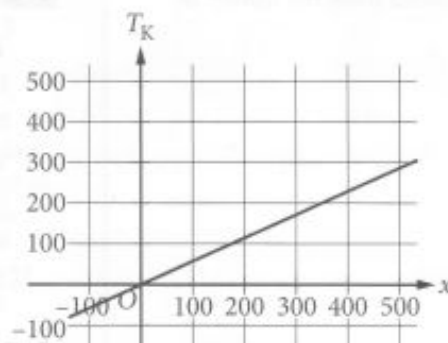
D)

15

Fiction Books Borrowed in January

Type	Number of books
Science fiction	175
Mystery	100
Fantasy	225
Adventure	125
Other	25

The table above shows the distribution of fiction books, by type, borrowed from Central Library in January. In February, the number of fantasy books borrowed and the number of adventure books borrowed each increased by 20% of their respective January values. How many more fantasy books than adventure books were borrowed from the library in February?

A)   70

B)   120

C)   125

D)   150

16

In the xy-plane, the graph of the quadratic function g intersects the x-axis at $x = 5$ and $x = 9$. Which of the following could be an equation of g ?

A) $g(x) = (x - 5)(x - 9)$

B) $g(x) = (x + 5)(x + 9)$

C) $g(x) = (x - 7)^2 + 4$

D) $g(x) = (x + 7)^2 + 4$

17

If $\sqrt{17 + (x - y)^3} = 9$, what is the value of $(x - y)^2$?

A)   4

B)   9

C)   16

D)   25

18

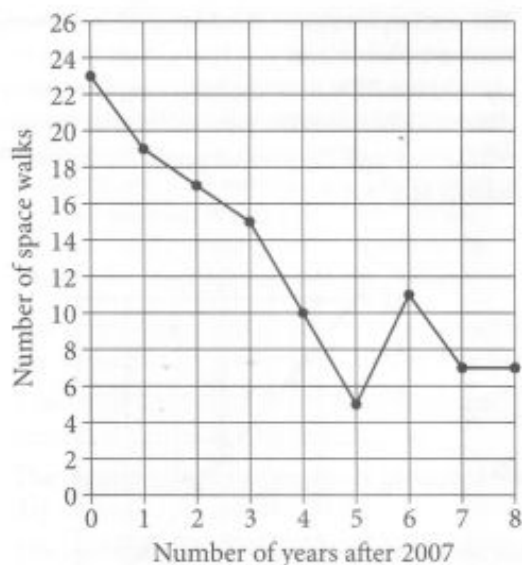The boiling point of water at sea level is 212 degrees Fahrenheit (°F). For every 550 feet above sea level, the boiling point of water is lowered by about 1°F. Which of the following equations can be used to find the boiling point B of water, in °F, x feet above sea level?

A) $B = 550 + \dfrac{x}{212}$

B) $B = 550 - \dfrac{x}{212}$

C) $B = 212 + \dfrac{x}{550}$

D) $B = 212 - \dfrac{x}{550}$

19

Number of years after 2007

A space walk is a physical activity by an astronaut outside a spacecraft in space. The line graph displays the number of space walks that occurred each year at the International Space Station (ISS) from 2007 to 2015. What is the average rate of change of the number of space walks per year from 2007 to 2012?

A) −3

B) −2

C) $-\dfrac{18}{5}$

D) $-\dfrac{7}{2}$

20

x	$h(x)$
0	1
1	7

The table shown gives two values of x and the corresponding values of $h(x)$ for the linear function h. If $y = h(x)$ is graphed in the xy-plane, what is the slope of the graph?
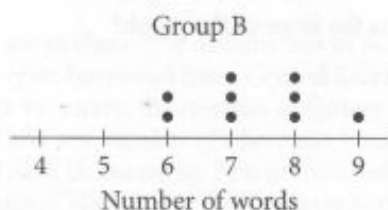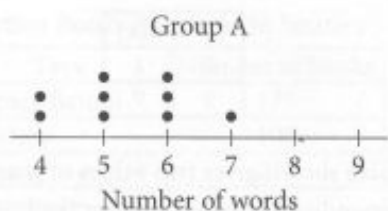
A) 0

B) 2

C) 6

D) 7

21

Group A

4   5   6   7   8   9
Number of words

Group B

4   5   6   7   8   9
Number of words

In a psychology experiment, students in two groups were given a word and asked to list words that rhyme with it. The number of words for the two groups of people are summarized in the dot plots shown. Which of the following statements is true?

A) The standard deviation is greater for group B than for group A.

B) The standard deviation is greater for group A than for group B.

C) The standard deviation for group A is equal to the standard deviation for group B.

D) The standard deviation for either group cannot be determined from the dot plots.

22

The scatterplot shows the relationship between two variables, x and y. A line of best fit for the data is also shown. Which of the following is closest to the difference between the y-coordinate of the data point with $x = 1$ and the y-value predicted by the line of best fit at $x = 1$?
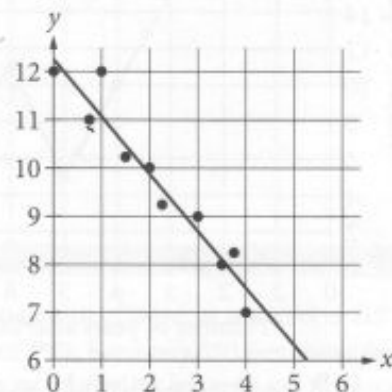
A) 1

B) 2

C) 5

D) 12

23

The total land area of Honduras is approximately 11.2 million hectares, of which 15% is suitable for agriculture, including land used for coffee growing. If 310,000 hectares are used for coffee growing, which of the following best approximates the percent of Honduras's land area that is suitable for agriculture that is used for coffee growing? (1 million = 1,000,000)

A) 2.8%

B) 9.8%

C) 18.5%

D) 27.7%

24

A factory produces only one type of product. To estimate the mean weight of the product produced by the factory on a particular day, a sample of the product produced that day from the factory was selected at random. The mean weight of the products in the sample was 19.8 ounces (oz). The margin of error for the estimate was 0.2 oz. Based on the sample mean and margin of error, which of the following is the most appropriate conclusion?

A) The actual weights of all products produced that day at the factory are between 19.6 oz and 20 oz.

B) The actual weights of all products from the sample are between 19.6 oz and 20 oz.

C) The mean weight of all products produced that day at the factory must be 19.8 oz.

D) The mean weight of all products produced that day at the factory is between 19.6 oz and 20 oz.

25

In the xy-plane, line ℓ is parallel to the line with equation $4x - y = 1$. If line ℓ contains the point $(0, 2)$, which of the following is an equation of line ℓ ?

A) $4x - y = -2$

B) $4x - y = 2$

C) $4x + y = -2$

D) $4x + y = 2$

26

Which of the following dot plots represents a data set for which the mean of the values is greater than the median of the values?

A)

1 2 3 4 5

B)

1 2 3 4 5

C)

1 2 3 4 5

D)

1 2 3 4 5

27

A new savings account was opened with an initial deposit of $1,000. Each year, the account earns 2% interest on the amount of money in the account the previous year, and this interest is added to the account. If no additional deposits or withdrawals are made, which of the following functions gives the account value $A(t)$, in dollars, after t years?

A) $A(t) = 1,000(1 + 0.02t)$

B) $A(t) = 1,000(1 + 1.02t)$

C) $A(t) = 1,000(0.02)^t$

D) $A(t) = 1,000(1.02)^t$

24

A factory produces only one type of product. To estimate the mean weight of the product produced by the factory on a particular day, a sample of the product produced that day from the factory was selected at random. The mean weight of the products in the sample was 19.8 ounces (oz). The margin of error for the estimate was 0.2 oz. Based on the sample mean and margin of error, which of the following is the most appropriate conclusion?

A) The actual weights of all products produced that day at the factory are between 19.6 oz and 20 oz.

B) The actual weights of all products from the sample are between 19.6 oz and 20 oz.

C) The mean weight of all products produced that day at the factory must be 19.8 oz.

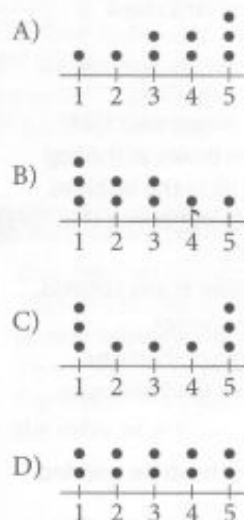D) The mean weight of all products produced that day at the factory is between 19.6 oz and 20 oz.

25

In the xy-plane, line ℓ is parallel to the line with equation $4x - y = 1$. If line ℓ contains the point $(0, 2)$, which of the following is an equation of line ℓ ?

A) $4x - y = -2$

B) $4x - y = 2$

C) $4x + y = -2$

D) $4x + y = 2$

26

Which of the following dot plots represents a data set for which the mean of the values is greater than the median of the values?

A)

B)

C)

D)

27

A new savings account was opened with an initial deposit of \$1,000. Each year, the account earns 2% interest on the amount of money in the account the previous year, and this interest is added to the account. If no additional deposits or withdrawals are made, which of the following functions gives the account value $A(t)$, in dollars, after t years?

A) $A(t) = 1,000(1 + 0.02t)$

B) $A(t) = 1,000(1 + 1.02t)$

C) $A(t) = 1,000(0.02)^t$

D) $A(t) = 1,000(1.02)^t$

DIRECTIONS

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

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

    as 3.5 or 7/2. (If [3][1][/][2] is entered into the

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

Answer: $\frac{7}{12}$ **Answer:** 2.5

Write answer in boxes. → Grid in result.

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

Answer: 201 – either position is correct

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

52

CONTINUE ▶

28

$$2x + y = 13$$
$$x + 2y = 11$$

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

29
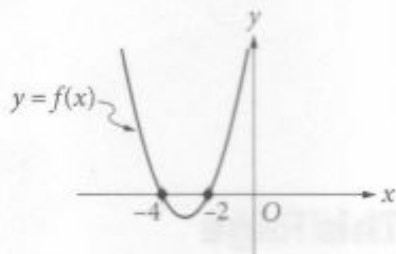
The function f is graphed in the xy-plane above. If $f(x) = x^2 + kx + 8$, where k is a constant, what is the value of k ?

Questions 30 and 31 refer to the following information.

On May 10, 2015, there were 83 million Internet subscribers in Nigeria. The major Internet providers were MTN, Globacom, Airtel, Etisalat, and Visafone. By September 30, 2015, the number of Internet subscribers in Nigeria had increased to 97 million.

30

If an Internet subscriber in Nigeria on September 30, 2015, is selected at random, the probability that the person selected was an MTN subscriber is 0.43. There were p million MTN subscribers in Nigeria on September 30, 2015. To the nearest integer, what is the value of p ?

31

The number of Internet subscribers increased by k percent from May 10, 2015, to September 30, 2015. To the nearest integer, what is the value of k ?

STOP

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