

The SAT[®]

IMPORTANT REMINDERS

1

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

2

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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 Alexander McCall Smith. *The Minor Adjustment Beauty Salon*. @2013 by Alexander McCall Smith. Mma Ramotswe married to Mr. J. L. B. Matekoni.

Precious Ramotswe, creator and owner of the No. 1 Ladies' Detective Agency, Botswana's only detective agency for the problems of ladies, and of others, had never studied business management.

She knew that it was common for people who ran their own businesses to take courses on topics such as stocktaking and cash flow, but she did not feel this was necessary in her case. Mind you, the No. 1 Ladies' Detective Agency had never made a profit, although in recent years it had not made a loss either, for Mma Ramotswe had managed to juggle income and expenditure in such a way as to end up breaking even—provided that you practised what a book-keeper friend of hers called, with some admiration, *Optimistic Accounting*.

It was not that she was averse to taking advice. A few days ago she had come across a business magazine that had been left behind in the garage by one of her husband's customers, and had read it from cover to cover, over a pot of red bush tea and a large doughnut. This magazine had been full of helpful articles with titles such as: "Making the Most of Your Human Resources" and "How to Maximize Growth in Difficult Economic Circumstances". There was also a column called Dr. Profit's Business Clinic, to which readers could write with their business problems and receive free advice from Dr. Profit

himself, a man who was pictured wearing a large square pair of glasses and a broad smile—the look of somebody, she thought, who was probably always in healthy profit.

In the issue perused by Mma Ramotswe, one concerned reader raised a problem connected with an awkward employee. Mma Ramotswe read this question with some interest—although it had no bearing on her own business—before turning the page and seeing an article on the maximising of growth. "A business that isn't expanding will actually be contracting," wrote the author. "That rule has been shown to be true time after time. How many businessmen are there who sit and contemplate the ruins of a once-profitable business simply because they forgot to expand?"

Mma Ramotswe frowned. The No. 1 Ladies' Detective Agency was exactly the same size as it had been when she had founded it. It had one owner and one employee, one vehicle, a filing cabinet, a kettle, two teapots, and three mugs. There was also one typewriter, which was operated by Mma Makutsi, and one box of stationery. These assets had been there more or less from the beginning, although the second teapot was certainly a later addition. Did that count as growth? Could you say that your business had expanded if it had gone from owning one teapot to two? Somehow she thought that Dr. Profit would answer both those questions with a shake of his head.

She thought of Mr. J. L. B. Matekoni's business, Tlokweng Road Speedy Motors, with which she shared premises, and wondered how it would fare

60 against this rather unsettling test. Again, it was difficult to see any significant expansion. Mr. J.L. B. Matekoni still had his two apprentices, although one of them, Fanwell, was now a qualified mechanic. That might count as growth of a sort, she supposed, 65 but it was probably cancelled out by reports that Charlie, the other young man employed in the garage, had, by all accounts, become rather worse at his job. Certainly there did not seem to be any more customers than there had been in the past; indeed, 70 Mr. J.L.B. Matekoni had complained only a few weeks previously that there seemed to be fewer and fewer cars being brought in for service.

“People have to go to those big garages these days,” he said. “They have to do that because their 75 cars are full of computers, and ordinary mechanics don’t have all the right wires and things for these clever cars. What can you do if you look at the engine and see that it is full of electric wiring and computer chips? Where’s the carburetor? Where’s the distributor? Where’s the starter motor?”

He had looked at Mma Ramotswe reproachfully, as if she had somehow mislaid these various parts.

She sighed “Everything is too complicated these days, Mr. J.L.B. Matekoni. Everything is made to be 85 thrown away rather than fixed. It is all very wasteful.”

She warmed to her theme. “When I think of what we made do with in the past, it makes me very sad. If you found a hole in a sock, you darned it. We were taught how to do that at school. And if your collar 90 frayed, then you had it turned. If the handle came off a cup, you glued it back on.”

1

The passage indicates that Mma Ramotswe is particularly impressed by Dr. Profit’s

- A) distinguished academic title.
- B) numerous editorial responsibilities.
- C) notable physical appearance.
- D) global commercial success.

2

The main purpose of the passage is to

- A) explain Mma Ramotswe’s sudden interest in taking business courses.
- B) present Mma Ramotswe’s reflections about operating a small business.
- C) describe Mma Ramotswe’s anxieties about the future of her business.
- D) analyze Mma Ramotswe’s past decisions about her business.

3

Which choice provides the best evidence that Mma Ramotswe is usually confident in her ability to manage her business?

- A) Lines 5-8 (“She knew . . . case”)
- B) Lines 8-13 (“Mind . . . even”)
- C) Line 16 (“It was . . . advice”)
- D) Lines 16-21 (“A few . . . doughnut”)

4

As used in line 31, “healthy” most nearly means

- A) safe.
- B) considerable.
- C) beneficial.
- D) vigorous.

5

It can reasonably be inferred from the passage that Mma Ramotswe considers Mma Makutsi to be

- A) somewhat unambitious in her attitude.
- B) often erratic in her productivity.
- C) unreasonably demanding in her requests.
- D) generally satisfactory as an employee.

6

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

- A) The narrator's comment that Mma Ramotswe believes that the problem of the awkward employee "had no bearing on her own business" (lines 35-36)
- B) The narrator's comment that the agency "exactly the same size as it had been when she had founded it" (lines 45-46)
- C) The narrator's assertion that the typewriter "was operated by Mma Makutsi" (line 49)
- D) The narrator's suggestion that Mma Ramotswe thinks that Dr. Profit would respond to her "with a shake of his head" (line 56)

7

It can most reasonably be inferred from the passage that, as a businesswoman, Mma Ramotswe has

- A) ignored the variety of resources available to different types of businesses.
- B) neglected to recognize the challenges specific to large businesses.
- C) underestimated the value of having a loyal and hardworking employee.
- D) failed to consider the link between expansion and business profitability.

8

Based on the passage, Mma Ramotswe and Mr. Matekoni share what point of view?

- A) Both believe that technology would make their business more profitable.
- B) Both fear that their business may one day become obsolete.
- C) Both regard the past as in some ways more desirable than the present.
- D) Both value loyalty over almost any other character trait.

9

As used in line 77, "clever" most nearly means

- A) cunning.
- B) sophisticated.
- C) witty.
- D) agile.

10

In line 79-80, Mr. Matekoni's three questions involving the design of newer cars primarily serve to

- A) underscore the impatience Mr. Matekoni had previously shown toward his mechanics.
- B) echo the complaints Mr. Matekoni had previously made to the owner of big garages.
- C) illustrate the frustration Mr. Matekoni had previously expressed about his current circumstances.
- D) correct the misconception Mr. Matekoni had previously identified regarding proper car maintenance.

Questions 11-20 are based on the following passages.

Passage 1 is adapted from a speech delivered in 1876 by John Mercer Langston, "Our Political Parties." Passage 2 is adapted from a speech delivered in 1890 by T. Thomas Fortune, "It is Time to Call a Halt". Langston was an African American lawyer, diplomat, and abolitionist. Fortune was an African American journalist who founded the National Afro-American League, an advocacy organization, in 1890.

Passage 1

The political parties of the country have held their conventions, defined their positions, and made and announced their nominations. The voters of the Line country are now called upon to make their choice.
 5 Choice here is free; and voters are only bound and restricted by those considerations of sound policy and patriotism which justly define and limit their obligation and duty. Perhaps never in the history of our country, a history distinguished in its more
 10 memorable parts for the establishment of free institutions, was there a time when the duty of the American voter, to consider well and wisely what vote to cast, what party to bring and support in power, was so imperative as in this centennial year of
 15 our national independence.

The earlier days of the Republic are distinguished for noble and heroic deeds, for self-denial and sacrifices made and performed in its behalf. Then our foe was a foreign and open one. Within the past
 20 fifteen years a domestic foe has with organized forces met the Government in deadly conflict, upon a bloody field ... Have our brave men died in vain? Are the burdens of the to prove no warning for our good?... These questions are answered in
 25 the affirmative or negative, wisely or foolishly, as we sustain by our vote the one or the other party. But in considering and determining our duty as voters, we ought to rise above mere partisan devotion. We ought to remember that party is but a means, an
 30 instrument used to gain some special or general political end. The end sought, the results to be accomplished must be fully considered in determining the character of the party and our duty to support, or refuse to support it. The language of its
 35 declaration of principles, the past character of its nominees and their protestations of loyalty to past records, will not always suffice to satisfy us of its and their trustworthiness. We are required often to seek

after the reputation of the party, and the probable associations, and party and individual obligations of the candidates after their election. And in discharging our duty in this regard, while we are fearless we should be impartial and just. Let us not make haste to condemn unduly, nor to accept
 45 without wise discrimination the claim of any candidate or party.

Passage 2

We here demand of the party now in power,¹ which has promised so much and which enjoyed our best confidence and our support in the past, that it
 50 make good the promises made We are weary of the empty promises of politicians and the platitudes of national conventions For the constitutional opponents our rights we have no faith, no confidence, and no support, and of possessed friends
 55 we here demand that they perform their part of the contract, which alone can justify the sacrifices we have been called upon to. If it cannot do this, then it has ceased to be the party of Lincoln, of Sumner, of Wilson, and of Logan², and deserves to
 60 die, and will die, that another party may rise to finish the uncompleted work, even as the Whig party died that the Republican party might triumph in the Nation.

I am no hero worshipper. Parties are.... [brought] 65 into existence by men to serve certain ends. They are the creatures not the creators of men. When they have fulfilled the objects for which were created or when they prove false to the great purpose of their creation, what further use are they? None certainly to
 70 us if they do not give us in return for our support the measure of justice and consideration in party management and benefits commensurate with the service we render. I do not speak here as a partisan; I speak as an Afro-American.... ready to [condemn]
 75 any party which robs me of my confidence and vote and straightway asks me 'what are you going to do about it?' I have served the Republican party, the Prohibition party, and the Democratic party, and I speak with the wisdom of experience when I declare
 80 that none of them cares a fig for the Afro-American further than it can use him. In seeking to rebuke false friends we often make false alliances. If we shall serve the party and the men, as Afro-Americans, who serve us best, in the present posture of our citizenship, we

85 shall follow the dictates of the highest wisdom and the most approved philosophy.

¹ the Republican Party

² Republican Politician

11

The question in lines 22-24 primarily serve to

- A) emphasize the critical importance of the subsequent discussion by appealing to emotion.
- B) signal an important qualification to the primary argument developed in the passage.
- C) shift from detailed consideration of the past to a tentative theory about the future.
- D) offer historical analogy to emphasize the timeless character of the passage's overall point of view.

12

The primary purpose of the first paragraph in Passage 1 is to

- A) reminisce about a nation's glorious past.
- B) stress the importance of a national undertaking.
- C) emphasize the liberties enjoyed by a free society.
- D) discuss the function of political parties.

13

Which choice best support the idea that citizen have an obligation to vote in the best interest of their country?

- A) Lines 1-3 ("The political . . . nominations")
- B) Lines 3-4 ("The voters . . . choice")
- C) Lines 5-8 ("Choice . . . duty")
- D) Lines 16-18 ("The earlier . . . behalf")

14

As used in line 42, "discharging" more nearly means

- A) dissolving.
- B) discarding.
- C) exploding.
- D) executing.

15

In the last sentence in Passage 1 (lines 43-46), Langston indicates that voters should

- A) ignore derogatory attacks on political nominees.
- B) cast their votes only after thoughtful deliberation.
- C) demand that political parties uphold noble and just values.
- D) elect candidates who are impartial in their judgment.

16

As used in line 71, "measure" more nearly means

- A) duration.
- B) gauge.
- C) degree.
- D) cadence.

17

In lines 77-81 (“I have... him”), Fortune makes which point about political parties?

- A) They are overly cautious in implementing reforms.
- B) They can be deeply exploitative of their members.
- C) They often act in ways that undermine national policies.
- D) They adopt progressive platforms just to attract new members.

18

Given the information presented in Passage 2. Langston in Passage 1 would most likely view Fortune’s comments in lines 57-63 of Passage 2 (“If it... Nation”) as

- A) prescient, because the demise of the party is imminent.
- B) deserved, because the party has violated legal contracts.
- C) justified, because the party has failed to live up to its obligations.
- D) appropriate, because the party is founded on corrupt principles.

19

Fortune would most likely respond to Langston’s comment in lines 31-38 of Passage (“The end ... trustworthiness”) with

- A) acceptance, because he has learned that parties are unlikely to change their stances.
- B) surprise, because he has discovered that parties are unresponsive to their constituents.
- C) confusion, because he has seen that parties are inconsistent in their actions.
- D) agreement, because he has experienced firsthand that parties can ignore their obligations.

20

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

- A) Lines 50-52 (“We are . . . conventions”)
- B) Lines 64-66 (“am . . . of men”)
- C) Lines 81-82 (“In seeking . . . alliances”)
- D) Lines 82-86 (“If we . . . philosophy”)

Questions 21-30 are based on the following passage.

This passage is adapted from Julia Rosen, "Earth May Have Kept Its Own Water Rather Than Getting It from Asteroids" © 2015 by American Association for the Advancement of Science.

Where Earth's water came from—and when it arrived—has been a longstanding debate. Many scientists argue that Earth formed as a dry planet, Line and gained its water millions of years later through 5 the impact of water-bearing asteroids or comets. But now, scientists say that Earth may have had water from the start, inheriting it directly from the swirling nebula that gave birth to the solar system. If true, the results suggest that water-rich planets may 10 abound in the universe.

To understand the origin of Earth's water, scientists have fingerprinted potential sources, like asteroids and comets, using the ratio of light to heavy hydrogen isotopes. Then, researchers can compare 15 the ratios with those found in water sources on Earth.

However, researchers don't really know the true hydrogen isotopic composition of Earth's water, says Lydia Hallis, a planetary scientist at the University of 20 Glasgow and lead author of the new study. Scientists have often assumed that the isotopic signature of seawater is close to the true value, but Hallis thinks 25 this has probably changed over geologic time, as Earth preferentially lost light hydrogen atoms to space and gained water from asteroid and comet impacts.

So Hallis and her colleagues went looking for vestiges of the early Earth that might preserve the original hydrogen isotope ratio of the planet. They 30 found them in an unlikely place: Baffin Island in the Canadian Arctic. Here, massive eruptions-fueled by the hot spot that now sits beneath Iceland-produced lava that originated deep in the mantle. So deep, in fact, that this material was probably isolated 35 from the surface for almost all of Earth's history.

The evidence lies in the fact that the lavas, now hardened into basalts, still contain a fair amount of light helium isotopes, which would have escaped to space had the rocks spent much time anywhere 40 near the surface.

In the new study, the researchers report the hydrogen isotope ratios of water trapped in glassy

inclusions inside the basalts. The results reveal that the inclusions have a much lighter isotopic signature 45 than does the ocean, suggesting that the composition of seawater has indeed evolved over time. Although scientists were aware of processes that could cause an isotopic shift in surface waters, Hallis says, "until we made our measurements, we didn't know whether 50 that would be a measurable difference or not."

The new data suggest that the difference is vast. And Hallis suspects that the deepest, most primitive material in the mantle should have an even lighter isotopic composition than the inclusions her team 55 measured. That's because the rising magma that produced the lavas probably mixed with upper mantle rocks, which have been contaminated with isotopically heavy surface water that got dragged down by subducting slabs of tectonic plates.

60 So what does all this mean for the origin of Earth's water? For one, the new data throw a wrench in the conventional story that carbonaceous chondrites—a water-rich variety of asteroid—delivered water to an initially dry Earth after its formation. That scenario 65 has been bolstered by similarities in the isotopic signatures of the asteroids and seawater. But the chondrite signatures are too heavy to explain the deep Earth samples, Hallis says. "The carbonaceous chondrites don't really work."

70 Instead, Hallis and her colleagues propose that Earth's water came directly from the protosolar nebula—the cloud of gas and dust that eventually clumped together to form the solar system. Based on measurements of Jupiter and the solar wind, which 75 are thought to preserve the hydrogen isotopic ratio of the protosolar nebula, scientists think nebular water had an extremely light hydrogen isotopic signature—much closer to what the Baffin Island lavas suggest about the deep mantle's water.

80 Traditionally, the main objection to this idea has been that the inner portion of the protosolar nebula, where Earth formed, would have been too hot for water to hang around. But Hallis's team suggests that water floating around in the nebula snuck into our 85 nascent planet by adsorbing to dust particles. They cite previous modeling work suggesting that this mechanism could allow a significant amount of water to survive the brutal temperatures and violent processes by which dust particles coalesced to form 90 planets. Hallis says the discovery of a deep reservoir

of material with protosolar isotope ratios supports the idea that the hot, early Earth somehow retained this water.

21

The main purpose of the passage is to

- A) challenge a study that suggests planets other than Earth contain water.
- B) describe a study that offers new insights into the origin of Earth's water.
- C) discuss a study that resolves competing hypotheses about the source of Earth's water.
- D) discredit a study that claims the origin of Earth's water is traceable to several sources.

22

The second paragraph (lines 11–16) mainly serves to

- A) describe a method used to identify potential sources of Earth's water.
- B) discuss the importance of ascertaining potential sources of Earth's water.
- C) explain the scientific debate about potential sources of Earth's water.
- D) indicate a characteristic that is unique to potential sources of Earth's water.

23

The passage most strongly suggests that Hallis and her colleagues believe that other researchers have made which mistake when thinking about the origin of Earth's water?

- A) They have overestimated the frequency with which water bearing asteroids and comets struck early Earth.
- B) They have miscalculated the ratio of light to heavy hydrogen isotopes in present-day Earth's seawater.
- C) They have posited that Earth's early water had a heavier isotopic signature than it actually did.
- D) They have assumed that the isotopic signature of Earth's seawater is similar to that of freshwater.

24

Based on the passage, Hallis would most likely agree that the isotopic signature she observed in the glassy inclusions in the Baffin Island basalts may be

- A) lighter now than it would have been before the inclusions came into contact with surface water.
- B) heavier than the isotopic signature of carbonaceous chondrites had led her to expect.
- C) less indicative of the isotopic signature of Earth's early water than is the isotopic signature of current seawater.
- D) closer to the isotopic signature of Earth's early water than to the isotopic signature of seawater.

25

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

- A) Lines 43–46 (“The result . . . time”)
- B) Lines 46–50 (“Although . . . not”)
- C) Lines 61–64 (“For one . . . formation”)
- D) Lines 64–66 (“That . . . seawater”)

26

As used in line 65, “bolstered” most nearly means

- A) expanded.
- B) lifted.
- C) supplemented.
- D) reinforced.

27

The last paragraph mainly serves to

- A) summarize the main finding of Hallis and her colleagues' study.
- B) explain why scientists are skeptical about Hallis and her colleagues' theory.
- C) convey Hallis and her colleagues' recognition that more research is needed.
- D) address a potential criticism of Hallis and her colleagues' conclusions.

28

As used in line 88, "brutal" most nearly means

- A) cruel.
- B) incisive.
- C) severe.
- D) ample.

29

Based on the passage, Hallis and her colleagues would likely conclude that the "most primitive material" (lines 52-53) has an isotopic signature most similar to the isotopic signature of

- A) the rocks in Earth's upper mantle.
- B) carbonaceous chondrites.
- C) the water in the protosolar nebula.
- D) Earth's surface water.

30

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

- A) Lines 36-40 ("The evidence . . . surface")
- B) Lines 55-59 ("That's . . . plates")
- C) Lines 66-69 ("But the chondrite . . . work")
- D) Lines 73-79 ("Based . . . water")

Questions 31-41 are based on the following passage and supplementary material.

This passage is adapted from Thomas Gilovich and Lee Ross, *The Wisest One in the Room: How You Can Benefit from Social Psychology's Most Powerful Insights*. © 2015 by Thomas Gilovich and Lee Ross.

Because people have the conviction that they see things as they are—that their beliefs, preferences, and responses follow from an essentially unmediated perception of objects, events, and issues—it follows
^{Line} 5 that other rational, reasonable people should reach the same conclusions, provided they have been exposed to the same information. This seemingly reasonable leap gives rise to a phenomenon that Stanford University psychologist Lee and his
¹⁰ colleagues dubbed the false consensus effect: People tend to think that their beliefs, opinions, and actions enjoy greater consensus than is really the case. More precisely, people who have a given opinion or preference tend to think that it is more common than
¹⁵ do those with the opposite opinion or preference. People who prefer Italian to French cinema think their preference is more common than French film enthusiasts do. People who are guilty of particular misdeeds think that those deeds are more common
²⁰ than people who wouldn't dream of such transgressions. Liberals think that there is more support for their candidates, and their views on contentious social and political issues, than conservatives do, and vice versa. And voters from
²⁵ both sides of the political spectrum think that nonvoters would have voted for their candidate if they had only cast their ballots.

In a vivid illustration of this phenomenon, Ross and his colleagues asked student volunteers to walk
³⁰ around campus wearing a large sandwich-board sign bearing a message (e.g., "Eat at Joe's") and to note the reaction of people they encountered. The students, however, were given the opportunity to decline the invitation to participate if they wished (and return
³⁵ for later study instead). Immediately after agreeing or refusing to participate, the students were asked to estimate the frequency of agreement on the part of other participants and to make inferences about the personal attributes of someone who would accept
⁴⁰ the experimenter's invitation and someone who would refuse it.

As predicted, the consensus estimates and trait

inferences were very different for the two types of participants. Those who agreed to wear the sign
⁴⁵ estimated agreement to be more common than refusal and less revealing of the person's personal attributes. Those who refused to wear it thought that refusal would be more common than agreement and assumed that agreeing to wear the sign said more
⁵⁰ about a person's personality.

It is easy to appreciate the role that naive realism played here. Those who imagined wearing the sign in benign terms—walking relatively unnoticed, explaining to acquaintances that one is taking part in
⁵⁵ a psychology experiment (and being complimented for being "good sport")—would be inclined to agree to the experimenters' request and to think that most other "normal" students would also agree. For such individuals, the refusal to undertake this task
⁶⁰ and have such experiences would seem to reflect uncooperativeness, uptightness, or some other departure from normality.

By contrast, those who imagined what it would be like in less positive terms (e.g., walking through
⁶⁵ throngs of giggling, finger-pointing students; seeing acquaintances shake their heads and avert their gazes as they wordlessly hurry off) would be likely to refuse the experimenters' request and expect others to refuse. For them, agreeing to wear the sign would
⁷⁰ seem more reflective of something atypical or negative (e.g., submissiveness or inclination to show off and make a fool of oneself).

Figure 1

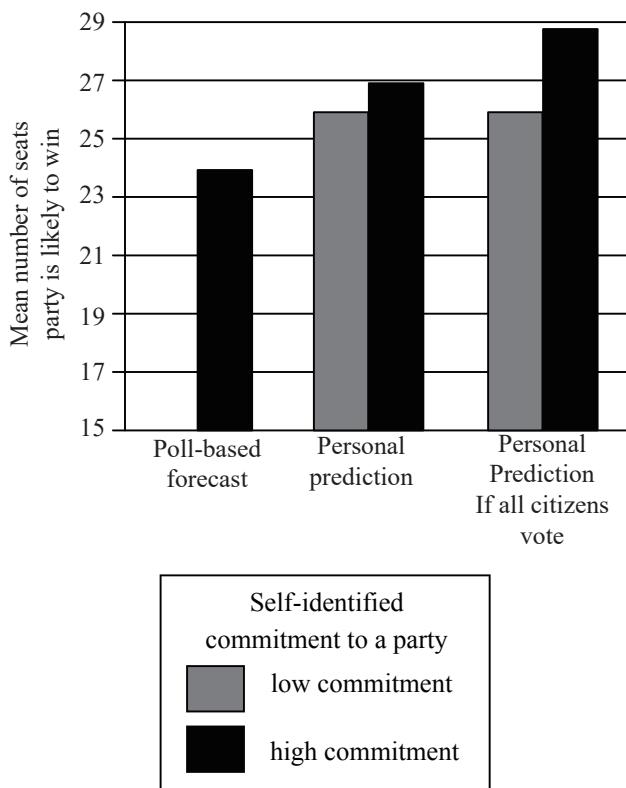
College Students' Mean Estimates of Percentage of All College Students Sharing Traits or Preference

Traits or Preference	Mean estimate of percentage of all college students with trait or preference	
Trait or Preference	by students who say they share trait or preference	by students who say they do not share trait or preference
Shy	45.9	35.9
Optimistic	61.9	50.4
Competitive	75.1	69.9
Prefer brown bread to white bread	52.5	37.4
Prefer Italian movie to French movie	51.6	43.4

Adapted from Lee Ross, David Greene, and Pamela House, "The 'False Consensus Effect': An Egocentric Bias in Social Perception and Attribution Processes." © 1977 by Academic Press, Inc

Figure 2

Predictions of Polls and Party Members in the Netherlands Regarding Number of Seats Party Is Likely to Win in Upcoming Election



Source: Data from Namkje Koudeburg, Tom Postmes, and Emestine H. Gordijn, "If They Were to Vote, They Would Vote for Us." © 2011 by Namkje Koudeburg, Tom Postmes, and Emestine H. Gordijn.

31

In saying the people consider perception to be "essentially unmediated" (line 3), the authors most likely mean that it seems to be

- A) inattentive to the middle ground.
- B) under little or no influence from outside factors.
- C) unlikely to be conveyed to others.
- D) determined without adequate deliberation.

32

The second paragraph (lines 16-27) primarily serves to

- A) extend the scope of the discussion to consider causes of a phenomenon.
- B) shift the discussion from general terms to specific situations.
- C) provide examples that challenge a faulty assumption.
- D) introduce some practical applications of a study.

33

According to the passage, the students participating in the study were asked to make inferences about

- A) themselves before they decided whether to wear the sign.
- B) themselves after responding to the researchers request to wear the sign.
- C) personality traits of a person who would agree to wear the sign and of a person who would refuse.
- D) the social consequences of the decision to wear or not wear the sign.

34

It can most reasonably be inferred from the passage that some of the students who declined to wear the sandwich-board sign did so primarily because they

- A) were concerned about social implications.
- B) tended to display unconventional traits.
- C) wanted to make a statement by refusing.
- D) preferred to avoid leadership roles.

35

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

- A) Lines 47-50 (“Those . . . personality”)
- B) Lines 52-58 (“Those . . . agree”)
- C) Lines 58-62 (“For . . . normality”)
- D) Lines 63-69 (“By contrast . . . refuse”)

36

Based on the passage, which assumption about the students asked to participate in the experiment did Ross and his colleagues most likely make?

- A) The students would either accept or reject the request in equal numbers.
- B) Students who were offered incentives to wear the sign would likely agree to participate.
- C) Students who had a negative experience while wearing the sign would be more likely to estimate a low frequency of agreement with other students.
- D) Students’ inferences about other students would follow a definite pattern.

37

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

- A) Lines 28-32 (“In a . . . encountered”)
- B) Lines 32-35 (“The students . . . instead”)
- C) Lines 35-41 (“Immediately . . . refuse it”)
- D) Lines 42-44 (“As predicted . . . participants”)

38

As used in line 51, “appreciate” most nearly mean

- A) welcome.
- B) improve.
- C) recognize.
- D) admire.

39

According to the figure 1, for which trait or preference were the two groups of students closest in their mean estimates of the percentage of all students with that trait or preference?

- A) Shy
- B) Competitive
- C) Prefer brown bread to white bread
- D) Prefer Italian movies to French movies

40

According to the figure 2, the mean prediction of the number of seats that the party is likely to win in the upcoming election exceeds 27 seats for which type of prediction?

- A) Poll-based forecast.
- B) Low-commitment party members if not all citizens vote.
- C) High-commitment party members if not all citizens vote.
- D) High-commitment party members if all citizens vote.

41

Based on the discussion of the false consensus effect in the passage, it can reasonably be inferred from figure 2 that

- A) level of commitment influences susceptibility to the false consensus effect.
- B) the false consensus effect makes people believe others are more committed than they are themselves.
- C) poll-based forecasts can predict the extent of the false consensus effect.
- D) the false consensus effect makes the predictor believe more people will care enough to vote than actually will.

Questions 42–52 are based on the following passage.

This passage is adapted from Gibert Waldauer, How Not to Be Eaten, The Insects Fight Back. © 2012 by Gibert Waldauer

Over a period of years, Lincoln Brower and his colleagues did a series of experiments in Trinidad, releasing and recapturing male promethea moth *Line* painted to resemble a colorful toxic butterfly that is common on Trinidad and mimicked by some nontoxic butterflies. Their presumably nonaposematic (lacking color markings that repel predators) controls were promethea males with black paint brushed on their black wings. This did not change their appearance, but it was a control for any possible effect on the moth of painting the wings. The Brower group ultimately concluded that their experiments had not constituted a convincing demonstration of mimetic advantage, because the artificial mimics and the presumed controls were usually recaptured in equal numbers, which indicated that they were equally likely to be captured by a predator. L. M. Cook, Brower, and John Alcock said, “Taking all the evidence over the four years there is no significant advantage to either mimic or control moths... and perhaps it should be concluded that under wild conditions no clear selective differential can be demonstrated with the *promethea moth mimicry system*” (emphasis mine).

Jim Sternburg and I reinterpreted the results of the Brower group’s experiments, making what we think is a persuasive case that they did not reveal a mimetic advantage because their presumed controls, black-painted promethea males, were actually mimics of three toxic Trinidadian butterflies related and similar in appearance to the pipevine swallowtail. One of them, the polydamus swallowtail, also occurs in the southern United States, where it coexists with promethea. Consequently, the Brower group had compared two different mimics, each apparently protected to approximately the same degree by its resemblance to a different toxic butterfly. In their first publication on the promethea lerent toxic system, Brower and his colleagues had themselves pointed out that the male promethea may be a mimic of the pipevine swallowtail.

Adopting the Brower group’s promethea release-and-recapture system, the graduate student Michael Jeffords, Sternburg, and I successfully demonstrated

- 45 mimetic advantage in the pipevine swallowtail complex in central Illinois. Equal numbers of moths painted as caricatures of the nonmimetic and palatable yellow and black form of the tiger swallowtail and others weighted with approximately equal amounts of black paint, which did not alter their resemblance to the unpalatable pipevine swallowtail, were released in a woodland, in the center of a mile-wide circle of seven traps baited with female prometheas. The recaptured moths, more than 40 percent of the 436 released, had run the gauntlet of more than sixty species of nesting birds—all of which capture at least some flying insects—for, at the very least, half a mile, the radius of the circle of traps.
- 60 Our results leave no doubt that the moths resembling pipevine swallowtails were much more likely to survive than those resembling nonmimetic tiger swallowtails. We recaptured close to 30 percent of those that resembled the black pipevine swallowtail but less than 13 percent of those that resembled the yellow-patterned tiger swallowtail a ratio of well over two to one. Furthermore, all of the recaptured yellow-painted but only 30 percent of the recaptured black-painted moths had wing injuries attributable to attacks by birds.

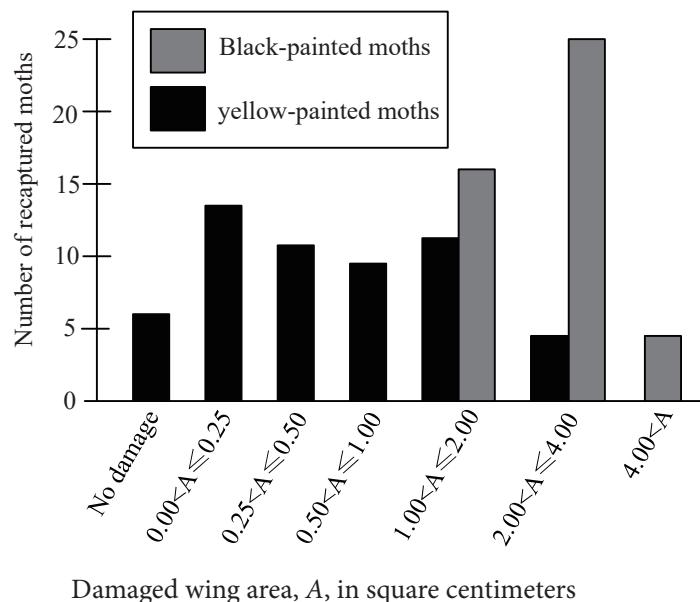
Figure 1

Painted Mimic and Painted Control Promethea Moth Recapture Rates in Trinidad

Study year	Mimic moths released (number)	Mimic moths recaptured		Control moths released (number)	Control moths recaptured	
		(number)	(percent)		(number)	(percent)
1964	198	53	26.8	197	37	18.8
1965	561	148	26.4	567	137	24.2
1966	946	392	41.4	957	416	43.5
1967	943	362	38.4	937	336	35.9

Figure 2

Extent of Wing Injury of Recaptured Promethea Moths in Central Illinois



Adapted from J.G. Sternburg, G. P. Waldbauer, and M. R. Jeffords, "Batesian Mimicry: Selective Advantage of Color Pattern." © 1977 by American Association for the Advanceme of Science

42

Based on the passage, Brower and his colleagues applied black paint to the wings of certain male promethea moths in order to

- A) rule out the potential objection that the sample evaluated in the study was not representative of the population being studied.
- B) ensure that the study's results were not influenced by a factor irrelevant to the question the study was intended to answer
- C) guarantee that the researchers could quickly identify which of the two groups being studied any individual belonged to.
- D) determine whether the findings of the study could be extrapolated to other conditions than those used in the study.

43

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

- A) an experiment whose results appear to cast doubt on a hypothesis to a description of a more recent experiment that supports it.
- B) a method used by some scientists for testing a hypothesis to an explanation of why that method led to results the scientists regarded as inconclusive.
- C) an assumption that guided past research to a summary of recent experimental data that undermine that assumption.
- D) a study that suggested that a particular phenomenon was restricted to one region to a discussion of a later study that showed the phenomenon to be widespread.

44

Which choice best supports the idea that the author thinks that Brower and his colleagues had information that could have helped them address a potential flaw in their experiment?

- A) Lines 1-6 (“Over . . . butterflies”)
- B) Lines 6-9 (“Their . . . wings”)
- C) Lines 25-32 (“Jim . . . pipevine swallowtail”)
- D) Lines 38-41 (“In their . . . swallowtail”)

45

As used in line 27, “reveal” most nearly means

- A) proclaim.
- B) inform.
- C) acknowledge.
- D) demonstrate.

46

Based on the passage, the author would likely agree with which statement about the black-paint moths in the experiment conducted by Brower and his colleagues?

- A) They would have been recaptured as frequently as the artificial mimics if they had been painted any color other than black.
- B) They would have been recaptured at a lower rate if they had been painted a color that was not shared by a local toxic butterfly.
- C) They were recaptured in comparable numbers to the artificial mimics because they were more numerous to begin with.
- D) They were recaptured at a misleadingly low rate because they closely resembled three toxic butterflies found in the area.

47

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

- A) Lines 9-12 (“This . . . wings”)
- B) Lines 18-24 (“L. M. Cook . . . mine”)
- C) Lines 32-34 (“One of . . . promethea”)
- D) Lines 34-38 (“Consequently . . . butterfly”)

48

As used in line 42, “adopting” most nearly means

- A) endorsing.
- B) absorbing.
- C) employing.
- D) fostering.

49

One important function of the sentence in lines 54-59 (“The recaptured... traps”) is to

- A) describe the difference recapture rates for the two groups of moths in the author’s study.
- B) underscore the similarity between the habitat used in the author’s study and the moth’s natural habitat.
- C) emphasize the extent of the predation risk experienced by the moths in the author’s study.
- D) explain why the proportion of moths recaptured during the author’s study was lower than expected.

50

As described in the passage, the results of the author’s experiment best support which claim about predatory birds in the pipevine swallowtail complex?

- A) They tend to behave as if mimetic moths are unpalatable.
- B) They exclusively prey on nonmimetic moths.
- C) They can distinguish natural mimetic moths from artificial ones.
- D) They do not typically encounter mimetic moths.

51

According to figure 1, in which year did researchers recapture the greatest percentage of both mimic moths and control moths?

- A) 1964
- B) 1965
- C) 1966
- D) 1967

52

Taken together, the passage and figure 2 most clearly support which statement about the wing injuries suffered by recaptured promethea moths?

- A) Injuries greater than 1.00 square centimeter probably caused by birds.
- B) Injuries to black-painted moths could not have been caused by birds.
- C) Injuries were rarely fatal unless they exceeded 1.00 square centimeter.
- D) Injuries varied in location depending on the color of the moth.

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.

Park Ranger

Park rangers in the United States National Park Service (NPS) are often thought of as welcoming guides who sport crisp, khaki-and-green uniforms and broad-brimmed hats and who issue permits to park visitors and lead nature walks. **1** But park rangers undergo extensive training. Some rangers collect data on wildlife;

1

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

- A) NO CHANGE
- B) And park rangers often work indoors processing paperwork.
- C) But park rangers, in fact, experience long periods of walking and standing.
- D) But park rangers are more than guides to the great outdoors.

others engage in law enforcement efforts and rescue missions. One of their lesser-known but culturally important duties is to 2 ensure visitors' safety. By sharing the stories of national landmarks, park rangers contribute to shaping visitors' understanding of US history. 3 Betty Reid Soskin was introduced to the park system in 2000.

2

Which choice most effectively sets up the information given in the next sentence?

- A) NO CHANGE
- B) act as guides to the past.
- C) enforce park rules.
- D) promote conservation.

3

The writer wants an effective conclusion to the paragraph that also helps establish the focus of the passage's main discussion. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) Betty Reid Soskin is one of the best active park rangers.
- C) One such park ranger is Betty Reid Soskin.
- D) One park ranger even maintains blog Betty Reid Soskin.

Soskin is a park ranger at Rosie the Riveter World War II Home Front National Historical Park in Richmond, California. The park commemorates the role of workers during the **4** war. The park includes sites such as a Ford assembly plant, which now serves as the visitor center, and a memorial to Rosie the Riveter, a fictional character who represents the contributions of women to industry during the Second World War. Soskin serves as an interpretive ranger, explaining the significance of the park's sites to visitors. Sometimes visitors can find her in the visitor **5** center, she brings the past to life by adding live commentary after visitors watch a video that **6** described the work of local shipbuilders.

4

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

- A) war and includes
- B) war, which includes
- C) war and includes the following
- D) war; being included are

5

- A) NO CHANGE
- B) center, which
- C) center that
- D) center, where

6

- A) NO CHANGE
- B) describe
- C) will describe
- D) describes

A clerk in a trade union office during the Second World War, Soskin regards herself as a primary resource on the history of the shipyards and factories in Richmond and, specifically, on the role and condition of women and African Americans in those industries. It was a desire to share the stories of her experiences that brought Soskin to the NPS. While working for a California state assemblywoman, Soskin attended NPS planning meetings that eventually led to the park's creation. At those meetings, she found herself **7** to think, "What gets remembered is a function of who's in the room doing the remembering." Soskin initially joined the development efforts and **8** then later became a park ranger.

7

- A) NO CHANGE
- B) in thought of,
- C) thinking,
- D) the thought,

8

- A) NO CHANGE
- B) then later, the next thing she accomplished was that she
- C) later, after having participated in the development efforts, she then
- D) then later did something else: she

Her most popular presentation at the park is called “Untold Stories and Lost Conversations,” a bus tour—which fills up two months in **9** advance recounting Soskin’s personal Second World War story. According to Soskin, although she’s not a trained historian, her tour is popular because she shares her personal story as well as the story of other African American workers, a narrative that has often been overlooked in history books. Continuing to appreciate how **10** distinguished her career has been, Soskin also asks visitors to contribute **11** one’s own stories to the park’s oral history collection.

9

- A) NO CHANGE
- B) advance—
- C) advance,
- D) advance:

10

Which choice most effectively sets up the conclusion of the passage?

- A) NO CHANGE
- B) challenging the work of a park ranger is,
- C) US citizens need constant reminders of the nation’s complex history,
- D) diverse perspectives provide a more complete picture of the past.

11

- A) NO CHANGE
- B) your
- C) their
- D) his or her

Questions 12–22 are based on the following passage.

The Case for E-waste Recycling

Globally, the amount of discarded electronic 12 equipment, or e-waste—has increased from about 37.3 million tons in 2010 to approximately 46.1 million tons in 2014. 13 Old and obsolete devices are deposited in landfills. When decides are in landfills, harmful substances can seep into the ground and water supply. However, if properly recycled, these products can become an ecofriendly source of manufacturing materials. As e-waste proliferates, both governments and manufacturers 14 need to plug away to ensure the effectiveness and practicality of recycling it.

12

- A) NO CHANGE
- B) equipment or,
- C) equipment—or
- D) equipment, or—

13

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

- A) What happens is that old and obsolete devices are deposited in landfills; that means that
- B) When old and obsolete devices are deposited in landfills,
- C) Old and obsolete devices get deposited in landfills;
- D) The depositing of old devices, which are also solete, in landfills makes it so that

14

Which choice is most consistent with the overall style and tone of the passage?

- A) NO CHANGE
- B) had better put their noses to the grindstone
- C) are obliged to endeavor
- D) must work

Currently, an estimated 70 percent to 80 percent of e-waste is not recycled. Many governments are addressing this issue by implementing regulations based 15 off of the principal of extended producer responsibility (EPR)—holding manufacturers accountable for the entire life cycle of products, including the final stages of collection, dismantling, reuse, and safe disposal. In 2012, for example, the Chinese government moved from a non-EPR e-waste recycling policy, implemented in 2009, to an EPR-based system. A research team led by Professor Jian Cao of Zhejiang University of Technology studied the efficacy of the new system, which was improved significantly in 2014 using taxes levied on manufacturers to subsidize 16 its upgraded capacity and safety standards. Cao's team 17 found that the new system ultimately contributed to an increase in e-waste recycling from 2.96 million units in 2009 to 69.8 million units in 2014.

15

- A) NO CHANGE
- B) on the principal
- C) from the principle
- D) on the principle

16

- A) NO CHANGE
- B) its
- C) they're
- D) there

17

Which choice provides the most effective conclusion for the paragraph?

- A) NO CHANGE
- B) focused on several types of popular electronics, including televisions and computers.
- C) found that some e-waste is eliminated by illegal means, which exacerbates pollution and squanders resources.
- D) emphasized the importance of consumer understanding of e-waste management and recycling programs.

Cao's team also noted **18** the constantly evolving nature of the Chinese e-waste management system. Slimmer and lighter devices often have design features that stymie **19** recyclers' efforts to extract valuable resources like **20** copper; iron, and glass for reuse. On the other hand, easy-to-dismantle designs, such as that of the cell phones made by the Dutch company Fairphone, **21** indicate a genuine commitment to style-conscious consumers. David Thompson, head of environmental affairs for a large electronics company, suggests that minimizing the use of glues, as well as adopting an industry standard for screws and plastic resin materials, will improve recycling efforts by making products easier to disassemble and repurpose. To encourage manufacturers to make these changes, governments should employ tax breaks for companies that adopt designs conducive to recycling, Cao's team concluded.

18

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

- A) NO CHANGE
- B) that Chinese government officials must bolster their supervision of electronics manufacturers
- C) the importance of design in enabling e-waste recycling
- D) that not all manufacturers are required by law to take recycling into consideration when they design products.

19

- A) NO CHANGE
- B) recycler's efforts
- C) recyclers' effort's
- D) recyclers efforts

20

- A) NO CHANGE
- B) copper iron,
- C) copper, iron,
- D) copper, iron;

21

Which choice provides information that is most relevant to the paragraph's discussion?

- A) NO CHANGE
- B) ensure that electronics can be broken down into their component parts once they become unusable.
- C) are the result of extensive research by manufacturers.
- D) help ensure that repairs to electronics can be made as easily as possible.

As people around the world regularly upgrade their electronic equipment, the amount of e-waste will continue to increase, posing wide-ranging ecological and health challenges. If governments and companies work proactively, and in some cases collaboratively, these dangers can be forestalled, [22] though the safety of workers tasked with dismantling electronics must also be guaranteed.

22

Which choice provides the most effective conclusion for the passage?

- A) NO CHANGE
- B) and innovative electronics designers can maintain a competitive edge.
- C) though helping consumers understand when they truly need new electronic equipment is equally important
- D) and valuable materials can be used-and reused-in the most efficient way possible.

Questions 23–33 are based on the following passage.

When Art Is Worthless but Not Meaningless

[1] Because of the high costs of buying and conserving artwork, museums typically have their collections insured. [2] However, if an insured artwork is damaged to the point where restoring it would cost more 23 then its market value, that piece is called a total loss and becomes legally worthless. [3] The insurer pays the museum the market value of the artwork and thereby 24 takes ownership of the work. [4] Such pieces then often sit in warehouses, never to be displayed again. [5] Seeing a different kind of value in these works that no longer have monetary value, 25 damaged art was given new life by Elka Krajewska when she began the Salvage Art Institute (SAI). [6] She says her goal in maintaining the collection is to bring total-loss works out of seclusion and spark conversations about them. 26

23

- A) NO CHANGE
- B) than its
- C) then it's
- D) than it's

24

- A) NO CHANGE
- B) take
- C) have taken
- D) are taking

25

- A) NO CHANGE
- B) new life was given to damaged art by Elka Krajewska, who began the Salvage Art Institute (SAI).
- C) Elka Krajewska began the Salvage Art Institute (SAI) to give new life to damaged art.
- D) Elka Krajewska's aim in beginning the Salvage Art Institute (SAI) was to give new life to damaged art.

26

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

In the event of damage to a work of art, the insurance company will pay for repairs.

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

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

The SAI acts as a haven for damaged works and allows them to be viewed by the public as a different kind of art. In 2012, one art insurance company donated about fifty total-loss pieces to the institute, and since then, the SAI has added a few **27** pieces and displayed the collection in an exhibit called No Longer Art in several cities in the United States and abroad. Some pieces are visibly destroyed, like a 1995 sculpture by Jeff Koons that was broken into several pieces, while others are not— **28** one 1997 painting by Ed Ruscha was deemed a total loss because someone spilled a few drops of a beverage onto the canvas.

27

- A) NO CHANGE
- B) pieces to the ones given by the insurance company
- C) pieces to the collection
- D) extra, additional pieces

28

Which choice establishes the most effective contrast with the example earlier in the sentence?

- A) NO CHANGE
- B) Alexandre Dubuisson's painting La Moisson has a foot-long gash between the bales of hay and the horses featured in the painting.
- C) a sculpture by Scottish artist David Mach is completely blackened because of a fire.
- D) the pieces of valuable violin were framed and displayed after it was accidentally shattered by a student.

The SAI also provides patrons opportunities to examine art in ways not possible in traditional museums. While most exhibits have tight security to prevent people from getting too close to valuable 29 art, yet No Longer Art invites visitors to touch the already-damaged objects. One work in the collection, *Piazza d' Italia*, painted by Italian artist Giorgio de Chirico between 1909 and 1919, was ripped in half by a wrecking ball that broke through a wall during building renovations. 30 The artist had created a series of paintings of the piazza, many of which now line the walls of other museums and are considered to be significant works in the Western canon. The SAI, though, encourages people to come face-to-face (and hand-to-canvas) with this well-known painting and examine it closely.

29

- A) NO CHANGE
- B) art,
- C) art;
- D) art and

30

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

De Chirico exerted a powerful influence on the Surrealist movement, which flourished during the 1920s.

Should the writer make this addition here?

- A) Yes, because it advances the narrative in the paragraph by incorporating information about the 1920s.
- B) Yes, because it demonstrates that de Chirico is a significant enough figure in art history to merit inclusion in the collection of the SAL.
- C) No, because it blurs the focus of the paragraph by adding irrelevant information about de Chirico.
- D) No, because it fails to identify the stylistic aspects of *Piazza d' Italia* that anticipate Surrealism.

31 Thanks to the generosity of an insurance company, the SAI offers a unique setting in which visitors may think about what 32 molds art and consider the process whereby art is assigned value. Krajewska 33 says, what she finds most interesting is, “how, even when damage is minor and easily restorable, something can be deemed to be art one moment but not the next.” At the SAI, viewers can contemplate this seemingly arbitrary line between art and nonart.

31

The writer wants a transition that summarizes important ideas in the passage at this point in its development. Which choice most effectively accomplishes this goal?

- A) NO CHANGE
- B) Not all of the items in the collection are as well known as *Piazza d’Italia*; nevertheless,
- C) Because of the distinctness of both its content and its hands-on approach,
- D) Like small art galleries that sometimes display unusual, highly challenging art objects,

32

- A) NO CHANGE
- B) formulates
- C) occasions
- D) constitutes

33

- A) NO CHANGE
- B) says—what she finds most interesting is
- C) says, what she finds most interesting is:
- D) says what she finds most interesting is

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

Clever Birds

Until recently, scientists thought that because birds' brains lack a prefrontal cortex (PFC)—the part of the brain associated with complex cognition in mammals—birds were unable to perform advanced cognitive tasks.

34 Recent research has confirmed that the brains of birds have distinctive structures. Studies show that corvids (a family of birds that includes ravens, crows, and jays) are capable of performing tasks previously thought to require a PFC.

Scientists now realize that some corvids possess cognitive capabilities rivaling those of advanced mammals. In one study, researchers found 35 that many birds are able to use simple tools such as twigs to search for food, the New Caledonian crow, corvid species, crafts sophisticated hook-shaped tools to root for insect larvae in trees. Other 36 studies, on the contrary, have indicated that corvids 37 grasp the concepts of object permanence (knowing that an object still exists even if it is hidden), impulse control (being able to delay gratification), and mental time travel (planning ahead and remembering the past).

34

Which choice provides the best transition from the previous sentence to the information that follows in the next sentence?

- A) NO CHANGE
- B) In fact, exciting new research regarding bird intelligence was recently presented in the journal *Trends in Cognitive Sciences*.
- C) Regardless, recent research reinforces the fact that birds' brains are relatively light in weight.
- D) However, new research has called this idea into question.

35

- A) NO CHANGE
- B) that, indeed,
- C) that whereas
- D) DELETE the underlined portion.

36

- A) NO CHANGE
- B) studies
- C) studies, for this reason,
- D) studies, of course,

37

- A) NO CHANGE
- B) lay hold of
- C) appreciate
- D) cling to

These findings led two researchers, Onur Güntürkün and Thomas Bugnyar, to hypothesize that some corvids have a brain structure that functions much like the PFC. After analyzing numerous studies of birds' brain **38** structures, Gintürkün and Bugbear concluded that the nidopallium, a region of the pallium (the layers of matter covering the upper surface of the cerebrum), is integral in synthesizing information from the senses and sharing **39** them with motor structures.

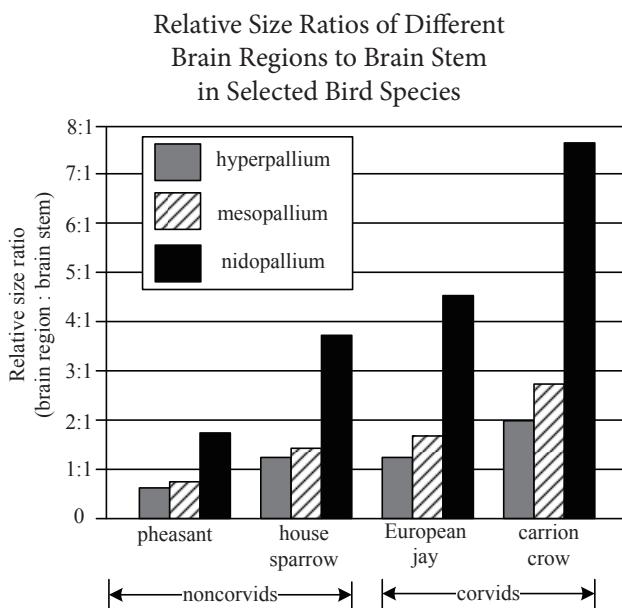
38

- A) NO CHANGE
- B) structures; thus,
- C) structures.
- D) structures, such that

39

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

A study by Nathan J. Emery and Nicola S. Clayton shows the relative prominence of the nidopallium in corvids. Comparing the relative size ratios of different regions of the pallium (hyperpallium, mesopallium, and nidopallium) to the brain stem in various bird species, these researchers found that the relative size ratio of nidopallium to brain stem **40** in European jays is approximately 7.5: 1. By comparison, the relative size ratios of **41** hyperpallium to brain stem in house sparrows and carrion crows are approximately 3.75: 1 and 1.8: 1, respectively. If the nidopallium **42** truly is in actuality the source of cognition in birds, then the relatively large ratio of nidopallium to brain stem in corvids helps explain why **43** is their cognitive ability higher than that of other bird species.



Adapted from Nathan J. Emery and Nicola S. Clayton, "The Mentality of Crows: Convergent Evolution of Intelligence in Corvids and Apes." © 2004 by American Association for the Advancement of Science.

40

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

- A) NO CHANGE
- B) European jays is approximately 1.5:1.
- C) carrion crows is approximately 4.5: 1.
- D) carrion crows is approximately 7.5: 1.

41

Which choice uses data from the graph most effectively to set up the information provided in the paragraph's final sentence?

- A) NO CHANGE
- B) hyperpallium to brain stem in European jays and carrion crows
- C) mesopallium to brain stem in European jays and carrion crows
- D) nidopallium to brain stem in house sparrows and pheasants

42

- A) NO CHANGE
- B) truly is the
- C) really happens to be the very
- D) really is the foundational

43

- A) NO CHANGE
- B) their cognitive ability is higher than that of other bird species.
- C) their cognitive ability is higher than that of other bird species?
- D) is their cognitive ability higher than that of other bird species?

Though many questions about the evolution of corvids cognitive abilities remain, the two research teams consider it likely that the birds' intellectual prowess evolved because corvids faced selective pressures similar to 44 mammals. The researchers are hopeful that their findings will spur further investigations of the evolutionary relationship between cognitive abilities and the physical structure of the brain.

44

- A) NO CHANGE
- B) such mammals.
- C) that encountered by mammals.
- D) those encountered by mammals.

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 webs.**

No Test Material On This Page



Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

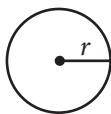
DIRECTIONS

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.

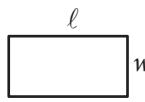
NOTES

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.

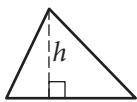
REFERENCE



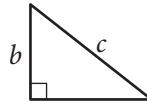
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



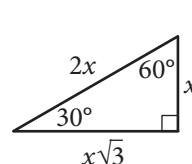
$$A = lw$$



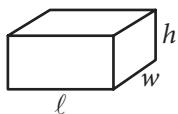
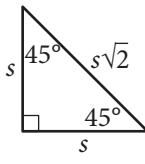
$$A = \frac{1}{2}bh$$



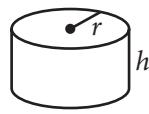
$$c^2 = a^2 + b^2$$



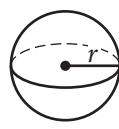
Special Right Triangles



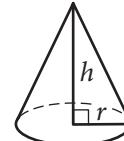
$$V = lwh$$



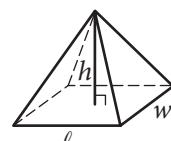
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}lwh$$

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

$$s(t) = 5,500(1.02)^t$$

The function shown models the relationship between $s(t)$, the number of students enrolled in a certain university and t , the number of years after 2010. Which of the following is the best interpretation of the number 1.02 in this context?

- A) The number of students enrolled in the university is predicted to increase by about 2% every years after 2010.
- B) The number of students enrolled in the university is predicted to decrease by about 2% every years after 2010.
- C) The number of students enrolled in the university is predicted to increase by about 102% every years after 2010.
- D) The number of students enrolled in the university is predicted to decrease by about 102% every year after 2010.

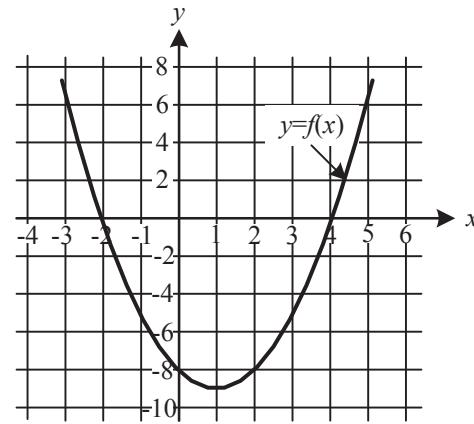
2

$$x^2 - 10x + 25 = 0$$

What value of x satisfies the given equation?

- A) -10
- B) -5
- C) 5
- D) 10

3



The graph of the quadratic function f is shown in the xy -plane. Which of the following are the coordinates of the y -intercept of f ?

- A) (4, 0)
- B) (0, 4)
- C) (0, -8)
- D) (0, -9)

4

$$x + 2y = 11$$

$$x - 2y = 3$$

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

- A) 3
- B) 7
- C) 12
- D) 14



5

A circle in the xy -plane has center $(0, 0)$ and radius 2. Which of the following is an equation of the circle?

- A) $x^2 + y^2 = 1$
- B) $x^2 + y^2 = 2$
- C) $x^2 + y^2 = 4$
- D) $x^2 + y^2 = 8$

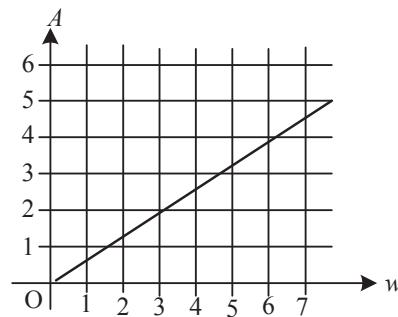
6

$$\sqrt{x} = x - 6$$

What are all possible solutions to the equation above?

- A) $x=4$
- B) $x=9$
- C) $x=12$
- D) $x=4$ and $x=9$

7



In a collection of rectangles that have the same fixed length, each rectangle has width w , in inches, and area A , in square inches. The graph shows the relationship between some possible values of A and w . Which of the following equations best represents this relationship?

- A) $A = w + \frac{3}{2}$
- B) $A = w + \frac{2}{3}$
- C) $A = \frac{3}{2}w$
- D) $A = \frac{2}{3}w$



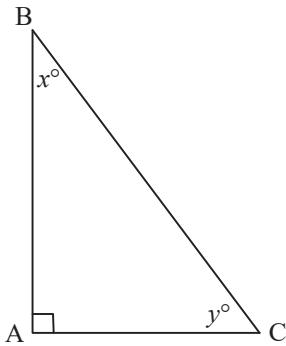
8

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

Which of the following is equivalent to the given expression?

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

9



Note: Figure not drawn to scale.

In $\triangle ABC$ shown, $\sin(x^\circ) = \frac{8}{13}$. What is the value of $\cos(y^\circ)$?

- A) $\frac{64}{169}$
- B) $\frac{105}{169}$
- C) $\frac{8}{13}$
- D) $\frac{\sqrt{105}}{13}$

10

$$F - \frac{9}{4}R = 32$$

The Reaumur temperature scale was established in 1730 by the French naturalist René-Antoine Réaumur. The equation above relates degrees Reaumur R to degrees Fahrenheit F . What is the temperature in degree Reaumur when the temperature is 50 degrees Fahrenheit?

- A) 144
- B) 80.5
- C) 40.5
- D) 8

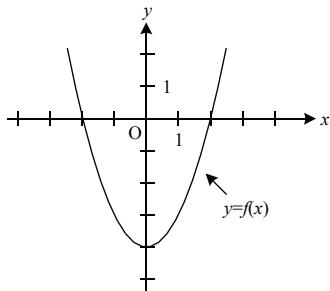
11

Pat and Malik made a total of 25 hats. Pat made 3 more hats than Malik made. If Pat made p hats, which of the following equations can be used to solve for p ?

- A) $p + (p - 3) = 25$
- B) $p + (p + 3) = 25$
- C) $\frac{p + (p - 3)}{2} = 25$
- D) $\frac{p + (p + 3)}{2} = 25$



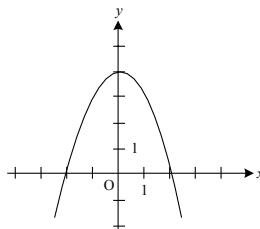
12



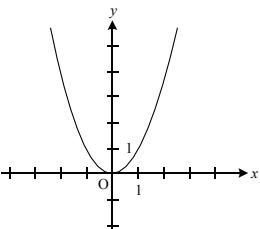
The graph of the quadratic function h is shown in the xy -plane above. Which of the following is the graph

of $y = |h(x)|$?

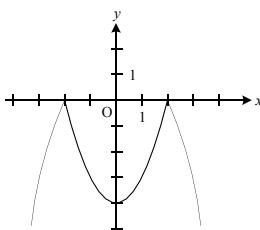
A)



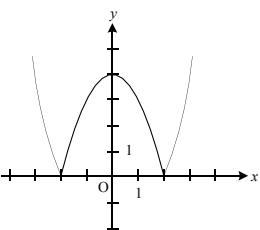
B)



C)



D)



13

If the expression $\frac{x+7}{x^2-x-6}$ is equivalent to

$$\frac{2}{x-3} + \frac{a}{x+2},$$
 what is the value of a ?

A) -2

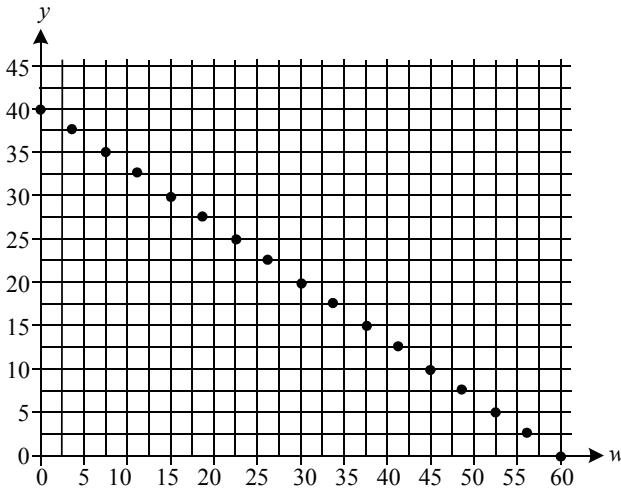
B) -1

C) 1

D) 2



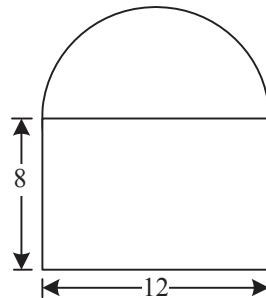
14



A school soccer team is holding a car wash fund-raise. The team plans to offer two services: a wash of the car's exterior for \$10 and a vacuum of the car's interior for \$15. The points (w, v) plotted above show all the ways the team can meet its exact fund-raising goal, where w represents the number of exterior washed performed and v represents the number of interior vacuums performed. What is the team's fund-raising goal?

- A) \$1,200
- B) \$800
- C) \$600
- D) \$400

15



The figure shown represents a rectangle and a semicircle. Which of the following gives the combined area of the rectangle and the semicircle?

- A) $12 \times 8 + 36\pi$
- B) $12 \times 8 + 18\pi$
- C) $12 \times 8 + 6\pi$
- D) $12 \times 8 + 6\pi$

**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 $\frac{7}{2}$. (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

Grid in result.

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

← 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

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



16

$$5(x+4) + 2 = 5x + p$$

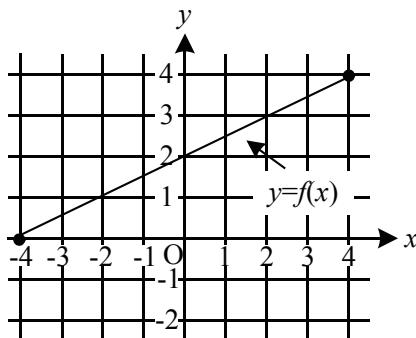
In the given equation, p is a constant. If the equation has infinitely many solutions, what is the value of p ?

18

$$7(x-4) = 3 + 5(x-4)$$

If x is the solution to the given equation, what is the value of $x-4$?

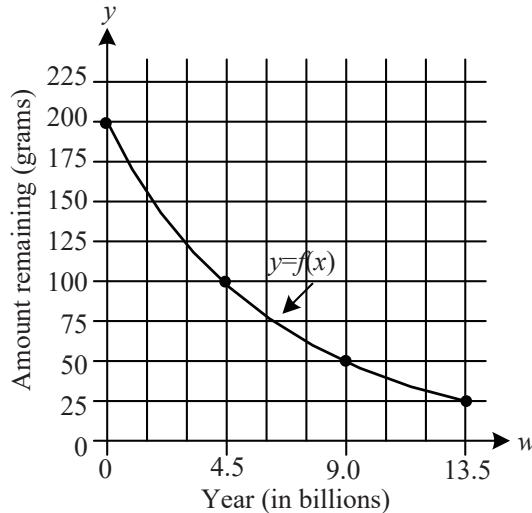
17



The graph of the linear function $f(x) = mx + 2$ is shown in the xy -plane, where m is a constant and $-4 \leq x \leq 4$. What is the value of m ?



19



The graph of the function $f(x) = 200 \left(\frac{1}{2}\right)^{\frac{x}{k}}$ shown in the xy -plane models the amount $f(x)$ of a 200-gram sample of a certain isotope of uranium that would remain x billion years after the sample is obtained. In the function, k is a positive constant. What is the value of k ?

20

$$V = \frac{1}{3}Ah$$

The equation above relates the volume V of a pyramid to the area A of its base and its height h . If the equation is rewritten in the form $h = k \frac{V}{A}$, where k is a constant, 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.

No Test Material On This Page



Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

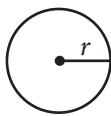
DIRECTIONS

For questions 1–30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding 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.

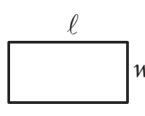
NOTES

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.

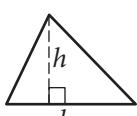
REFERENCE



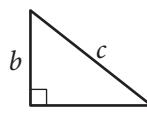
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



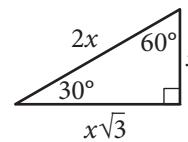
$$A = \ell w$$



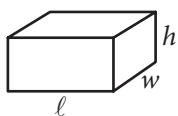
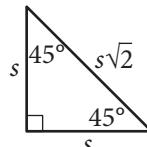
$$A = \frac{1}{2}bh$$



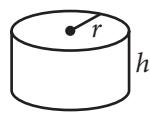
$$c^2 = a^2 + b^2$$



Special Right Triangles



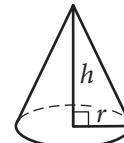
$$V = \ell wh$$



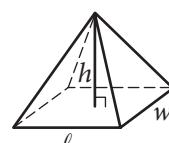
$$V = \pi r^2 h$$



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



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



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

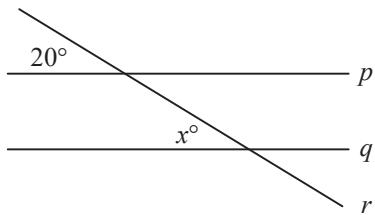
The number of degrees of arc in a circle is 360.

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.



1

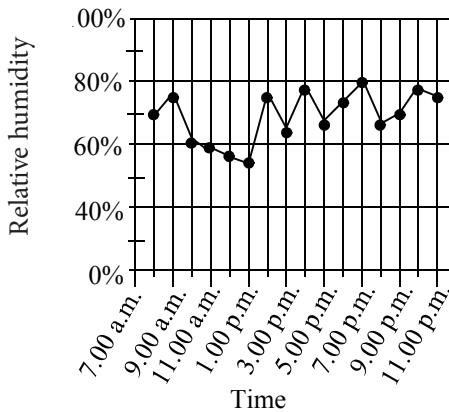


The figure shows lines p , q , and r in the same plane. If the line p is parallel to line q , what is the value of x ?

- A) 20
- B) 70
- C) 160
- D) 180

2

Relative Humidity Recorded at Weather Station



The given line graph shows the relative humidity recorded at different times of the day at weatherstation. According to the graph, at what time did the maximum recorded relative humidity occur?

- A) 8:00 a.m.
- B) 1:00 p.m.
- C) 7:00 p.m.
- D) 11:00 p.m.

3

If $p\%$ of 124 is 31, what is the value of p ?

- A) 25
- B) 50
- C) 75
- D) 80

4

The cost of a carpet was \$324, and the carpet cost \$3 per square foot. What is the area, in square feet, of the carpet?

- A) 972
- B) 486
- C) 108
- D) 54

5

The function g is defined by $g(x) = 2^{x+3}$. What is the value of $g(2)$?

- A) 7
- B) 10
- C) 25
- D) 32



6

	Branch office	ATM	Total
Bank	8	16	24
Credit union	5	14	19
Total	13	30	43

Aaliyah recorded the number of branch offices and freestanding automatic teller machines (ATM) within 5 miles of her house by bank or credit union. Her data are summarized in the table. If an ATM is selected at random, what is the probability it belongs to a credit union?

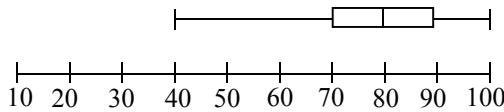
- A) $\frac{14}{19}$
- B) $\frac{14}{30}$
- C) $\frac{19}{30}$
- D) $\frac{19}{43}$

7

A soccer team's goal is to earn at least \$1,500 by selling coupon books. The team earns \$15 from selling each coupon book. Which of the following inequalities describes all possible values for the number of coupon books, n , the team can sell and meet the goal?

- A) $15n \leq 1500$
- B) $15n \geq 1,500$
- C) $n + 15 \geq 1,500$
- D) $n + 15 \leq 1,500$

8



The box summarizes the distribution of 100 distinct values in a data set. Which of the following intervals contains the most data values?

- A) $10 \leq x \leq 40$
- B) $40 \leq x \leq 70$
- C) $70 \leq x \leq 90$
- D) $90 \leq x \leq 100$



Questions 9 and 10 refer to the following information.

	Rate of energy use in standby mode (watts)	Rate of energy use during active use (watts)
Monitor	1.1	26
Computer	2.9	74
Workstation	4.0	100

The rates of energy use for a monitor, a computer, and a workstation (monitor-computer combination), in standby mode and during active use, are shown in the table above.

9

What is the rate of energy use P , in watts, of M monitors during active use?

- A) $P=M+26$
- B) $P=M-26$
- C) $P=\frac{M}{26}$
- D) $P=26M$

10

If the total rate of energy use for 28 workstations being actively used and x workstations in standbymode is 2,848 watts, how many workstations are in standby mode?

- A) 12
- B) 17
- C) 28
- D) 87



11

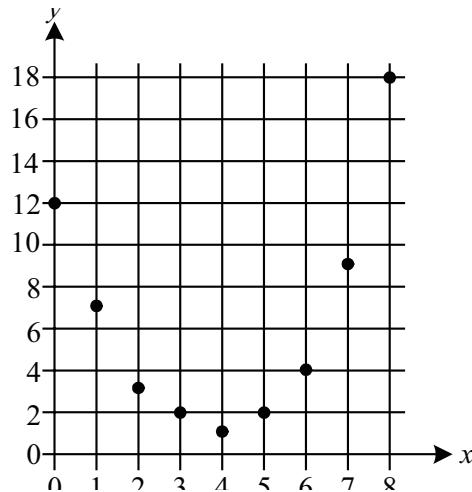
$$y = \frac{1}{2}x$$

$$10 - 2y = 4x$$

In the xy -plane, what is the x -coordinate of the point of intersection of the graphs with equations above?

- A) 2
- B) $\frac{5}{2}$
- C) $\frac{10}{3}$
- D) 5

12



Which of the following equations best models the data in the scatter plot shown?

- A) $y = 0.9x^2 - 6.5x + 12.5$
- B) $y = 0.9x^2 - 6.5x + 6.5$
- C) $y = 0.9x^2 - 6.5x + 0.9$
- D) $y = 0.9x^2 - 6.5x - 12.5$

13

If $y = 6x + 8$ and $3x + 2y = 46$, what is the value of $x + y$?

- A) 11
- B) 18
- C) 20
- D) 22



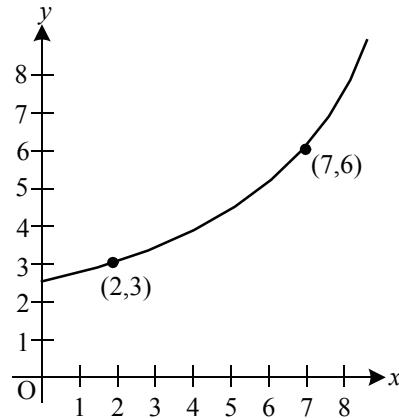
14

Year	Number of music single Downloads (in million)
2005	370
2006	585
2007	810
2008	1,013
2009	1,138
2010	1,177
2011	1,332
2012	1,392
2013	1,328
2014	1,199
2015	1,021

The table shows the annual number of music single downloads in the United States from 2005 to 2015. What is the median number of annual music single downloads for this period?

- A) 810 million
- B) 881 million
- C) 1,138 million
- D) 1,177 million

15



In the xy -plane, the graph of an exponential equation is shown. The graph of a linear equation (not shown) intersects the graph of the exponential equation at $(2, 3)$ and $(7, 6)$. The point (c, r) is on the exponential graph, and the point (c, t) is on the linear graph, where $r < t$. Which of the following could be the value of c ?

- A) 1
- B) 4
- C) 8
- D) 10

**Questions 16 and 17 refer to the following information.**

College: $R(t) = 42t + 4,682$

College W: $W(t) = 106t + 4,362$

The given functions model the numbers of undergraduate students, $R(t)$ and $W(t)$, predicted to be enrolled at College R and College W, respectively, t years after October 2016, where t is an integer and $0 \leq t \leq 10$.

16

How many years after October 2016 is the number of undergraduate students enrolled at College R predicted to be 4,976?

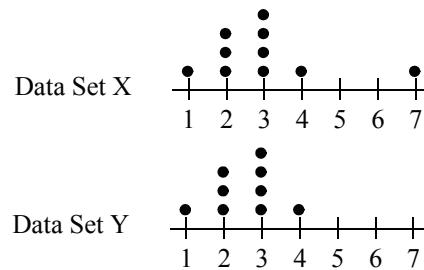
- A) 5
- B) 6
- C) 7
- D) 8

17

In October 2016, the number of undergraduate students predicted to be enrolled at College R was $p\%$ greater than the number of undergraduate students predicted to be enrolled at College W. Which of the following is closest to the value of p ?

- A) 2.4
- B) 3.4
- C) 6.8
- D) 7.3

18



Data set X and data set Y are represented by the dot plots shown. Which of the following is (are) true?

- I. The median of data set X is greater than the median of data set Y.
 - II. The mean of data set X is greater than the mean of data set Y.
- A) I only
 - B) II only
 - C) I and II
 - D) Neither I nor II

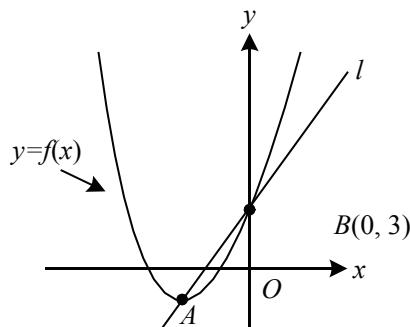


19

A necklace is made of 24 beads that are either white or green. The ratio of white beads to green beads in this necklace is 5 to 1. A second necklace is made of 40 beads that are either white or green. The ratio of white beads to green beads in this second necklace is 5 to 3. How many more green beads are in the necklace with 40 beads than in the necklace with 24 beads?

- A) 2
- B) 5
- C) 7
- D) 11

20



The graph of the function f defined by $f(x) = (x+2)^2 - 1$ is shown in the xy -plane above. Line ℓ intersects the graph of f at points A and B , as shown. If point A is the vertex of the graph of f , which of the following points does NOT lie on line ℓ ?

- A) $(4, 11)$
- B) $(1, 3)$
- C) $(-1, 1)$
- D) $(-3, -3)$

21

The manager of a small deli prepares c cups of coleslaw for a group of p people, where $c = 2p + 3$ and $p > 1$. Based on the equation, how many cups of coleslaw does the manager prepare for each additional person in the group?

- A) 2
- B) 3
- C) 5
- D) 6

22

$$y = 10x + 5$$

$$y = 4(2)^x$$

A linear growth model and an exponential growth model are shown above. If x is a positive integer, which of the following statements is true?

- A) The y -value of the exponential model exceeds that of the linear model only for positive integer values of x less than 4.
- B) The y -value of the linear model exceeds that of the exponential model only for positive integer values of x less than 4.
- C) The y -value of the exponential model exceeds that of the linear model for all positive integer values of x .
- D) The linear and exponential models have equal y -values when $x=4$.

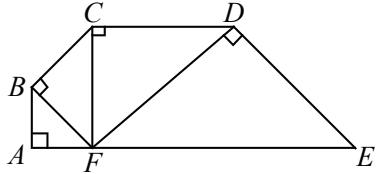


23

A juvenile koala has a head length of x millimeters. After a certain period of time, the juvenile koala's head length is predicted to increase by 92%. Multiplying the juvenile koala's head length of x by which of the following best predicts the head length of the juvenile koala after this certain period of time?

- A) 0.92
- B) 1.92
- C) 2.92
- D) 92.26

24



In the figure above, all the triangles are isosceles right triangles. What is the ratio of \overline{AB} to \overline{FE} ?

- A) 1 to $\sqrt{2}$
- B) 1 to 3
- C) 1 to 4
- D) 1 to 5

25

$$5x - 3y = 12$$

$$y = qx + 3$$

In the system of equations above, q is a constant. If the system has no solution, what is the value of q ?

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



26

$$h(t) = -16t^2 + 96t + 52$$

The function above models the height h , in feet, of an object t seconds after it is launched straight up in the air. Which of the following methods can be used to find m , the maximum height, in feet, of the object?

- A) Rewrite h as $h(t) = -4(2t+1)(2t-13)$, with the constant representing m .
- B) Rewrite h as $h(t) = -4(2t+1)(2t-13)$, with the constant 13 representing m .
- C) Rewrite h as $h(t) = -16(t-3)^2 + 196$, with the constant 3 representing m .
- D) Rewrite h as $h(t) = -16(t-3)^2 + 196$, with the constant 196 representing m .

27

The shape of the state of Wyoming can be modeled by a rectangle that has a width of 275 miles and a length of 352 miles. A scale drawing of this model shows Wyoming as rectangle with a width of w inches. Which of the following equations gives the area $A(w)$, in square inches, of the scale drawing of Wyoming?

A) $A(w) = 1.28w^2$

B) $A(w) = 0.78w^2$

C) $A(w) = \frac{w^2}{1.28}$

D) $A(w) = \frac{w^2}{0.78}$

28

Data set A consists of 20 different values that have a minimum of 22, a maximum of 86, a mean of 54, and a standard deviation of 15. The values 22 and 86 are removed from the set to create data set B , which consists of 18 different values. Which of the following statements is true?

- A) The mean of data set B is greater than 54.
- B) The mean of data set B is less than 54.
- C) The standard deviation of data set B is greater than 15.
- D) The standard deviation of data set B is less than 15.



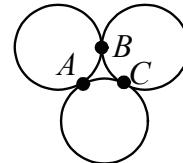
29

$$\frac{x-3}{3} + 1 = \frac{x+2}{5}$$

The solution to the equation above is between which of the following pairs of values?

- A) $\frac{1}{4}$ and $\frac{1}{2}$
- B) $\frac{2}{3}$ and 1
- C) 1.8 and 2.2
- D) 2.5 and 3.7

30



In the figure above, three circles are tangent to each other at points A, B and C, as shown. If the radius of each circle is 9, what is the length of arc AB?

- A) $\frac{3\pi}{2}$
- B) $\frac{9\pi}{4}$
- C) 3π
- D) $\frac{9\pi}{2}$

**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 $\frac{7}{2}$. (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	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

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

Grid in
result.

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

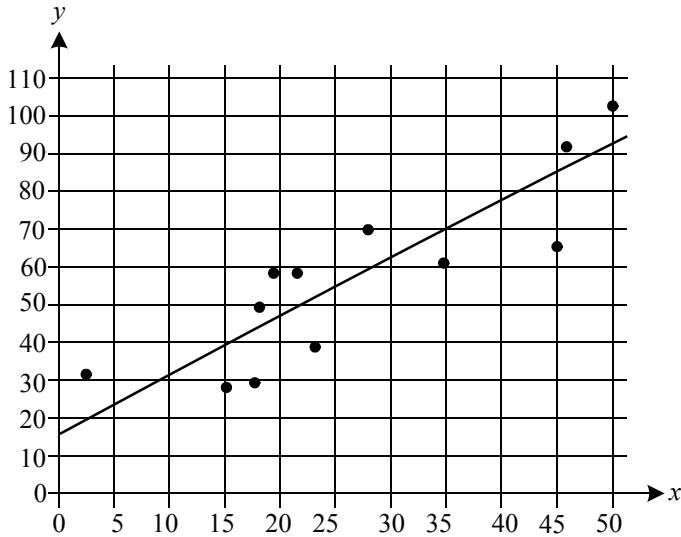
2	0	1
0	0	0
1	1	1
2	2	2
3	3	3

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.



31



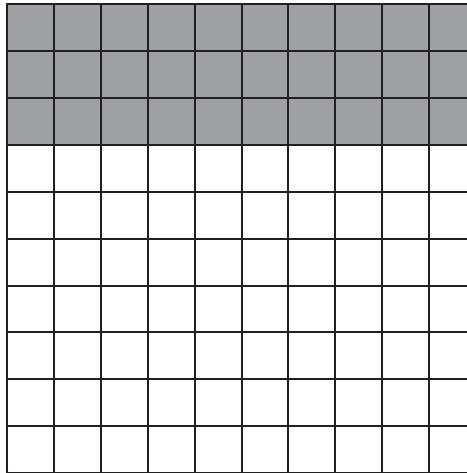
A data set of 12 points is shown in the scatterplot. A line of best fit for the data is also shown. For how many data points is the y -value predicted by the line of best fit greater than the actual y -value?

32

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

The expression above is equivalent to $ax^2 + bxy + cy^2$, where a , b , c are constants. What is the value of b ?

33



A square is divided into 100 small squares, as shown. If one of the 100 small squares is selected at random, what is the probability that it is shaded? (Express your answer as a decimal or fraction, not as percent.)

34

In the xy -plane, a line passes through the points $(2, 5)$ and $(6, 11)$. If an equation of the line is $y = mx + b$, where m and b are constants, what is the value of b ?

**Questions 35 and 36 refer to the following information.**

A team of wildlife biologists estimated the population of adult male and adult female deer in a 250,000-square-meter forest. They estimated that there are 172 adult male deer in the forest.

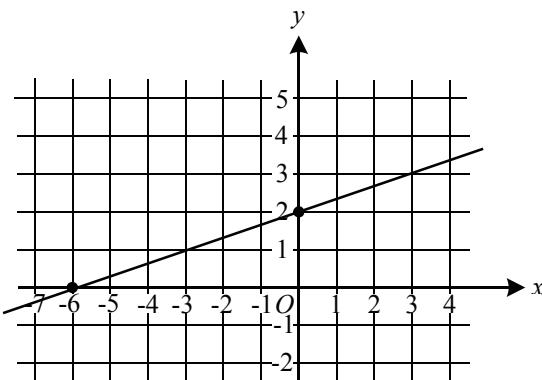
35

What is the land area, in hectares, of the forest being studied? (1 hectare = 10,000 square meters)

36

The ratio of adult male to adult female deer in the forest is 2 to 3. What is the estimated number of adult female deer in the forest?

37



The graph of the equation $3x-9y+C=0$, where C is a constant, is shown in the xy -plane. What is the value of C ?

38

If $\frac{x+1}{x^2-1} = 3$, what is the value of x ?

STOP

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

NOVEMBER 9, 2019 U.S. ANSWERS

Reading				Writing				Math1		Math2	
Question	Answer	Question	Answer								
1	C	41	A	1	D	41	D	1	A	1	C
2	B	42	B	2	B	42	B	2	C	2	C
3	A	43	A	3	C	43	B	3	C	3	A
4	B	44	D	4	A	44	D	4	B	4	C
5	D	45	D	5	D			5	C	5	D
6	A	46	B	6	D			6	B	6	B
7	D	47	D	7	C			7	D	7	B
8	C	48	C	8	A			8	A	8	C
9	B	49	C	9	B			9	C	9	D
10	C	50	A	10	D			10	D	10	A
11	A	51	C	11	C			11	A	11	A
12	B	52	A	12	C			12	D	12	A
13	C			13	B			13	B	13	D
14	D			14	D			14	C	14	C
15	B			15	D			15	B	15	B
16	C			16	B			16	22	16	C
17	B			17	A			17	1/2 or 0.5	17	D
18	C			18	C			18	1.5 or 3/2	18	B
19	D			19	A			19	4.5 or 9/2	19	D
20	A			20	C			20	3	20	B
21	B			21	B					21	A
22	A			22	D					22	B
23	C			23	B					23	B
24	D			24	A					24	C
25	A			25	C					25	C
26	D			26	A					26	D
27	D			27	A					27	A
28	C			28	A					28	D
29	C			29	B					29	D
30	D			30	C					30	C
31	B			31	C					31	5
32	B			32	D					32	4
33	C			33	D					33	0.3
34	A			34	D					34	2
35	D			35	C					35	25
36	D			36	B					36	258
37	D			37	A					37	18
38	C			38	A					38	4/3
39	B			39	C						
40	D			40	D						