

The SAT[®]

IMPORTANT REMINDERS

1

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

2

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

THIS TEST BOOK MUST NOT BE TAKEN FROM THE ROOM. UNAUTHORIZED REPRODUCTION OR USE OF ANY PART OF THIS TEST BOOK IS PROHIBITED.

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 Elizabeth Gilbert, *Stern Men*. ©2000 by Elizabeth Gilbert. Ruth Thomas spent her childhood on Fort Niles Island with her father and now, as a teenager, attends a boarding school arranged for by her mother.

It was Ruth Thomas's firm position that she belonged nowhere but on Fort Niles Island. This was the position she took with her mother: she was truly, Line happy only on Fort Niles; Fort Niles was in her blood 5 and soul; and the only people who understood her were the residents of Fort Niles Island. None of this, it must be said, was entirely true.

It was important to Ruth in principle that she feel happy on Fort Niles, although, for the most part, she 10 was pretty bored there. She missed the island when she was away from it, but when she returned, she immediately found herself at a loss for diversion. She made a point of taking a long walk around the shoreline the minute she came home ("I've been 15 thinking about this all year!" she would say), but the walk took only a few hours, and what did she think about on that walk? Not much. There was a seagull; there was a seal; there was another seagull. The 20 scenery was as familiar to her as her bedroom ceiling. She took books down to the shore, claiming that she loved to read near the pounding surf, but the sad fact is that many place on this Earth offer better reading environments than wet, barnacle-covered rocks.

When Ruth was away from Fort Niles, the island 25 became endowed with the characteristics of a distant

paradise, but when she returned to it, she found her home cold and damp and windy and uncomfortable.

Still, whenever she was on Fort Niles, Ruth wrote letters to her mother, saying, "Finally I can breathe 30 again!"

More than anything, Ruth's passion for Fort Niles was an expression of protest. It was her resistance against those who would send her away, supposedly for her own good. Ruth would have much preferred 35 to determine what was good for her. She had great confidence that she knew herself best and that, given free rein, would have made more correct choices. She certainly wouldn't have elected to send herself to an elite private school hundreds of miles away, where 40 girls were concerned primarily with the care of their skin and horses. No horses for Ruth, thank you. She was not that kind of girl. She was more rugged. It was boats that Ruth loved, or so she constantly said. It was Fort Niles Island that Ruth loved. It was fishing that 45 Ruth loved.

In truth, Ruth had spent time working with her father on his lobster boat, and it had never been a terrific experience. She was strong enough to do the work, but the monotony killed her. Working as 50 a sternman meant standing in the back of the boat, hauling up traps, picking out lobsters, baiting traps and shoving them back in the water, and hauling up more traps. And more traps and more traps. It meant getting up before dawn and eating sandwiches for 55 breakfast and lunch. It meant seeing the same scenery again and again, day after day, and rarely venturing more than two miles from shore. It meant spending

hour upon hour alone with her father on a small boat, where the two of them never seemed to get along.

- 60 On one of their early trips, Ruth warned her father about a barrel drifting up on his “port side,” and he laughed in her face.

“Port side?” he said. “This isn’t the Navy, Ruth. You don’t need to worry about port and starboard.

- 65 The only direction you need to worry about is staying out of my way.”

Ruth seemed to get on his nerves even when she wasn’t trying to, although sometimes she did so on purpose, just to pass the time.

1

Which of the following statements best described the role of the narrator in the passage?

- A) The narrator reports Ruth’s ideas without judgment or evaluation.
- B) The narrator relates Ruth’s thoughts and demonstrates their inconsistencies.
- C) The narrator reveals how Ruth appears to the people around her.
- D) The narrator compares Ruth as a teenager to Ruth as a child.

2

The passage as a whole presents Ruth as the type of person who

- A) realizes clearly what she really likes in life.
- B) prefers to live in a close-knit community.
- C) greatly enjoys spending time in nature.
- D) prizes independence and self determination.

3

Which choice provides the best evidence in support of the idea that Ruth idealized her life on island?

- A) Line 10-15 (“She . . . say”)
- B) Line 17-18 (“There . . . another seagull”)
- C) Line 24-27 (“When . . . uncomfortable”)
- D) Lines 41-42 (“No horses . . . rugged”)

4

In line 18, the reference to Ruth’s bedroom ceiling supports the narrator’s claim that Ruth found the island

- A) hospitable and welcoming.
- B) domestic and cozy.
- C) unpretentious and authentic.
- D) predictable and unexciting.

5

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

- A) agitation.
- B) anger.
- C) vulnerability.
- D) enthusiasm.

6

According to the narrator, Ruth insists to her mother that she loves Fort Niles primarily in order to

- A) show her displeasure with decisions made on her behalf.
- B) prevent unwanted intrusion into her social life.
- C) criticize her mother for her conventionality.
- D) test the limits of established parental authority.

7

It can reasonably be inferred that in comparison to the girls at her school, Ruth sees herself as less

- A) accomplished and intimidating.
- B) inquisitive and annoying.
- C) naive and athletic.
- D) superficial and pampered.

8

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

- A) Lines 35-41 (“She . . . and horses”)
- B) Lines 42-43 (“It was . . . said”)
- C) Lines 46-48 (“In truth . . . experience”)
- D) Lines 53-55 (“It meant . . . lunch”)

9

The passage indicates that Ruth’s assertion that she loves fishing is a

- A) contradiction of her actual disdain for her father’s failure at lobstering.
- B) suggestion of her inability to get along with her father while fishing with him.
- C) misrepresentation of her feelings while working on her father’s boat.
- D) concealment of her sentimentality about working together with her father.

10

The pattern of starting three consecutive sentences with “It mean...” in lines 53-59 mainly has the effect of

- A) imitating the frequency of Ruth’s complaints to her father.
- B) disrupting the predictable sequence of night, dawn, and daytime.
- C) emphasizing the repetitiveness in Ruth’s days spent fishing.
- D) representing the physical stamina required to work on a fishing boat.

Questions 11 -21 are based on the following passage.

This passage is adapted from Joshua Greene, Moral Tribes. ©2013 by Joshua D. Greene.

In 1995, a U.S. News & World Report survey posed the following question to readers: If someone sues you and you win the case, should he pay your legal costs?" Eighty-five percent of respondents said yes. Others got this question: "If you sue someone and lose the case, should you pay his costs?" This time, only 44 percent said yes. As this turnabout illustrates, ones sense of fairness is easily tainted by self-interest. This is considered biased fairness, rather than simple bias, because people are genuinely motivated to be fair. Suppose the magazine had posed both versions of the question simultaneously. Few respondents would have said, "The loser should pay if I'm the winner, but the winner should pay if I'm the loser." We genuinely want to be fair, but in most disputes there is a range of options that might be seen as fair, and we tend to favor the ones that suit us best. Many experiments have documented this tendency in the lab. The title of a Dutch paper nicely summarizes the drift of these findings: "Performance-based pay is fair, particularly when I perform better."

A series of negotiation experiments by Linda Babcock, George Loewenstein, and colleagues illuminates the underlying psychology of biased fairness. In some of these experiments, pairs of people negotiated over a settlement for a motorcyclist who had been hit by a car. The details of the hypothetical case were based on a real case that had been tried by a judge in Texas. At the start of the experiment, the subjects were randomly assigned to their roles as plaintiff and defendant. Before negotiating, they separately read twenty-seven pages of material about the case, including witness testimony, maps, police reports, and the testimonies of the real defendant and plaintiff. After reading this material, they were asked to guess what the real judge had awarded the plaintiff, and they did this knowing which side they would be on. They were given a financial incentive to guess accurately, and their guesses were not revealed to the opponents, lest they weaken their bargaining positions. Following the subsequent negotiation, the subjects were paid real money in proportion to the size of the settlement, with the plaintiff subject getting more money for a large settlement and the defendant

subject getting more money for a smaller one. The settlement could be anywhere from \$ 0 to \$ 100,000. The pairs negotiated for thirty minutes, with their negotiations divided into six five-minute periods. Both subjects lost money in "court costs" as the clock ticked, and failure to agree after thirty minutes resulted in an additional financial penalty for both negotiators.

On average, the plaintiffs' guesses about the judge's award were about \$15,000 higher than those of the defendants, and the bigger the discrepancy between the two guesses, the worse the negotiation went. In other words, the subjects' perceptions of reality were distorted by self-interest. What's more, these distortions played a big role in the negotiation. Pairs with relatively small discrepancies failed to agree only 3 percent of the time, while the negotiating pairs with relatively large discrepancies failed to agree 30 percent of the time. In a different version of the experiment, the negotiators didn't know which side they would be on until after they made their guesses about the judge's settlement. This dropped the overall percentage of negotiators who failed to agree from 28 percent to 6 percent.

These experiments reveal that people are biased negotiators, but, more important, they reveal that their biases are unconscious. Plaintiffs guessed high about the judge's award, and defendants guessed low, but they weren't consciously inflating or deflating their guesses. (Once again, they had financial incentives to guess accurately.) Rather, it seems that knowing which side of a dispute you're on unconsciously changes your thinking about what's fair. It changes the way you process the information. In a related experiment, the researchers found that people were better able to remember pretrial material that supported their side. These unconsciously biased perceptions of fairness make it harder for otherwise reasonable people to reach agreements, often to the detriment of both sides.

Settlement Rates and Amounts by Condition

Condition	Settlement rate	Average number of negotiation periods to settle	Mean settlement amount
Subjects knew their roles (n = 47)	72%	3.75	\$29,970
Subjects did not know their roles (n = 47)	94%	2.51	\$36,762

n = number of subjects

11

In the passage the author implies that the survey by U.S. News and World Report would likely have produced different results had it

- A) been distributed to a different group of readers.
- B) proceeded from the assumption that people consciously act out of self-interest.
- C) discussed similar legal cases that occurred in states other than Texas
- D) framed the question in a manner that made a moral issue apparent.

12

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

- A) Lines 1-5 (“In 1995 . . . yes”)
- B) Lines 6-11 (“This time . . . motivated to be fair”)
- C) Lines 11-15 (“Suppose . . . want to be fair”)
- D) Lines 15-17 (“In most . . . best”)

13

As used in line 11, “fair” most nearly means

- A) pleasing.
- B) adequate.
- C) equitable.
- D) legitimate.

14

As used in line 15, “range” most nearly means

- A) series.
- B) distance.
- C) sum.
- D) region.

15

It can reasonably be inferred from the passage that the negotiation experiments described in the second paragraph (lines 22-52) were designed in such a way that subjects

- A) had little incentive to study the background material on the real case.
- B) felt pressured to use dishonest means to reach settlement quickly.
- C) lacked key pieces of information when negotiations began.
- D) had a compelling reason to estimate the judge’s award correctly.

16

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

- A) Lines 27-29 (“The details . . . Texas”)
- B) Lines 29-31 (“At the . . . defendant”)
- C) Lines 35-38 (“After . . . on”)
- D) Lines 38-39 (“They . . . accurately”)

17

The passage indicates that the difference between the earlier negotiators and the negotiators participating in the “different version” (line 63) of the study is that the latter were

- A) given financial incentives to settle.
- B) less motivated by self-interest.
- C) never told the amount of the judges settlement.
- D) more fully aware of their biases.

18

The parenthetical comment in lines 74–75 mainly serves to

- A) reiterate that the participants wanted to be fair.
- B) highlight the nature of the participants' motivation.
- C) suggest that the results of the studies were questionable.
- D) indicate a factor that can make participants behave aggressively.

19

Data in the table best support which conclusion about the mean settlement amounts awarded in the experiments?

- A) A higher mean settlement amount generally meant that negotiators had difficulty reaching an agreement.
- B) Mean settlement amounts were largely unrelated to whether or not subjects knew their roles.
- C) When unconscious bias was minimized, mean settlement amounts were higher.
- D) As unconscious bias was reduced, both mean settlement amounts and rates decreased.

20

The table best supports which conclusion about the negotiations in which subjects knew their roles?

- A) These negotiations resulted in higher mean settlement amounts than did negotiations in which subjects did not know their roles.
- B) These negotiations required more time to settle than did negotiations in which subjects did not know their roles.
- C) Less than half of these negotiations actually reached a settlement.
- D) None of these negotiations took longer than four negotiation periods to settle.

21

Taken together, the table and the passage support the idea that

- A) settlement rates and the settlement amounts appear to vary in random and unpredictable ways.
- B) the more self-interested that negotiators are, the more motivated they will be to settle quickly.
- C) there is a strong positive relationship between productive settlement negotiations and the absence of bias.
- D) spending more time in settlement negotiations generally leads to more enduring settlements.

Questions 22-32 are based on the following passages.

Passage 1 is adapted from David A. Kessler, "A New Crack at Friction." ©2001 by Macmillan Magazines Ltd. Passage 2 is adapted from Peter Weiss, "Model May Expose How Friction Lets Loose." ©2001 by Society for Science & the Public.

Passage 1

Friction is a ubiquitous feature of everyday life. Without it, we couldn't walk, tires wouldn't roll, and ballpoint pens would fail to write. But what is friction, and how does it act?

- 5 The basic properties are simple to grasp. To move a solid object from rest on top of a solid surface, a minimum force has to be applied to overcome the force of friction. This force is proportional to the compressive force pushing the two surfaces together, 10 in this case the weight of the object. Intriguingly, this minimum force is independent of the area of contact between the body and the surface. So the friction force on a rectangular solid resting on a table is the same whichever face is in contact with the surface.
- 15 These laws have been known since the mid 1700s. It is one of the dirty little secrets of physics that while we physicists can tell you a lot about quarks, quasars and other exotica, there is still no universally accepted explanation of the basic laws of friction.
- 20 The standard picture of friction is that the solid surfaces are not really planar, but are rough on a microscopic scale. The presence of these tiny surface features, or asperities as they are known, prevents the surfaces from coming into full contact.
- 25 So the true contact area is much smaller than its apparent value, and is proportional to the compressive force between the surfaces, in much the same way that the contact area between a car tire and the road increases when you load your car. Problems have 30 arisen when physicists tried to confirm this picture using calculation from first principles. The goal is to construct, either analytically or on the computer, a solid body and surface from atoms with prescribed interactions, and calculate the friction force directly.
- 35 But previous attempts at this found that the two surfaces ride freely on top of each other because of the mismatch between the asperities on the two surfaces, so there is no friction.

One solution to this problem, suggested by Muser, 40 Wenning and Robbins, attributes a crucial role to dirt - the diffuse collection of foreign mobile atoms trapped between the two surfaces. According to the

authors' numerical simulations, these mobile atoms quickly find appropriate gaps between the surfaces 45 where they become trapped. These atoms then "lock" the two surfaces in place. To move the top surface, it has to be pushed up and over the dirt atoms, the force required being proportional to the weight of the top body. Furthermore, the calculated force is seen to be 50 essentially independent of the apparent contact area.

Passage 2

Now, two physicists have modeled surface slippage-friction's retreat-as bands of atoms in the top surface momentarily leading up from the underlying surface. Millions of such ripples propagate 55 simultaneously along the interface when, for instance a book slides on a table, they say.

For year, physicists have tried to explain this large-scale behavior in terms of atomic-scale events. They've had some success by portraying surfaces 60 as jagged on an atomic scale. That way, very little material actually touches. However, scientists still struggle to explain why protrusions from two surfaces would stick together at all.

There's incentive to find out. A better 65 understanding of friction could improve scientist's grasp of countless phenomena, such as engine performance and tool wear. Moreover, friction is particularly vexing for developers of micromachines.

In the new mathematical model, Eric Gerde and 70 Michael P. Marder build upon the physics of how cracks form and propagate through solids. Think of a bump in a rug, says Marder. As people know from everyday experience, pushing such bumps along can move a big rug over a floor.

75 Something similar may be happening at the atomic scale between sliding surfaces. Marder says that the combination of downward and sideways forces on an object sliding along an underlying surface can translate into upward forces that open 80 "cracks" at the interface, akin to bumps in a rug. These cracks amount to a series of arches, each a few atomic diameters across. As these waves of separation advance along the interface, the overlying surface comes back down behind each wave and reconnects 85 with the surface below. A plus for this hypothesis is that it predicts the simple relationship between compressive forces, like weight, and frictional forces. Yet it doesn't require the surfaces to be rough on an atomic scale, as previous models do.

22

As used in lines 11 and 50, “independent of” most nearly means

- A) affiliated with.
- B) proportional to.
- C) caused by.
- D) unrelated to.

23

According to Passage 1, what is the current state of scientists’ understanding of friction?

- A) Friction’s strength can be calculated by computer programs based on the standard theory of friction.
- B) Friction between rough surfaces is better understood than friction between smooth surfaces.
- C) Friction between clean surfaces is better understood than friction between dirty surfaces.
- D) Friction’s properties are familiar, but its explanation remains elusive.

24

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

- A) Lines 15-19 (“It is . . . friction”)
- B) Lines 20-22 (“The standard . . . scale”)
- C) Lines 31-34 (“The goal . . . directly”)
- D) Lines 46-49 (“To move . . . body”)

25

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

- A) approximated.
- B) given.
- C) written.
- D) recommended.

26

According to Passage 2, friction especially affects the making of

- A) small machines.
- B) automobile engines.
- C) high-speed tools.
- D) floor coverings.

27

In the proposed friction model of Passage 2, how do the two surfaces differ?

- A) The overlying surface remains intact, while the underlying surface cracks.
- B) The overlying surface’s protrusions are stickier than the underlying surface’s protrusions.
- C) The overlying surface deforms, while the underlying surface remains rigid.
- D) The overlying surface is smooth, but the underlying surface is rough.

28

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

- A) Lines 61-63 (“However . . . all”)
- B) Lines 67-68 (“Moreover . . . micromachines”)
- C) Lines 72-74 (“As people . . . floor”)
- D) Lines 85-87 (“A plus . . . frictional forces”)

29

Which choice best describes the perspective of the author of Passage 2 on models of friction?

- A) Describing today’s models of friction in terms of everyday experiences is difficult.
- B) Given physicists’ ability to explain other phenomena, their models of friction should be more successful.
- C) Models that do not depend on atomic - scale surface roughness are preferable to those that do.
- D) Friction’s observed properties are not described by models that consider the behavior of atoms at the interface.

30

What is a difference between the structures of the two passages?

- A) Passage 1 concludes with a brief comparison of a proposed model’s predictions to experimental results, while Passage 2 concludes by describing the mathematical structure of a proposed model.
- B) Passage 1 focuses on the scientific principles behind friction, while Passage 2 focuses on situations in which friction plays an important role.
- C) Passage 1 describes theories, while Passage 2 describes attempts to repudiate those theories.
- D) Passage 1 places greater emphasis on the conventional model of friction, while Passage 2 places greater emphasis on a proposed model of friction.

31

According to Passage 1, what is the precise nature of the “simple relationship” mentioned in line 86 of Passage 2?

- A) Frictional forces are proportional to compressive forces.
- B) Frictional forces are weaker than compressive forces.
- C) Frictional forces are simulated from compressive forces.
- D) Frictional forces are less common than compressive forces.

32

Which of the following statements correctly compares the passages’ use of analogies?

- A) The author of Passage 1 uses an analogy to explain the conventional model of friction, while the author of Passage 2 uses an analogy to explain a new model of friction.
- B) The author of Passage 1 uses an analogy to explain different fields of physics, while the author of Passage 2 uses an analogy to explain industrial uses of friction.
- C) The author of Passage 1 uses an analogy to explain industrial uses of friction, while the author of Passage 2 uses an analogy to explain the shape of the sliding surface.
- D) The author of Passage 1 uses an analogy to explain the shape of the sliding surface, while the author of Passage 2 uses an analogy to explain the conventional model of friction.

Questions 33-42 are based on the following passage.

This passage is adapted from a speech delivered in 1795 by Samuel Taylor Coleridge. In the speech, Coleridge, an English poet, discusses the French Revolution, which began in 1789.

Revolutions are sudden to the unthinking only. Strange rumblings and confused noises still precede these earthquakes and hurricanes of the moral world.
Line The process of revolution in France has been dreadful, 5 and should incite us to examine with an anxious eye the motives and manners of those, whose conduct and opinions seem calculated to forward a similar event in our own country. The oppositionists to "things as they are," are divided into many and different classes. To 10 delineate them with an unflattering accuracy may be a delicate, but it is a necessary, task, in order that we may enlighten, or at least be aware of, the misguided men who have enlisted under the banners of liberty, from no principles or with bad ones....

15 The first class among the professed friends of liberty is composed of men, who unaccustomed to the labor of thorough investigation, and not particularly oppressed by the burthens of state, are yet impelled by their feelings to disapprove of its grosser depravities, 20 and prepared to give an indolent vote in favor of reform. Their sensibilities not braced by the co-operation of fixed principles, they offer no sacrifices to the divinity of active virtue. Their political opinions depend with weather-cock uncertainty on the winds 25 of rumour, that blow from France. On the report of French victories they blaze into republicanism, at a tale of French excesses they darken into aristocrats. These dough-baked patriots are not however useless.

This oscillation of political opinion will retard the 30 day of revolution, and it will operate as a preventive to its excesses. Indecisiveness of character, though the effect of timidity, is almost always associated with benevolence.

Wilder features characterize the second class...

35 They listen only to the inflammatory harangues of some mad-headed enthusiast, and imbibe from them poison, not food; rage not liberty. Unillumined by philosophy, and stimulated to a lust of revenge by aggravated wrongs, they would make the altar of freedom stream with blood, while the grass grew in the desolated halls of justice.

We contemplate those principles with horror. Yet they possess a kind of wild justice well calculated

to spread them among the grossly ignorant. To 45 unenlightened minds, there are terrible charms in the idea of retribution, however savagely it be inculcated. The groans of the oppressors make fearful yet pleasant music to the ear of him, whose mind is darkness, and into whose soul the iron has entered....

50 There is a third class among the friends of freedom, who possess not the wavering character of the first description, nor the ferocity last delineated. They pursue the interests of freedom steadily, but with narrow self-centering views: they anticipate with 55 exultation the abolition of privileged orders, and of acts that persecute by exclusion from the right of citizenship. Whatever is above them they are most willing to drag down; but every proposed alteration that would elevate their poorer brethren, they rank 60 among the dreams of the visionaries; as if there were any thing in the superiority of Lord to Gentleman, so mortifying in the barrier, so fatal to happiness in the consequences, as the more real distinction of master and servant, of rich man and of poor.
 65 Wherein am I made worse by my ennobled neighbor? Do the childish titles of Aristocracy detract from my domestic comforts, or prevent my intellectual acquisitions? But those institutions of society which should condemn me to the necessity of twelve hours 70 daily toil, would make my soul a slave, and sink the rational being into the mere animal. It is a mockery of our fellow-creatures' wrongs to call them equal in rights, when by the bitter compulsion of their wants we make them inferior to us in all that can soften the 75 heart, or dignify the understanding. Let us not say that this is the work of time—that it is impracticable at present, unless we each in our individual capacities do strenuously and perseveringly endeavor to diffuse among our domestics those comforts and that 80 illumination which far beyond all political ordinances are the true equalizers of men.

33

Which choice best describes the author's perspective on those who support revolutionary political change?

- A) He believes that they tend to be driven by jealousy.
- B) He thinks that they have a variety of motives, all of which are foolish.
- C) He dismisses them as posing a greater threat to themselves than to the nation.
- D) He is sympathetic to their grievances but skeptical of their methods.

34

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

- A) Lines 4-8 ("The process . . . country")
- B) Lines 8-14 ("The oppositionists . . . ones")
- C) Lines 21-23 ("Their . . . virtue")
- D) Lines 35-37 ("They . . . liberty")

35

Early in the passage, the main focus shifts from a

- A) critique of revolutions to an acknowledgment of their occasionally beneficial consequences.
- B) general discussion of revolutions to an analysis of different types of revolutionaries.
- C) defense of class barriers in England to an argument for a more equal society.
- D) caution about the consequences of revolution to a condemnation of the indecision of many citizens.

36

What is the author's central claim in the first paragraph of the passage?

- A) Revolutionaries are too fanatical to be persuaded by intellectual arguments.
- B) The political problems leading to the revolution in France developed gradually over the course of many years.
- C) The reasons people oppose the current system must be understood if revolution in England is to be prevented.
- D) Understanding the true motivations of revolutionaries is a nearly impossible task.

37

In the first paragraph, the author refers to "strange rumblings" and "confused noises" most likely to

- A) suggest that there are always signs that a revolution will occur.
- B) emphasize the chaos that typically accompanies revolution.
- C) explain the unusual features of the French Revolution.
- D) underscore the fear of many people about the possibility of revolution.

38

As used in line 6, "manners" most nearly means

- A) behaviors.
- B) properties.
- C) traditions.
- D) quirks.

39

In the second paragraph (lines 15-33), the author uses the phrases “weather-cock uncertainty” and “dough-baked patriots” most likely to emphasize the

- A) unreliability of certain military procedures.
- B) unpredictable nature of warfare.
- C) variability of some people’s beliefs.
- D) contrariness of political leaders’ strategies.

40

According to the author, members of the “second class” (line 34) are characterized by their

- A) jealousy of French victories.
- B) clearly defined ideology.
- C) desire for retribution
- D) charismatic political leadership.

41

Based on the passage, the “third class” (line 50) of supporters of revolution would most likely fight for the

- A) acceleration of economic reform.
- B) ability to boost their own incomes.
- C) improved treatment of the lower class.
- D) removal of the nobility’s privileges.

42

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

- A) lines 50-52 (“There . . . delineated”)
- B) lines 53-55 (“They . . . orders”)
- C) lines 58-60 (“but . . . visionaries”)
- D) lines 71-75 (“It is . . . understanding”)

Questions 43-52 are based on the following passage and supplementary materials.

This passage is adapted from Lee Alan Dugatkin, *Principles of Animal Behavior*, © 2009 by W. W. Norton & Company, Inc. The book concerns natural selection, a process that results in the survival and reproductive success of individuals or groups best adjusted to their environment.

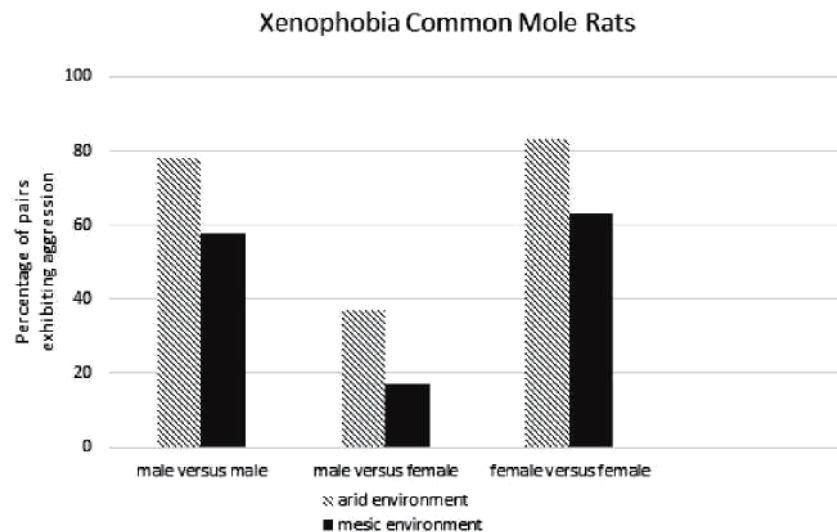
As an example of natural selection acting on animal behavior, let's examine how individuals in social groups respond to strangers. For animals that live in stable groups, strangers-known individuals from outside ones group-represent a significant danger. Such individuals may compete for scarce resources, disrupt group dynamics that have long been in place, and so on. As such, ethologists are interested in whether animals from group-living species display a fear of strangers, a phenomenon technically known as xenophobia. In particular ethologists hypothesize that xenophobia may be especially strong when resources are scarce, since competition for such resources will be intense under such a scenario, and keeping strangers away may have a strong impact on the lifetime reproductive success of group members.

To examine the effect of resource scarcity on the evolution of xenophobia, Andrew Spinks and his colleagues examined xenophobia in the common mole rat. Common mole rats live in South Africa in underground colonies made up of two fourteen individuals. They are an ideal species in which to examine xenophobia and its possible connection to resource availability for two reasons: First, all populations of common moles rats are "tightly knit" in the sense that each group typically has a single pair of "reproductive individual" who produce most of the offspring in a colony, which means that all group members tend to be genetic relatives. Second, populations of common mole rats differ in terms of the amount of resources in their environments. Some common mole rat populations inhabit mesic (moderately moist) environments that presents only mild resource limitations, while other populations live in arid environments and face intense limitations on their resources. This variation in resource availability is largely due to the fact that mesic environments have about four times as much rainfall as arid environments.

Spinks and his colleagues examined whether

populations from arid areas were more xenophobic than those from mesic environments, as one might predict based on our above discussion of natural selection, resources, and xenophobia. To do this, they conducted 206 "aggression" trials. The protocol for these experiments was quite simple: Two mole rats—one from the arid and one from the mesic environment—were placed together, and any aggression that occurred between them was recorded. This procedure was repeated for two mole rats from different mesic colonies. Results were clear-cut: For both male vs. male and female vs. female, when the pair of individuals were from different colonies, fear of strangers and aggression toward such strangers was much more pronounced in the common mole rats from the arid environment, where resources were limited, than it was in the common mole rats from the mesic environment. "This result was not a function of individuals from arid populations just being more aggressive in general. Control experiments demonstrated that when two individuals who knew each other from the arid population were tested together, aggression disappeared—thus it was the identification of a stranger that initiated the aggression. This is precisely the sort of behavior that natural selection should favor.

Common mole rats that are lucky enough to end up reproducing almost always move from their home colony to find a mate. What this means is that some strangers that are encountered by members of a social group are potential mates, and hence perhaps worth tolerating. Natural selection then should not simply favor all xenophobia, but a xenophobia that is sensitive to the sex of the stranger. In support of this, in trials in which the two individuals tested were a male and a female, Spinks and his colleagues found that while aggression was still uncovered in the low-resource, arid population, the level of aggression decreased dramatically when compared to aggression in same-sex interactions. In other words, natural selection has produced common mole rats that temper their fear of strangers as a function of both where they live and the sex of the strangers.



43

- The main purpose of the passage is to
- account for the causes of the growth of the common mole rat population.
 - challenge a set of claims about the behavior of common mole rats.
 - examine factors influencing a particular behavior in common mole rats.
 - explain how the common mole rat has deviated from an evolutionary pattern.

44

- As used in line 5, “represent” most nearly means
- identify.
 - portray.
 - personify.
 - constitute.

45

- The main focus of the passage shifts from articulation of a hypothesis to
- discussion of experiments testing the validity of that hypothesis.
 - review of data that appear to undermine the basis of that hypothesis.
 - exploration of a disagreement surrounding the specifics of that hypothesis.
 - explanation of the origin of that hypothesis.

46

- It can reasonably be inferred from the passage that common mole rats are least likely to show aggression toward
- common mole rats from mesic areas.
 - members of their own colonies.
 - common mole rats removed from their natural environments.
 - members of different species.

47

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

- A) Lines 30-32 (“Second . . . environments”)
- B) Lines 59-61 (“This . . . general”)
- C) Lines 61-66 (“Control . . . aggression”)
- D) Lines 68-70 (“Common . . . mate”)

48

As used in line 67, “favor” most nearly means

- A) approve.
- B) promote.
- C) regard.
- D) indulge.

49

One major purpose of the chart is to provide information that supports the idea that

- A) common mole rats base their rejection of a given stranger exclusively on the sex of that stranger.
- B) common mole rats from environments in which resources are scarce are markedly more aggressive than common mole rats from environments in which resources are more readily available.
- C) male common mole rats are typically more aggressive than female common mole rats.
- D) common mole rats from mesic environment are more likely to base their decision about rejecting a given stranger on the stranger’s sex than on which environment the stranger is from.

50

Which of the following questions CANNOT be answered by the information in the chart?

- A) In same-sex interactions, which group rejects unfamiliar mole rats more often, males or females?
- B) In interactions between male and female mole rats, is the male party or the female party more likely to initiate the aggression?
- C) Across all interaction, are the rejection rates between mole rats from different environments relatively consistent?
- D) Across all interactions, which combination of sexes is least likely to produce a rejection?

51

Which of the following conclusions about common mole rats is suggested by both the passage and the chart?

- A) When common mole rats from arid populations encounter each other, aggressive interactions are very likely.
- B) When one common mole rat from an arid environment and one common mole rat from mesic environment encounter each other, aggression will inevitably result.
- C) When resources are scarce, male common mole rats exhibit far more aggressive behaviors than female common mole rats do.
- D) When resources are scarce, the competition for resources will sometimes outweigh the fact that a stranger is of the opposite sex.

52

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

- A) Lines 46-50 (“The protocol . . . recorded”)
- B) Lines 61-66 (“Control . . . aggression”)
- C) Lines 73-75 (“Natural . . . stranger”)
- D) Lines 77-81 (“Spinks . . . interactions”)

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
and supplementary material.**

Flavorists: A Taste of Success

Whenever you enjoy a refreshing strawberry sorbet, praise not the strawberry, but the flavorist. Flavorists are professional **1** chemists. Flavorists specialize in the art of mixing chemicals to create food flavoring. They are tasked with giving a tantalizing taste to everything from soup to juice to chewing gum, often to imitate a flavor found in nature at a fraction of the cost of using the actual ingredient. By combining their knowledge of chemistry and their innate sense of taste, **2** appealing flavors designed by flavorists sell products and keep consumers wanting more.

1

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

- A) chemists who
- B) chemists, and they
- C) chemists, and flavorists
- D) chemists who are the ones that

2

- A) NO CHANGE
- B) the flavors are designed to be appealing so that they
- C) flavorists design appealing flavors that
- D) it is the appealing flavors designed by flavorists that

Most flavorists earn a bachelor's degree in chemistry or a related field. In a process regulated and administered by the Society of Flavor **3** Chemists. Aspiring flavorists must then undergo at least seven years of additional training. They spend the first five of those years as apprentices in a laboratory, learning the trade by working with senior flavorists. Applicants to the Society of Flavor Chemists must then pass two **4** exams: an oral exam which qualifies them to become junior flavorists, and then a written exam two years later to earn their professional senior flavorist certifications.

3

- A) NO CHANGE
- B) Chemists, aspiring
- C) Chemists; thus, aspiring
- D) Chemists, and aspiring

4

- A) NO CHANGE
- B) exams;
- C) exams; being
- D) exams—being

The flavoring industry is resolutely mysterious. There are fewer than 500 flavorists in the world, all of them committed to keeping their recipes secret. [5] Food companies rely on this confidentiality to maintain the integrity of their brands' image, because consumers' perception of a brand is based partly on the idea that the products are created as a [6] hole rather then in parts. Even the US Food and Drug Administration, to allow food companies to conceal their formulas, permits flavoring ingredients to be labelled under the all-encompassing name "natural and artificial flavors."

5

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

One company, Givaudan, sends its flavorists on trips called "Taste Treks" to learn about the natural flavors particular to a region.

Should the writer make this addition here?

- A) Yes, because it illustrates just how knowledgeable flavorists must be about their field.
- B) Yes, because it provides an example of how flavorists conduct research about the natural flavors they re-create.
- C) No, because it interrupts the paragraph's discussion of the importance of secrecy to flavorists.
- D) No, because it undermines the paragraph's claim about secrecy by providing an example of collaboration among flavorists.

6

- A) NO CHANGE
- B) hole rather than
- C) whole rather than
- D) whole rather then

Mysterious, too, is the craft. How flavorists replicate flavors found in nature, often using a minuscule amount of many **7** ingredients: is not readily apparent. A beef-and-onion flavoring demonstrates the ingredients' potency; apart from a glycerin and water base, **8** two major ingredients compose the bulk of the recipe. And at twelve ingredients, **9** this is actually quite simple—the standard strawberry flavoring, **10** on the other hand, contains forty-nine ingredients.

Ingredients of Beef-and-Onion Flavoring

Ingredient	Percent
L-Arginine	1.00
L-Cysteine	1.00
L-Methionine	0.10
L-Glutamic acid	4.00
L-Rhamnose	1.00
D-Xylose	2.00
Water	12.45
Salt	1.01
Glycerin	68.44
Canola oil	0.99
Lactic acid	3.00
Onion powder	5.00

Adapted from Shane McDonald, Meghan Paltz, and David Bolliet "Cooking with Alliums." ©2013 by Allured Business Media.

7

- A) NO CHANGE
- B) ingredients
- C) ingredients;
- D) ingredients,

8

Which choice provides the most relevant and accurate interpretation of the data in the table?

- A) NO CHANGE
- B) the flavorists is a mixture of 0.10 to 5.00 percent of each of a series of ingredients.
- C) each ingredient in the flavoring composes up to 10 percent of the recipe.
- D) the three primary ingredients are onion powder, lactic acid, and salt.

9

- A) NO CHANGE
- B) this flavoring
- C) it
- D) DELETE the underlined portion.

10

- A) NO CHANGE
- B) consequently,
- C) particularly,
- D) as a result,

Though flavorists spend most of their days in lab coats, they are nonetheless artists, using creativity and expertise to turn a myriad of ingredients into a unified and distinct product. 11

11

The writer wants a conclusion that indicates the broader implications of flavorists' work. Which choice most effectively accomplishes this goal?

- A) The modern food industry, with its seemingly infinite variety of tastes and aromas, stands upon this meeting of chemistry and human perception.
- B) Many flavorists report high job satisfaction, though the industry can be quite competitive because of the small number of jobs.
- C) Aspiring flavorists can look forward to more job opportunities: the US Bureau of Labor Statistics predicts an 11 percent growth in food science employment between 2012 and 2020.
- D) Though rewarding, flavoring is not an easy job, as demonstrated by the large amount of training it requires.

Questions 12–22 are based on the following passage and supplementary material.

Fitness in a Flask

Shortly after finishing his postdoctoral research, Richard Lenski of the BEACON Center for the Study of Evolution in Action began the Long-Term Evolution Experiment (LTEE). In 1988, he placed twelve populations of *Escherichia coli*, each of which started from a single, identical bacterial cell, into twelve flasks that contained a nutrient medium, and then he **12** pronounced what happened. Contrary to the traditional view of evolution, **13** holding that evolution stops in an unchanging environment, Lenski had predicted that the bacteria would evolve, or mutate, over time.

Every day since the experiment began, Lenski and a team of more than thirty graduate students have transferred 1 percent of the bacteria in each flask into a new flask containing fresh nutrients to keep the bacteria growing. Samples of the bacteria are frozen every 500 generations in order to provide a record of ancestry, much in the same way a fossil provides a record of a previously living organism. **14**

12

- A) NO CHANGE
- B) conserved
- C) realized
- D) observed

13

- A) NO CHANGE
- B) which holds
- C) this holds
- D) it olds

14

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

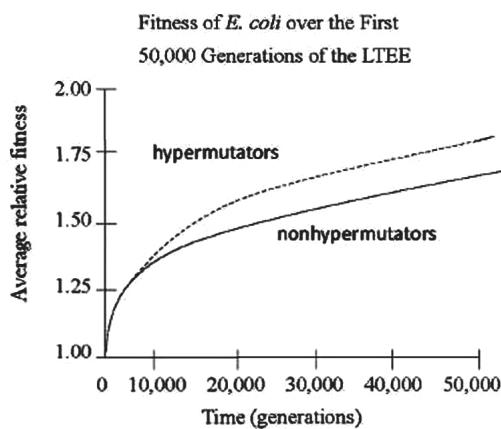
The frozen bacteria, however, have an advantage over fossilized organisms; the bacteria can be thawed and regrown.

Should the writer make this addition here?

- A) Yes, because it helps to clarify the process describing the transfer of bacteria from one flask to another.
- B) Yes, because it introduces a key point discussed in the next paragraph.
- C) No, because an explanation of the fossilization process is not essential to understanding the passage.
- D) No, because it contradicts a point made earlier in the paragraph.

Three years into the **15** LTEE, at approximately generation 5,000, the bacteria in three of the flasks began mutating at a higher frequency. These bacteria, called hypermutators, replicated much faster and thus were said to have **16** less relative fitness at the end of the study than at the beginning of the study. Relative fitness is determined by comparing the growth rate of a current generation to the growth rate of an initial population.

When Lenski thawed and regrew the **17** hypermutator's frozen ancestors, they underwent similar mutations and also began to replicate faster. The mutations that led to quicker replication were **18** therefore reproducible, changing scientists' understanding of evolution as an irreproducible process.



Adapted from Michael J. Wiser et al., "Long-Term Dynamics of Adaptation in Asexual Populations." ©2013 by American Association for the Advancement of Science.

15

- A) NO CHANGE
- B) LTEE at approximately generation 5,000
- C) LTEE, at approximately, generation 5,000
- D) LTEE: at approximately generation 5,000,

16

Which choice makes the writer's description of the data represented in the figure most accurate?

- A) NO CHANGE
- B) less relative fitness around this generation than in previous generations.
- C) less relative fitness than ancestors that could replicate faster.
- D) greater relative fitness than populations that did not mutate at the higher frequency.

17

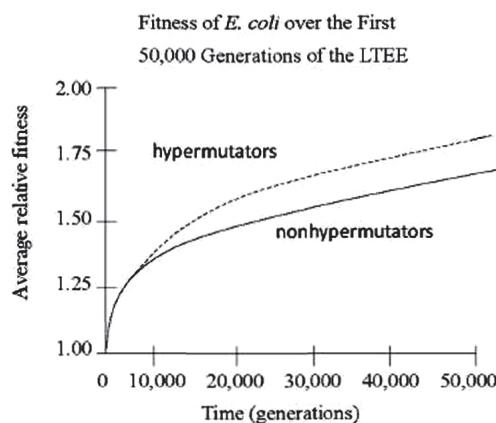
- A) NO CHANGE
- B) hypermutator's frozen ancestor,
- C) hypermutators frozen ancestor's,
- D) hypermutators' frozen ancestors,

18

- A) NO CHANGE
- B) initially
- C) nonetheless
- D) on the other hand

19 *E. coli* was once widely used by scientists in studies involving DNA recombination. But in this case, the growth medium was cloudy because mutations in the *E. coli* enabled the bacteria to utilize citrate, an organic molecule in the growth medium. The growth rate of the citrate-utilizing bacteria skyrocketed because they were able to replicate faster than the *E. coli* that had not mutated. Once again, the frozen ancestors of the citrate-utilizing bacteria, when thawed and **20** being regrown, underwent the same evolutionary change.

The ability to **21** repeat and rerun the course of evolution has been a key to the success of the LTEE. **22** Although Lenski's bacteria experienced the greatest rate of increase in relative fitness before generation 10,000, the *E. coli* in the LTEE continue to steadily increase their fitness, proving that evolution is an ongoing process, even in an unchanging environment.



Adapted from Michael J. Wiser et al., "Long-Term Dynamics of Adaptation in Asexual Populations." ©2013 by American Association for the Advancement of Science.

19

Which choice provides the most logical introduction to the paragraph?

- A) NO CHANGE
- B) The bacteria took another twist in 2003 when the growth medium in one flask became cloudy, usually a sign of bacterial contamination.
- C) This view of evolution took scientists by surprise, as *E. coli* was thought to be unable to adapt to its environment.
- D) High mutation rates are well known to occur in many types of bacteria, including some strains that Lenski has studied in the past.

20

- A) NO CHANGEX
- B) regrew,
- C) regrown,
- D) having regrown,

21

- A) NO CHANGE
- B) repeat
- C) repeat and begin anew
- D) start over and repeat

22

Which choice makes the writer's description of the data represented in the figure most accurate?

- A) NO CHANGE
- B) increased their relative fitness at a constant rate over the 50,000 generations,
- C) did not begin to improve their relative fitness until the end of the experiment,
- D) slowly improved their fitness throughout only the first 30,000 generations,

Questions 23–33 are based on the following passage.

Digitizing the Humanities

Once requiring access to libraries, vaults, or other physical collections of books, the study of language and literature is now being transformed by digital tools.

Software allows text and other visual artifacts to be [23] archived and searched. They can also be adapted, and interactive programs help readers engage with texts and with each other in new ways. Digital applications [24] greatly enhance readers, enjoyment of texts and facilitate collaboration among students and scholars all over the world.

[1] Digitized documents level the playing field in humanities scholarship [25] by, removing the need for expensive and time-consuming travel to locate works and meet with other scholars. [2] While rare works are tucked away in libraries around the [26] world and many are now also a click away on the Internet. [3] Through an archive called Early English Books Online (EEBO), for example,

23

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

- A) archived and searched; while works can also be adapted.
- B) archived and searched, and besides being adapted,
- C) archived, searched, and adapted; however,
- D) archived, searched, and adapted, and

24

Which choice most effectively sets up the main claim of the passage.

- A) NO CHANGE
- B) can be less expensive than hard-copy texts
- C) allow unprecedented access to archived collections
- D) require researchers to learn new skills

25

- A) NO CHANGE
- B) by removing
- C) by removing,
- D) by; removing

26

- A) NO CHANGE
- B) world;
- C) world,
- D) world however,

users are able to access nearly every work in the English language published before 1700. [4] The EEBO database allows users to search the texts for authors, titles, dates, and keywords. [5] In 2010, the company ProQuest **27** propelled EEBO Interactions, a social-networking site where users can discuss texts, share commentary and queries, and **28** can suggest revisions to the supporting descriptions of archived materials on EEBO. [6] The site enables “members of this geographically diverse community to collaborate and learn from one another,” said Dan **29** Burnstone vice president of arts and humanities publishing at ProQuest. **30**

27

- A) NO CHANGE
- B) embarked
- C) launched
- D) instigated

28

- A) NO CHANGE
- B) revisions can be suggested
- C) they can suggest revisions
- D) suggest revisions

29

- A) NO CHANGE
- B) Burnstone; vice president of arts and humanities publishing,
- C) Burnstone, vice president of arts and humanities publishing
- D) Burnstone: vice president of arts and humanities publishing,

30

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

Another important innovation is an online platform allowing researchers to communicate with one another.

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

- A) after sentence 1.
- B) after sentence 3.
- C) after sentence 4.
- D) after sentence 5

Another organization leading the way in digitizing works of interest to students and scholars is the Folger Shakespeare Library in Washington, DC. The library's Digital Image Collection includes over 80,000 images and detailed descriptions of theatre memorabilia, photographs, and letters that can be used to study Shakespeare's life and productions of his plays. The Folger Digital Texts, 31 moreover, offer all of Shakespeare's poems and plays digitally, coded with information that can be used to search and index the texts. The texts and coding can be downloaded at no charge for noncommercial use. The library even encourages researchers and developers to use the materials on mobile applications and other digital programs.

For students writing essays on the humanities and 32 developers writing code for materials archived online, digital tools provide almost unlimited access to texts and innumerable ways to interact with them. Not only will these tools foster a holistic approach to the study of the humanities, but 33 it will also allow people from all over the world to read these works and collaborate on important and innovative research.

31

- A) NO CHANGE
- B) however,
- C) for example,
- D) in particular,

32

Which choice gives a second supporting example that is most similar to the example already in the sentence?

- A) NO CHANGE
- B) publishers considering putting their works online,
- C) librarians who provide training in online archives,
- D) school working on extensive research projects,

33

- A) NO CHANGE
- B) it has also allowed
- C) it had also allowed
- D) they will also allow

Questions 24-44 are based on the following passage.

Nursing by the Numbers

Florence Nightingale is widely known as a nurse who cared tirelessly for British soldiers in Turkey during the Crimean War of 1853-1856 and developed new standards for management and hygiene in hospitals. Less well known [34] were Nightingale's promotion of statistical analysis in the field of medicine, [35] since her famous publication *Notes on Nursing*, which has been in print since 1859, does not discuss statistics. By compiling medical statistics and making [36] it comprehensible and persuasive, Nightingale showed that such information can help shape public policy and improve the quality of health care.

34

- A) NO CHANGE
- B) are
- C) is
- D) had been

35

The writer wants to provide context for understanding the significance of Nightingale's contribution. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) even though this work may have been more important to the development of modern health policy.
- C) since these are many other early statisticians who developed mathematical models that are still in use today.
- D) and historians later discovered that the British government had concealed the true soldier mortality rate during the Crimean War.

36

- A) NO CHANGE
- B) his or hers
- C) one
- D) them

During the Crimean War, Nightingale kept note of the number of soldiers in her hospitals, the reasons for their treatment, and the causes of death for those who didn't survive. The knowledge provided by these records would

37 ultimately convince her in the end that inadequate sanitation was the main cause of death in the hospitals—an unorthodox view at the time. When she returned to England in 1856, Nightingale wished to make use of the information she had collected to improve medical treatment for soldiers. 38 She had accrued prestige during the war. She then used her prestige to advocate for a Royal Commission to create a report on health care in the military. When the Commission was approved, she provided it with data and graphs that showed the shortcomings of military hospitals and the 39 expressive lifesaving effects of sanitary measures.

37

- A) NO CHANGE
- B) eventually convince her in the end
- C) eventually convince her, after all,
- D) ultimately convince her

38

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

- A) She used the prestige she had accrued during the war to advocate
- B) She used the prestige she had accrued during the war; she used it to advocate
- C) Having accrued it during the war, she used her prestige to advocate
- D) To use the prestige that she had accrued during the war, she advocated

39

- A) NO CHANGE
- B) emotional
- C) exaggerated
- D) dramatic

The Commission's report represented the advance in the use of statistics to advocate for new public policies, but Nightingale's contribution to applied statistics was only beginning. In 1858 she published an 40 exhaustive, 860-page book with the problems with British military hospitals, complete with detailed statistical analysis. Nightingale worried that conventional presentations of data would be dull and unintelligible to government officials unversed in statistics. She decided, 41 therefore, to use 42 multicolored, circular graphs, similar to pie charts to represent the different

40

- A) NO CHANGE
- B) exhaustive, 860-page book on
- C) exhausting, 860-page book about
- D) exhausting, 860-page book with

41

- A) NO CHANGE
- B) otherwise,
- C) nevertheless,
- D) moreover,

42

- A) NO CHANGE
- B) multicolored, circular, graphs,
- C) multicolored, circular graphs
- D) multicolored circular graphs,

numbers of casualties suffered during the months of the year. These new graphs were comprehensible and **43** striking, they clearly showed that the majority of casualties were caused by infectious disease. The graphs were published in magazines and placed on the walls of the Army Medical Board and the War Department; they created momentum for broad reforms to military medical care. In acknowledgement of her contribution to the field of statistics, Nightingale was elected a Fellow of the Statistical Society of London in October 1858. **44**

43

- A) NO CHANGE
- B) striking; in that they clearly showed
- C) striking; clearly showing
- D) striking, clearly showing

44

The writer wants a conclusion that summarizes the main idea of the passage. Which choice best accomplishes this goal?

- A) Some of her most important work was in educational programs that trained people in nursing and other aspects of health care.
- B) She would help standardize administrative aspects of the health-care industry in ways that are still in effect today.
- C) Today, changes in the way health-care methods are studied require updated statistical methods and presentation techniques.
- D) She had demonstrated that carefully collected, strikingly presented statistical data could help transform public policy.

STOP

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

No Test Material On This Page



Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

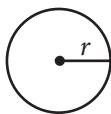
DIRECTIONS

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

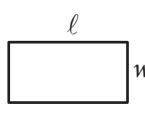
NOTES

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

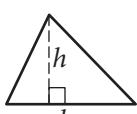
REFERENCE



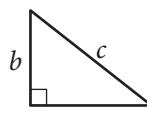
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



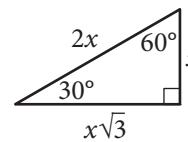
$$A = \ell w$$



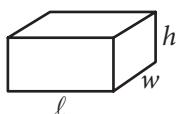
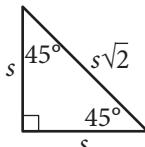
$$A = \frac{1}{2}bh$$



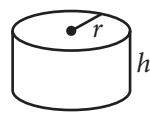
$$c^2 = a^2 + b^2$$



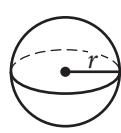
Special Right Triangles



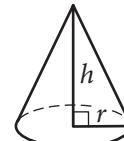
$$V = \ell wh$$



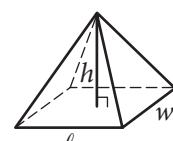
$$V = \pi r^2 h$$



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



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



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

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

A snack stand sells bags of popcorn for \$1 each and bags of peanuts for \$2 each. If no more than \$30 worth of bags of peanuts and popcorn were sold one evening, and at least 8 of the bags sold were popcorn, what is maximum number of bags of peanuts that could have been sold that evening?

- A) 7
- B) 11
- C) 14
- D) 16

2

$$d=35w + 250$$

The number of dollars, d , in Vonn's holidays savings account w weeks after he opened the account is modeled by the equation above. Which of the following best describes the meaning of the number 250 in the equation?

- A) The number of dollars Vonn deposited into the account each week
- B) The number of dollar Vonn initially deposited into the account
- C) The total number of dollars in the account after w weeks
- D) The number of weeks since the account was opened

3

If $\frac{3}{4}x + 1 = k + \frac{1}{4}x$, what is the value of k when $x = 0$?

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

4

Which of the following is equivalent to $a^{\frac{8}{7}}$?

- A) $\sqrt[8]{a^7}$
- B) $\sqrt[7]{a^8}$
- C) $a\sqrt[8]{a}$
- D) $a\sqrt[7]{a^8}$

5

Which of the following is equivalent to the expression $4(x+1)^2 - 3(x+1)^2$?

- A) 1
- B) $x+1$
- C) $x^2 + 2x + 1$
- D) $x^2 + 2x + 7$



6

At a Mexican restaurant, tacos cost \$3 and burritos cost \$6. If a group of students spends at least \$30 but at most \$45 on 5 tacos and n burritos, which of the following is true about n ?

- A) $33 \leq n \leq 45$
- B) $18 \leq n \leq 30$
- C) $12 \leq n \leq 15$
- D) $3 \leq n \leq 5$

7

A home improvement store sells indoor paint for \$20 a can and outdoor paint for \$30 a can. A customer spends \$260 on cans of indoor and outdoor paint. If the customer buys 2 fewer cans of indoor paint than cans of outdoor paint, how many cans indoor paint did the customer buy?

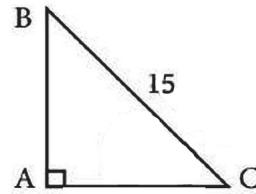
- A) 4
- B) 5
- C) 6
- D) 7

8

If $4(h - 1) = 3(t + 2)$, what is h in terms of t ?

- A) $h = \frac{3t + 3}{4}$
- B) $h = \frac{3t + 6}{4}$
- C) $h = \frac{3t + 10}{4}$
- D) $h = \frac{4t + 11}{3}$

9



In right triangle ABC above, the tangent of $\angle C$ is $\frac{3}{4}$. What is the length of AB ?

- A) 9
- B) $\frac{105}{16}$
- C) $\frac{45}{4}$
- D) 12

10

$$\frac{5}{x} + 3 = \frac{4}{x-1}$$

What are the two solutions to the equation above?

- A) 1 and $\frac{3}{5}$
- B) 1 and $\frac{5}{3}$
- C) -1 and $\frac{3}{5}$
- D) -1 and $\frac{5}{3}$



11

If $9x^2y^2 = 25$ and $xy > 0$, what is the value of $18xy$?

- A) 6
- B) 30
- C) 50
- D) 150

12

Emmery makes and sells ceramics. It costs her \$12 to make a ceramic piece. If she sells each piece for \$33, which of the following equations gives the amount of profit P , in dollars, Emmery will receive for selling n pieces?

- A) $P = 21n$
- B) $P = 33n$
- C) $P = 33n - 12$
- D) $P = 33n + 12$

13

$$x^2 + y^2 = 104$$

$$y - 5x = 0$$

If the ordered pair (x, y) is a solution to the system of equations above, and $x < 0$, what is the value of y ?

- A) -20
- B) -10
- C) -5
- D) -2

14

$$f(x) = (x - 3)(x^2 - 4x + 3)$$

How many distinct zeros does the function f , defined?

- A) None
- B) One
- C) Two
- D) Three

15

The function f is defined by $f(x) = (x + 2)^2$.

If $f(x + a) = x^2 - 6x + 9$, where a is a constant, what is the value of a ?

- A) -5
- B) -3
- C) 1
- D) 3

**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	2	3
2	2	3	4
3	3	3	5
4	4	4	6
5	5	5	7
6	6	6	8
7	7	7	9
8	8	8	9
9	9	9	9

← Fraction line

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

2	.	5
0	0	0
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	9

← Decimal point

Answer: 2.5

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

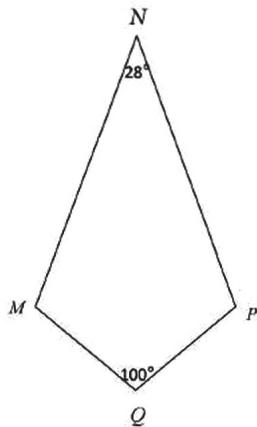
NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.



16

A bamboo plant has a height of 11 feet and grows at a constant rate of 2 feet per day. At this rate, how many days from now will the height of the bamboo plant be 27 feet?

17



In the figure above, $\overline{MN} = \overline{NP}$ and $\overline{MQ} = \overline{QP}$. What is the value of $\angle M$ in degrees? (Disregard the degree sign when gridding your answer.)

18

If x is positive and $x + (x+1) + (x+2) = x^2 - 1$, what is the value of x ?

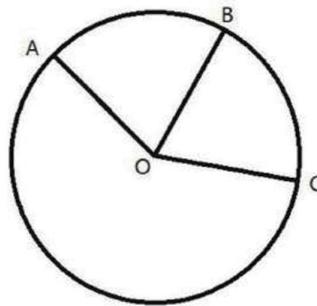
19

$$2x + 3y = 26$$

$$x + 3y = 19$$

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

20



In the circle above, radius OB has length 1. The measure of $\angle AOB$ is equal to the measure of $\angle BOC$, and the length of arc ABC is $\frac{8\pi}{9}$. What is the measure, in degrees, of $\angle AOB$? (Disregard the degree symbol when gridding your answer.)

STOP

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



Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

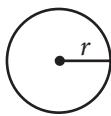
DIRECTIONS

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.

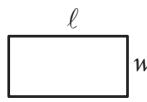
NOTES

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.

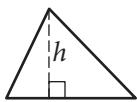
REFERENCE



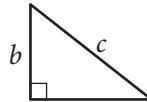
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



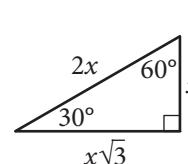
$$A = \ell w$$



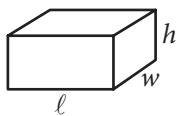
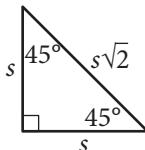
$$A = \frac{1}{2}bh$$



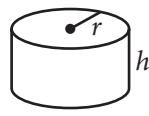
$$c^2 = a^2 + b^2$$



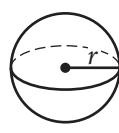
Special Right Triangles



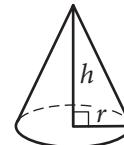
$$V = \ell wh$$



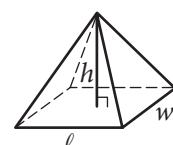
$$V = \pi r^2 h$$



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



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



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

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

On Tuesday, Dianna's store sold 5 pairs of running shoes for every 9 pairs of sandals sold. If Dianna's store sold 27 pairs of sandals on Tuesday, how many pairs of running shoes did Dianna's store sell on that day?

- A) 10
- B) 15
- C) 20
- D) 25

2

A bag containing 12 marbles includes 3 red marbles, 6 blue marbles and 3 white marbles. What percent of the marbles in the bag are blue?

- A) 6%
- B) 25%
- C) 50%
- D) 75%

3

If 3 times k is equal to 15, what is 4 more than k ?

- A) 7
- B) 9
- C) 19
- D) 49

4

If $12ax - 6 = 36$, what is the value of $ax - \frac{1}{2}$?

- A) 3
- B) 6
- C) 12
- D) 24

5

Type of particle	Size range
Clay	Less than 0.002 mm
Silt	0.002 mm up to 0.061 mm
Sand(fine)	0.061 mm up to 0.124 mm
Sand (medium)	0.124 mm up to 0.49 mm
Sand (coarse)	0.49 mm up to 2.00 mm

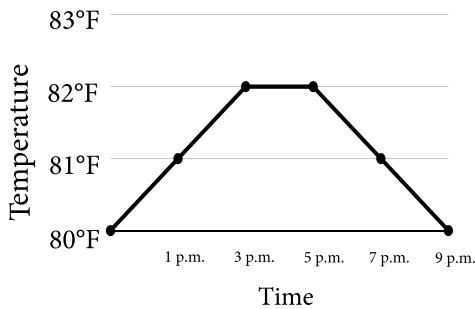
The table above shows the size of several types of particles found in soil. In which of the following inequalities does p represent the size range, in millimeters (mm), of the three types of sand particles listed in the table?

- A) $0.061 \leq p < 2.0$
- B) $0.002 \leq p < 0.49$
- C) $p < 0.061$
- D) $p < 2.0$



6

Temperature Inside Alicia's Home



The graph above represents the temperature inside Alicia's home on a certain day. From 5 p.m. to 9 p.m., how many degrees Fahrenheit ($^{\circ}\text{F}$), did the temperature decrease each hour?

- A) 2
- B) 1
- C) $\frac{1}{2}$
- D) $\frac{1}{4}$

7

If $a = 2(x+1)^2$ and $b = (x+1)$, which of the following is equivalent to ab ?

- A) $2(x+1)^3$
- B) $2(x+1)^2$
- C) $2(x+2)^3$
- D) $2(x+2)^2$

8

Career

Majors	Career				
	Law	Medicine	Teaching	Other	Total
English	23	5	32	30	90
Biology	2	78	20	10	110
Political Science	54	1	9	16	80
Economics	13	10	17	80	120
Total	92	94	78	136	400

The table above shows the number of students who were enrolled in one of four majors when they were in college and the career that each student chose directly after college? Based on the table, what proportion of students who majored in political science did not have a career in law, medicine, or teaching directly after college?

- A) 0.04
- B) 0.12
- C) 0.16
- D) 0.20

9

It is often possible to donate money to a charity by mail or by cell phone. The amounts of 5 mail donations and 5 cell phone donations are given in the table below. What is the positive difference, in dollars, in the mean donation amount for mail donations and for cell phone donations?

Donation method	Amount (in dollars)				
	10	50	25	5	10
Mail					
Cell phone	5	10	10	20	5

- A) 0
- B) 10
- C) 25
- D) 50



10

A bucket contains 5 gallons of water. The water in the bucket weighs 42 pounds. One gallon of diluted bleach is mixed with the water, and then the total weight of the liquid in the bucket is 50.52 pounds. What is the weight per gallon of the liquid in the bucket after the diluted bleach is added? (Assume that the total volume of the liquid is the sum of gallons of water and gallons of diluted bleach.)

- A) 0.10 pounds/ gallon
- B) 0.12 pounds/ gallon
- C) 8.42 pounds/ gallon
- D) 8.50 pounds/ gallon

11

Researchers in Australia carried out an experiment to determine if the color of a coffee mug affects how people rate the flavor intensity of the coffee. Volunteers were randomly assigned to taste coffee in mugs that differed only by color: some white and some clear. The same type of coffee was used in both mugs. The researchers concluded that the mean flavor intensity rating was significantly higher for those who drank coffee in a white mug than for those who drank coffee in a clear mug. Based on this study, which of the following statements is correct?

- A) The color of the mug was the cause of the difference in mean intensity rating for these volunteers, and this conclusion can be generalized to all coffee drinkers.
- B) The color of the mug was the cause of the difference in mean intensity rating for these volunteers, but it is not reasonable to generalize this conclusion to all coffee drinkers.
- C) It is not reasonable to conclude that the color of the mug was the cause of the difference in mean intensity rating for these volunteers.
- D) It is not possible to draw any conclusion from this experiment because volunteers were used.

12

The average net primary production in tropical rain forest each year is 8,900 kilocalories per square meter. If the total net primary production of a selected portion of a tropical rain forest in a given year is 1.8×10^8 kilocalories, what is the approximate total area, in square meters, of the selected portion?

- A) 4.9×10^3
- B) 1.6×10^4
- C) 2.0×10^4
- D) 1.6×10^{12}

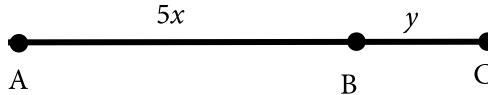
13

$$a^2 + 6a + 9 = 16$$

Based on the equation above, which of the following could be the value of $a + 3$?

- A) 8
- B) 4
- C) 2
- D) 1

14



Note: Figure not drawn to scale

In the figure above, $AC = 42$. If $y = 2x$, what is the length of line segment BC?

- A) 6
- B) 7
- C) 12
- D) 14



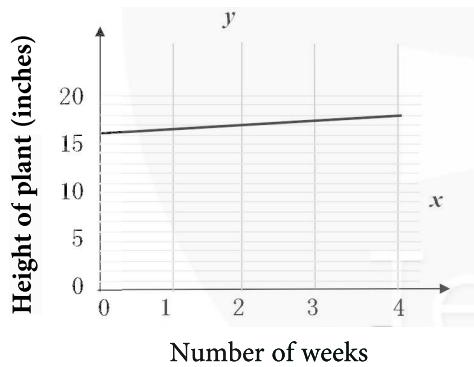
15

If a and b are positive integers, which of the following is NOT equivalent to $\frac{-a}{-b}$?

- A) $\frac{a}{b}$
- B) $\frac{-(a)}{b}$
- C) $\frac{1}{\frac{-b}{-a}}$
- D) $\frac{-(a)}{-b}$

16

Milagros recorded the height of a plant, in inches, each week as it grew. The results are graphed below, and the line of best fit is also shown.



What is the meaning of the y -intercept of the graph?

- A) The plant measured 16 inches one week after Milagros started measuring its height.
- B) The plant grew 16 inches each week after Milagros started measuring its height.
- C) The plant increased height $\frac{1}{2}$ each week.
- D) The plant measured 16 inches when Milagros started measuring its height.

17

Distribution of 250 History Books

Book type	US	British
Paperbacks	40	45
Hardcovers	90	75

A historian has a collection of 250 books about US and British history. The distribution of the books is shown in the table above. If a hardcover book is to be selected at random, what is the probability that the book will be a US history book?

- A) $\frac{6}{11}$
- B) $\frac{13}{25}$
- C) $\frac{4}{9}$
- D) $\frac{9}{25}$

18

Pilar is a salesperson at a car dealership. Each car at the dealership costs at least \$15,000. For each car Pilar sells, she receives a commission of 6% of the amount by which the selling price exceeds \$10,000. If Pilar sells a car at a price of d dollars, which of the following functions gives her commission $C(d)$, in dollars, on the sale?

- A) $C(d) = 0.06(d - 10,000)$
- B) $C(d) = 0.06(d - 15,000)$
- C) $C(d) = 0.06(10,000 - d)$
- D) $C(d) = 0.06(10,000 - d)$



19

The point $(5, -3)$ lies on both line j and line k in the xy -plane. The equations of lines j and k are $y = cx + 2$ and $y = 3x + b$, respectively. What is the value of $c + b$?

- A) -19
- B) -17
- C) 2
- D) 17

20

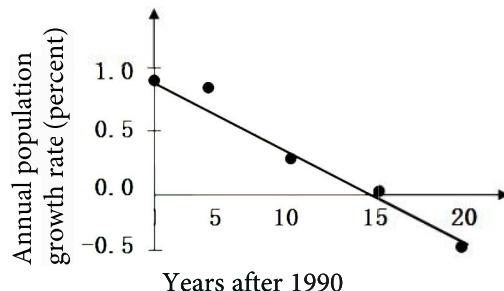
Employee Absences

Number of days	Number of employees
0	8
1	4
2	3
4	4
5	5
13	1

The frequency table above shows the distribution of the number of days each of the 25 employees of a company was absent last month. What is the median number of days absent for the 25 employees last month?

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

Questions 21 and 23 refer to the following information.



The graph above shows the percent of annual population growth rate, r , in a certain country for the number of years after 1990, t , at 5-year intervals. A linear model fitting the plotted points is also shown. The equation for the linear model is

$$r = -0.07t + 1.06.$$

21

Which of the following statements is the best interpretation of the coefficient of t in the model?

- A) The predicted annual population growth rate of the country increases by 1 every 0.07 years.
- B) The predicted annual population growth rate of the country decreases by 0.07 every five years.
- C) The predicted annual population growth rate of the country decreases by 0.07 every year.
- D) The predicted annual population growth rate of the country increases by 0.07 every year.



22

Based on the model, which of the following is closest to the year in which the predicted annual population growth rate of the country is - 1%?

- A) 2010
- B) 2015
- C) 2020
- D) 2025

23

The actual annual population growth rate in the country in 1995 was 0.9%. For the year 1995, what is the actual annual population growth rate minus the annual population growth rate predicted by the model?

- A) -0.07%
- B) 0.19%
- C) 0.67%
- D) 1.06%

24

Which of the following examples would exhibit linear growth over time?

- A) The height of a plant that doubles in height every two months
- B) The value of a home that is increasing in value by 5% every year
- C) The number of books read by someone who reads 3 books every month
- D) The number of birds in an area where the population of birds is decreasing by 30% every year

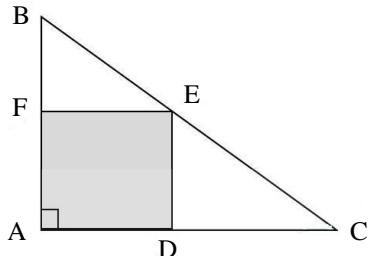
25

A book publishing company pays the author of a certain book \$2.50 per book for the first 500 books sold. After the first 500 books are sold, the payment increases to \$3.25 per book sold. Which of the following functions gives the author's total payment $P(b)$, in dollars, in terms of the number of books sold, b , where $b > 500$?

- A) $P(b)=2.50(500)+ 3.25b$
- B) $P(b) = 2.50b + 3.25b$
- C) $P(b) = 2.50b + 3.25(b - 500)$
- D) $P(b) = 2.50(500) + 3.25(b - 500)$



26



Note: Figure not drawn to scale

In the figure above, ABC is a right triangle and $2AC = 3AB$. If the quadrilateral AFED is a square, the area of the shaded region is what fraction of the area of triangle ABC?

- A) $\frac{3}{4}$
- B) $\frac{2}{3}$
- C) $\frac{13}{20}$
- D) $\frac{12}{25}$

27

$$(x - 3)^2 + (y - 5)^2 = 18$$

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

- A) 6π
- B) 9π
- C) 12π
- D) 18π

28

$$\frac{3x^2 + 7x - 6}{9 - x^2}$$

Which of the following is equivalent to the quotient shown above for $x \neq -3$ and $x \neq 3$?

- A) $-3 + \frac{7}{3-x}$
- B) $3 - \frac{7}{3-x}$
- C) $-3 + \frac{7}{3+x}$
- D) $3 - \frac{7}{3+x}$

**Questions 29 and 30 refer to the following information.**

$$S = 2Cr$$

The formula above can be used to approximate the surface area S of a planet using its average radius r and average circumference C .

29

The surface area of Neptune is approximately 2.94×10^9 square miles. Of the following, which best approximates the average radius, in miles, of Neptune?

- A) 2,643
- B) 15,300
- C) 96,120
- D) 192,200

30

The volume V of a planet can be expressed in terms of its surface area S and its average radius r by the

formula $V = \frac{1}{3}Sr$. Which of the following expresses the planet's average circumference, G , in terms of its volume and its average radius?

- A) $G = \frac{2r^2}{3V}$
- B) $G = \frac{3r^2}{2V}$
- C) $G = \frac{2V}{3r^2}$
- D) $G = \frac{3V}{2r^2}$

**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. →

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

← Fraction line

Grid in result. ← Decimal point

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

2	/	3
.	6	6
.	6	7
.	7	7
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

Answer: 201 – either position is correct

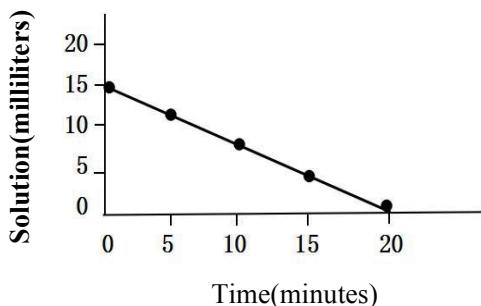
2	0	1
.	/	/
0	0	0
1	1	1
2	2	2
3	3	3

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



31

Lab Experiment



The graph above gives the number of milliliters of solution in a beaker from the start to the end of an experiment. According to the graph, how many milliliters of solution were in the beaker at the start of the experiment?

32

Kim purchased a shirt that cost \$23.00 before a 6% sales tax was added. How much sales tax, in dollars, did Kim pay for this shirt? (Disregard the \$ sign when gridding your answer. For example, if your answer is \$4.97, grid 4.97)

33

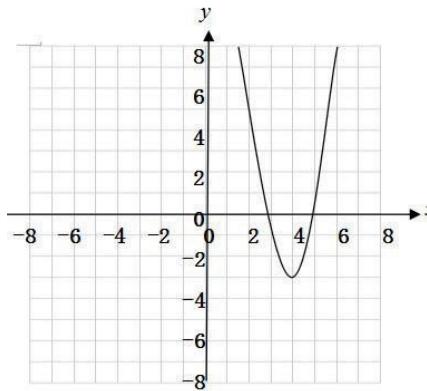
$$3r - 4s = 8$$

$$r - s = 2$$

What is the value of r in the system of linear equations above?

34

The function f is defined by $f(x) = 2x^2 - 8x + 5$. The graph of $y = f(x - h)$ is shown in the xy -plane below.



What is the value of h ?

35

A right circular cylinder has a height of 4 inches and is $\frac{1}{2}$ full of water. If the amount of water in the can is 32π cubic inches, what is the diameter, in inches, of the can?

36

At a theater, adult tickets for a play cost \$15 each and child tickets cost \$10 each. If 300 tickets were sold, and the sale of the tickets generated between \$3575 and \$3600, inclusive, what is a possible number of child tickets that were sold?



Questions 37 and 38 refer to the following information.

In a typical elk herd in Yellowstone National Park. The ratio of males to females is 14 to 46.

37

A biologist spots a herd of 150 elk in the park. The biologist uses the ratio of males to females in a typical herd to estimate the number of males in the herd. How many males would the biologist expect be in this herd?

38

If p percent of a typical herd of elk is female, what is the value of p , rounded to the nearest whole number?

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 2016 International Answers

Reading				Writing				Math N/Calc		Math W/Calc	
Question	Answer	Question	Answer	Question	Answer	Question	Answer	Question	Answer	Question	Answer
1	B	41	D	1	A	41	A	1	B	1	B
2	D	42	B	2	C	42	D	2	B	2	C
3	C	43	C	3	B	43	D	3	D	3	B
4	D	44	D	4	A	44	D	4	B	4	A
5	D	45	A	5	C			5	C	5	A
6	A	46	B	6	C			6	D	6	C
7	D	47	C	7	D			7	A	7	A
8	A	48	B	8	B			8	C	8	D
9	C	49	B	9	B			9	A	9	B
10	C	50	B	10	A			10	D	10	C
11	D	51	D	11	A			11	B	11	B
12	C	52	D	12	D			12	A	12	C
13	C			13	B			13	B	13	B
14	A			14	B			14	C	14	C
15	D			15	A			15	A	15	D
16	D			16	D			16	8	16	D
17	B			17	D			17	116	17	A
18	A			18	A			18	4	18	A
19	C			19	B			19	7	19	A
20	B			20	C			20	80	20	B
21	C			21	B					21	C
22	D			22	A					22	C
23	D			23	D					23	B
24	A			24	C					24	C
25	B			25	B					25	D
26	A			26	C					26	D
27	C			27	C					27	D
28	C			28	D					28	A
29	C			29	C					29	B
30	D			30	C					30	D
31	A			31	A					31	15
32	A			32	D					32	1.38
33	B			33	D					33	0
34	B			34	C					34	2
35	B			35	B					35	8
36	C			36	D					36	180 to 185
37	A			37	D						
38	A			38	A						35
39	C			39	D					38	77
40	C			40	B						