

November SAT
2018 US

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.

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Reading Test

65 MINUTES, 52 QUESTIONS

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

DIRECTIONS

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

Questions 1-10 are based on the following passage.

This passage is from Jhumpa Lahiri. *The Lowland* ©2013 by Jhumpa Lahiri. Udayan and Subhash are two brothers who live in Calcutta, India. *Pather panchali* (1955) is an award-winning India film.

When they were old enough, when they were permitted to leave the house, they were told not to lose sight of one another. Together they wandered *Line* down the winding lanes of the enclave, behind the 5 ponds and across the lowland, to the playing field where they sometimes met up with other boys. They went to the mosque at the corner, to sit on the cool of its marble steps, sometimes listening to a football game on someone's radio, the guardian of the 10 mosque never minding.

Eventually they were allowed to leave the enclave, and to enter into the greater city. To walk as far as their legs would carry them, to board trams and busses by themselves. Still the mosque on the corner, 15 a place of worship for those of a separate faith, oriented their daily comings and goings.

At one point, because Udayan suggested it, they began to linger outside Technicians Studio, where Satyajit Ray had shot *Pather Panchali*, where Bengali 20 cinema stars spent their days. Now and then, because someone who knew them was employed on the shoot, they were ushered in amid the tangle of cables and wires, the glaring lights. After the call for silence, after the board was clapped, they watched the director and 25 his crew taking and retaking a single scene, perfecting a handful of lines. A day's work, devoted to a moment's entertainment.

They caught sight of beautiful actresses as they emerged from their dressing rooms, shielded by 30 sunglasses, stepping into waiting cars. Udayan was the one brave enough to ask them for autographs. He was blind to self-constraints, like an animal incapable of perceiving certain colors. But Subhash strove to minimize his existence, as other animals merged with 35 bark or blades of grass.

In spite of their differences one was perpetually confused for the other, so that when either name was called both were conditioned to answer. And sometimes it was difficult to know who had 40 answered, given that their voices were nearly indistinguishable. Sitting over the chessboard they were mirror images: one leg bent, the other splayed out, chins propped on their knees.

They were similar enough in build to draw from a 45 single pile of clothes. Their complexions, a light coppery compound derived from their parents, were identical. Their double-jointed fingers, the sharp cut of their features, the wavy texture of their hair.

Subhash wondered if his placid nature was regarded 50 as a lack of inventiveness, perhaps even a failing, in his parents' eyes. His parents did not have to worry about him and yet they did not favor him. It became his mission to obey them, given that it wasn't possible to surprise or impress them. That was what Udayan 55 did.

In the courtyard of their family's house was the most enduring legacy of Udayan's transgressions. A trail of his footprints, created the day the dirt surface was paved. A day they'd been instructed to remain 60 indoors until it had set.

All morning they'd watched the mason preparing the concrete in a wheelbarrow, spreading and smoothing the wet mixture with his tools. Twenty-four hours, the mason had warned them, before

65 leaving.

Subhash had listened. He had watched through the window, he had not gone out. But when their mother's back was turned, Udayan ran down the long wooden plank temporarily set up to get from

70 the door to the street.

Halfway across the plank he lost his balance, the evidence of his path forming impressions of the soles of his feet, tapering like an hourglass at the center, the pads of the toes disconnected.

75 The following day the mason was called back. By then the surface had dried, and the impressions left by Udayan's feet were permanent. The only way to repair the flaw was to apply another layer. Subhash wondered whether this time his brother had gone

80 too far.

But to the mason their father said, Leave it be. Not for the expense or effort involved, but because he believed it was wrong to erase steps that his son had taken.

85 And so the imperfection became a mark of distinction about their home. Something visitors noticed, the first family anecdote that was told.

2

In describe the activity at the film studio, the narrator draws which contrast?

- A) The calmness of the film shoot versus the fanfare that accompanies the debut of a film in movie theaters.
- B) The talent of the actors and film crew versus the quality of the finished film.
- C) The brothers' interest in filmmaking versus the filmmakers' obliviousness to the boys.
- D) The time and effort that go into making a film versus the audience's fleeting experience of a film.

3

Which choice best supports the idea that Udayan and Subhash accept, as a matter of course, the fact that others fail to draw a clear distinction between them?

- A) Lines 36-38 ("In spite ... answer")
- B) Lines 38-41 ("And sometimes ... indistinguishable")
- C) Lines 41-43 ("Sitting...knees")
- D) Lines 45-47 ("Their...identical")

4

In the context of the narrator's physical description of the brothers, the detail of the "single pile of clothes" (Line 45) serves mainly to

- A) emphasize that the description mirrors the brothers' perception of themselves.
- B) note one respect in which the description may misrepresent the brothers.
- C) cite a particular fact about the brothers that corroborates the description.
- D) suggest that the description holds truer at certain times than at others.

1

The passage indicates that as the brothers age, they are allowed greater freedom to

- A) explore the world outside their home.
- B) assist in household chores.
- C) spend time apart from one another.
- D) pursue work in the film industry.

5

As used in line 49, “nature” most nearly means

- A) temperament.
- B) influence.
- C) environment.
- D) shape.

6

It can reasonably be inferred from the passage that Subhash perceives his parents as

- A) mistaking his self-restraint for apathy.
- B) preferring his brother to him.
- C) resenting him as a reflection of their own weakness.
- D) underestimating the effort that obeying them requires.

7

In the context of the passage, the “transgression” (line 57) are best understood as

- A) violations of public law.
- B) instances of physical trespassing.
- C) acts of thoughtless rule breaking.
- D) misunderstandings of social custom.

8

Based on the passage, which choice best states how the father views the footprints in the courtyard?

- A) He cherishes them as suggestive of the children’s future greatness.
- B) He accepts them as symbolic of Udayan’s boldness.
- C) He interprets them as a metaphor for his own lost youth.
- D) He welcomes them as a reminder of his other son’s obedience.

9

The narrator suggests that as time passed, the incident involving the footprints took on a significance most like that of a

- A) familiar legend whose exact origin cannot be identified.
- B) historical narrative that suggests how one should behave in the present.
- C) personal memory that one recounts to a new acquaintance.
- D) cautionary tale that one tells to discourage careless behavior.

10

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

- A) Lines 56-59 (“In the ... paved”)
- B) Lines 75-78 (“The following... layer”)
- C) Lines 81-84 (“But to ... taken”)
- D) Lines 85-87 (“And so... told”)

Questions 11-21 are based on the following passage and supplementary material.

Passage 1 is adapted from a speech delivered in 1980 by Thurgood Marshall, "Remarks at the Second Circuit Judicial Conference." Passage 2 is adapted from Steven Mazie, "Playing Favourites." ©2014 by The Economist Newspaper Limited.

Passage1

In the courts, impartiality is required, and political compromise has no role at all. Judges are supposed to be reflective, considering the controversy before them in light of the broader legal schemes, Line 5 Constitutional and otherwise, which guide the country. Decisions traditionally are justified by opinions announcing reasoning derived from earlier cases and established principles; raw political power is never a sufficient justification for any judicial 10 decision. Constitutional rights should never be compromised by the courts in the name of expediency.

The judiciary operates under a premise of neutrality rather than partisanship. Federal judges are insulated, as much as possible, from political pressure 15 which might interfere with principled decision making. [Federal] judges have life tenure and are free from threats of economic retaliation for unpopular decisions. In addition, we cannot have a personal 20 stake in the outcome of any case before us, and the Code of Judicial Conduct cautions us to avoid even the appearance of impropriety.

The reason for this strict requirement of impartiality is that the judiciary stands as the referee 25 whenever the individual citizen and his government conflict. Such an arbiter must be independent and neutral. The whole purpose of the separation of powers is to establish an equal branch of the government which can check the other branches 30 when their political compromises and generalized focus result in unfairness to the individual. If the government acts unfairly, the court stands as a guardian, forcing the other branches to recognize that basic principles have been violated and that certain 35 persons have been denied their fundamental right to equal treatment under law. It can never be the greatest good for the greatest number to deny the equal moral worth of a fellow human being. Similarly, when the interests of individuals clash, 40 there cannot be any danger of predisposition by the court if each litigant is to be confident that he has received equal treatment. Before the bar, all men and

women must stand equal, with their claims resolved solely on the strength of legal principles.

Passage2

45 JEROME FRANK, a mid-20th-century legal thinker, is said to have claimed that justice is a function of what the judge had for breakfast. Don't let their black robes, serious mien and pledges of fealty to the law fool you, Mr Frank warned: judicial 50 decisions are not cool applications of objective legal principles. Rather, they are manifestations of personal predilections and biases.

Mr. Frank's observation seems to apply all too well to today's Supreme Court. When ruling on big, 55 controversial cases, the justices split fairly reliably along party lines dictated by their appointing presidents. It wasn't always this way. Until 1937,party simply wasn't a factor in high-court decisions. Only in recent decades have party politics 60 infiltrated the marble halls of the Supreme Court, and only in the past few years have they become the best predictor of its major rulings. The Supreme Court has never divided along partisan lines as neatly as it does today.

65 A high court that splits into ideological camps while purporting to provide "equal justice under law" calls into question its very legitimacy. It makes a mockery of Chief Justice John Roberts's hoary claim that a justice's job is to "call balls and strikes and not 70 to pitch or bat." It gives one the sense that when the Chief Justice asserts he has "no agenda," he's protesting a bit too much.

Indeed, new research by three political scientists shows just how avidly the justices go to bat for causes 75 they identify with. In their paper, Lee Epstein of the University of Southern California and two colleagues examined 4,519 votes in 516 Supreme Court free-speech cases from 1953 to 2010 to determine whether "justices defend the speech they hate." The 80 answer: rarely. Contrary to stereotypes about the relative friendliness of conservatives or liberals to free-speech claims generally, Ms Epstein and her co-authors found that the justices are "opportunistic free speechers." Some principle might be found to 85 account for the suspicious patterns in their votes, but the evidence looks pretty damning. Justices' votes "are neither reflexively pro- or anti-the first amendment"; they are, instead, for or against "the speaker's ideological enclave."

11

It can reasonably be inferred from Passage 1 that Marshall believes the purpose of the federal judiciary would be undermined if it were altered in which way?

- A) Officials in other branches of government were forbidden from discussing federal court cases with the press.
- B) The ethical standards of the judiciary were determined by its members rather than by other branches.
- C) Judges were subject to reappointment or dismissal by elected officials, based a review of their rulings.
- D) Court rulings were narrowly tailored to the specifics of each case, avoiding fundamental political and philosophical questions.

12

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

- A) Lines 13-14 (“The judiciary…… partisanship”)
- B) Lines 17-19 (“Federal…… decisions”)
- C) Lines 19-22 (“In addition…… impropriety”)
- D) Lines 27-31 (“The whole …… individual”)

13

According to Marshall in Passage 1, the code of Judicial Conduct recommends that judges

- A) relinquish financial gains that may result from their rulings.
- B) shun any behavior that can be interpreted as improper.
- C) use their rulings to retaliate against elected officials.
- D) dispense rulings that are timely and efficient.

14

As used in line 47, “function” most nearly means

- A) result.
- B) occupation.
- C) celebration.
- D) purpose.

15

In passage 2, how does Mazie use discussions of Frank and Epstein to present his argument?

- A) He cites Frank as an established authority for a recommended course of action and Epstein as a more contemporary authority.
- B) He cites Frank in order to endorse a theory and Epstein in order to suggest a slight modification to that theory.
- C) He cites Frank as a spokesperson for a particular position and Epstein as a researcher corroborating that position.
- D) He cites Frank in order to identify a long-standing dilemma and Epstein as a scientist offering a solution to that dilemma.

16

As used in lines 53-54, “apply all too well” most nearly means

- A) plead successfully.
- B) relate especially.
- C) appeal deeply.
- D) stick physically.

17

In passage 2, Mazie states that over the course of recent decades, the decisions of Supreme Court justices increasingly correlate with

- A) an emerging national consensus on free-speech issues.
- B) shifts in the tone of political discussion in the United States.
- C) personal experiences in the justices’ lives outside of the courtroom.
- D) the political affiliation of the presidents who appointed the justices.

18

It can reasonably be inferred from the passages that both authors would consider the integrity of a court ruling to be compromised under which condition?

- A) The ruling invokes legislative and executive precedent as well as judicial precedent.
- B) Judges defend a ruling they have issued by commenting on it outside of the courtroom.
- C) Political tendencies inform the legal reasoning behind the ruling.
- D) The values of the judges differ from those embodied by the government.

19

Which choice best identifies a difference in how the authors make use of the comparison of judges to the referee or umpire in a sporting event in line 25 of Passage 1 and lines 69-70 of Passage 2?

- A) Marshall considers the comparison as valid, if overused, whereas Mazie identifies it as a cliche to be avoided.
- B) Marshall offers the comparison as an part description, whereas Mazie suggests it is misleading.
- C) Marshall implies that the comparison is a respectful one, whereas Mazie criticizes it as scornful.
- D) Marshall employs the comparison as an image of unity, whereas Mazie employs it as an image of divisiveness.

20

Based on Passage 2, how would Mazie most likely respond to the position Marshall takes in lines 42-44 of Passage 1 (“Before... principles”)?

- A) He would argue that although casual observation of Supreme Court rulings debunks Marshall’s claim, examination of them by legal scholars confirm it.
- B) He would consider Marshall’s description true for the majority of Supreme Court rulings but misrepresentative of rulings in free-speech cases.
- C) He would contend that Marshall’s assessment was an unusual one in the past but has grown increasingly mainstream in the current political climate.
- D) He would assert that Marshall’s sentiment is contradicted by judges’ sympathetic treatment of litigants whose beliefs they endorse.

21

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

- A) Lines 54-57 (“When... presidents”)
- B) Lines 59-62 (“Only... rulings”)
- C) Lines 73-75 (“Indeed... with”)
- D) Lines 75-79 (“In their... hate”)

Questions 22-31 are based on the following passage.

This passage is adapted from Elizabeth Preston, "Found: The Ideal Fatness for Elephant Seals." ©2014 by Kalmbach Publishing Co.

Northern elephant seals (*Mirounga angustirostris*) spend 9 to 10 months of the year at sea. Twice annually, the animals haul their enormous bodies ashore. In the winter, they gather on beaches in Mexico and Southern California for breeding and mating. Females deliver their pups and nurse them; males defend "harems" of dozens of mates and work on impregnating them again. While on land, the seals fast. Then they go back to the ocean, abandoning the babies to their own devices. In the spring, the seals return to the same beaches to molt, shedding their fur and even some skin before spending the rest of the year in the ocean.

During their travels, northern elephant seals may migrate as far as Alaska. They make dives almost half a mile deep, pursuing squid, fish, and other animals unfortunate enough to be in their paths. But to regain the body mass that they lost while fasting on land, they have to bank their calories. Energy that they save while swimming can be spent on longer dives. Energy gained from a stomach full of squid can be used to hunt some more.

Taiki Adachi, a graduate student in the polar science department at Tokyo's Graduate University for Advanced Studies, wanted to learn how a migrating seal's increasing blubberiness affects its swimming. Does a fatter, more buoyant seal need to spend less energy on swimming and diving? And is this beneficial overall?

He and his colleagues developed a new type of accelerometer to find out. When worn by an elephant seal, the device can monitor cyclic patterns in speed and count each surge forward as one stroke of the flippers. By also tracking depth and swimming angle, the device can constantly measure the seal's rate of strokes per distance traveled. Seals that make more strokes are working harder.

The researchers captured 14 female *Mirounga angustirostris* and affixed the accelerometers to their backs. They also outfitted each seal with radio and GPS transmitters. Half the seals were monitored during their "short migration," the two months following breeding. The rest were tracked during the seven-month "long migration" that follows molting.

Although the scientists were limited by the battery life of their instruments, they were able to collect data over the entire short migration, as well as the first 140 days or so of the long migration. The GPS transmitters announced when the elephant seals had returned to their home beaches. There, scientists used radio signals and plain old binoculars to pick out tagged seals from the rest of the colony. After removing the loggers, they sent the seals back on their way.

For any point in time, the scientists could estimate a seal's fatness by seeing how much it drifted down in the water when it wasn't actively swimming. At the beginning of each migration, the starved seals had "negative buoyancy." In other words, they tended to sink. But as their roving fish binge progressed, the seals became more and more buoyant.

As the blubbery seals gained buoyancy, swimming became easier. They needed slightly more flipper strokes to make their deep dives, but many fewer strokes to ascend. This meant that overall, fatter seals used fewer strokes to cover the same distance.

The scientists had predicted that saving energy in swimming would allow the seals to spend more energy elsewhere, and this seemed to be true. As the seals got fatter, they doubled the amount of time they spent at the bottom of their dives, from about 10 minutes to 20. (The bottom of the dive is where they find the most food.)

After two months at sea, all the seals were still negatively buoyant, though their blubber had notably increased their buoyancy. After about five months, when the loggers stopped gathering data for the long migration, 5 out of 7 seals had become "neutrally buoyant"—when drifting in the ocean, they didn't sink or rise.

Fatter seals can spend less energy swimming and more time eating, which gives them even more energy. So do they keep gaining blubber indefinitely? "Yes, I think they get fatter to become positively buoyant," Adachi says. If he could have monitored the seals all the way to the end of their long migration, he thinks he would have seen them gain so much blubber that they tended to float. Other research has found that elephant seals become positively buoyant, he adds.

Adachi thinks the best state for elephant seals—the body type that keeps them swimming most

- 95 efficiently—is neutral buoyancy. Yet the hungry animals, gearing up for their next fast, keep eating beyond that. Adachi says that when elephant seals come to shore after their long migration, 40 percent of their body mass is fat. For them, it's the perfect beach body.

22

The primary purpose of the passage is to

- A) weigh the merits of several competing theories about buoyancy in a species of elephant seal.
- B) challenge an established approach in the study of buoyancy in a species of elephant seal.
- C) discuss a novel means of evaluating the migratory patterns of a species of elephant seal.
- D) explore a research team's contribution to the study of buoyancy in a species of elephant seal.

23

The first paragraphs of the passage (lines 1–22) serve mainly to

- A) compare the findings of previous research on northern elephant seals to the findings of the study consider in the passage.
- B) present a popular hypothesis regarding the behaviors of northern elephant seals that will be developed throughout the passage.
- C) provide an overview of northern elephant seal behavior that is relevant to the study discussed in the passage.
- D) introduce an argument about northern elephant seals that will be countered later in the passage.

24

Which statement about the number of swimming strokes taken by northern elephant seals is supported by the passage?

- A) A greater number of swimming strokes signifies a greater amount of energy expended.
- B) A greater number of swimming strokes signifies a more pronounced swimming angle.
- C) A lesser number of strokes signifies a more potential for deeper diving depth.
- D) A lesser number of strokes signifies a more urgent need for nutritional supplementation.

25

What is the main effect of the phrase “plain old binoculars” (line 51)?

- A) It suggests that the observations made with such binoculars may be unreliable.
- B) It emphasizes the surprising usefulness of a simple observatory tool.
- C) It reinforces that binoculars are obsolete compared to the radio signals used by the scientists.
- D) It establishes a definitive contrast between the goals of past and present researchers.

26

Which choice provides the best evidence of an inverse relationship between the amount of energy that elephant seals with relatively more buoyancy expand while making deep dives and the amount they expand swimming back to the surface?

- A) Lines 58–62 (“At the... buoyant”)
- B) Lines 63–66 (“As the... ascend”)
- C) Lines 69–71 (“The scientists... true”)
- D) Lines 71–75 (“As the... food”)

27

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

- A) spread out
- B) shelter
- C) deal with
- D) travel

28

Which finding, if accurate, would most clearly undermine Adachi’s belief that the northern elephant would keep gaining blubber after the loggers stopped tracking the seals?

- A) Evidence that elephant seals do not stay negatively buoyant after the first month in the ocean.
- B) Confirmation of the elephant seal’s tendency to consume increasingly greater quantities of food.
- C) Proof that the elephant seals remain neutrally buoyant just before they return to the beaches to breed.
- D) The discover that the elephant seals reach their highest body mass just before they return to the beaches to breed.

29

It can almost reasonably be inferred from the passage that the overall conclusions reached by Adachi’s team might be challenged for being

- A) somewhat tenuous, because the team was unable to study the elephant seals throughout their entire migration.
- B) because the team failed to expand the study to include a greater number of elephant seals from the group.
- C) moderately outdated, because the team used imprecise equipment to measure the buoyancy of the elephant seals.
- D) Slightly unfocused, because the team incorporated extraneous information provided by others researchers into their work.

30

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

- A) Lines 83-85 (“Fatter... energy”)
- B) Lines 85-87 (“So do... says”)
- C) Lines 87-90 (“If he... float”)
- D) Lines 97-99 (“Adachi... fat”)

31

The comment in lines 91-92 (“Other...adds”) mainly serves to

- A) promote other lines of research related to Adachi’s study of elephant seals.
- B) offer additional support to Adachi’s hypothesis about the blubber of elephant seals.
- C) criticize alternative interpretations of elephant seal blubber put forth by other researcher.
- D) portray elephant seals as unique because of the means by which they increase their blubber.

Questions 32-41 are based on the following passages and supplementary material.

This passage and accompanying figure are adapted from "Free Exchange: A Mean Feat." ©2016 by The Economist Newspaper Limited.

"The only function of economic forecasting is to make astrology look respectable," John Kenneth Galbraith, an irreverent economist, once said. Since *Line* economic output represents the aggregated activity of 5 billions of people, influenced by forces seen and unseen, it is a wonder forecasters ever get it right. Yet economists cannot resist trying. As predictions for 2016 are unveiled, it is worth assessing the soothsayers' records.

10 Forecasters usually rely on two different predictive approaches. One is theory-based, shaped by how economists believe economies behave. The other is data-based, shaped by how economies have behaved in the past. The simplest of the theoretical bunch is the Solow growth model, named for Robert Solow, a Nobel-prize winning economist. It posits that poorer countries should generally invest more and grow faster than rich ones. Central banks and other big economic institutions use far more

15 complicated formulas, often grouped under the bewildering label of "dynamic stochastic general equilibrium" (DSGE) models. These try to anticipate the ups and downs of big economies by modeling the behaviour of individual households and firms.

20 25 The empirical approach is older; indeed, it was the workhorse of government forecasting in the 1940s and 1950s. Data-based models analyse the relationship between hundreds or thousands of economic variables, from the price of potatoes to snowfall in January. They then work out how zinc sales, for example, affect investment and growth in the years that follow.

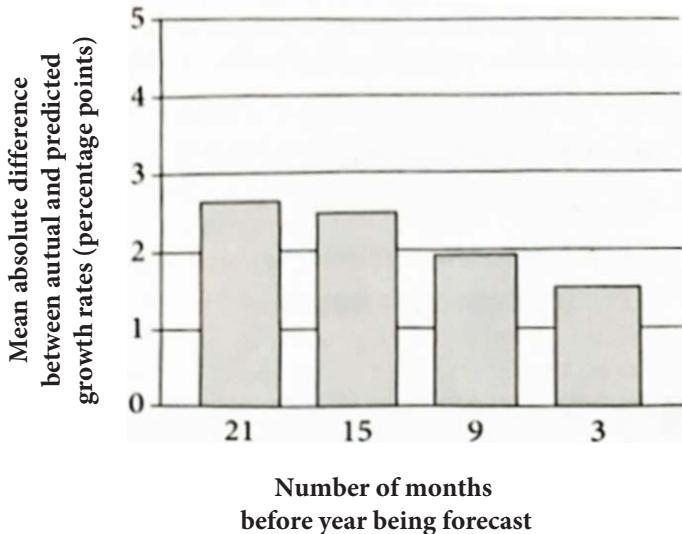
Both strategies have faced withering criticism. DSGE models, for all their complexity, are typically 35 built around oversimplifications of how markets function and people behave. Data-based models suffer from their own shortcomings. In a paper published in 1995 Greg Mankiw of Harvard University argued that they face insurmountable 40 statistical problems. Too many things tend to happen at once to isolate cause and effect; liberalised trade might boost growth, or liberalisation might be the sort of thing that governments do when growth is

rising, or both liberalisation and growth might follow 45 from some third factor. And there are too many potential influences on growth for economists to know whether a seemingly strong relationship between variables is real or would disappear if they factored in some other relevant tidbit, such as the wages of Canadian lumberjacks.

In practice, most forecasters combine the two approaches and inject, when necessary, a dose of common sense. The IMF, for instance, relies on a global model, built in part on economic theory and in 55 part on data analysis. The global projections generated by that hybrid model are combined with country-specific details to produce country-level forecasts. The country forecasts are then checked for consistency against the global projections and 60 adjusted when necessary-to make sure, for example, that most countries do not show strong trade growth when the global projection heralds a decline in trade. A recent analysis of the IMF's forecasts by the organisation's Independent Evaluation Office 65 concluded that their accuracy was "comparable to that of private-sector forecasts". But how accurate is that?

Not very, Lant Pritchett and Larry Summers of Harvard University argued in 2014. Forecasters 70 overestimate the extent to which the future will look like the recent past, they reckon. It is assumed that fast-growing countries will keep speeding along while the economic tortoises continue crawling. "Regression to the mean is perhaps the single most 75 robust and empirically relevant fact about cross-national growth rates," say Messers Pritchett and Summer. In other words, booming countries slow down and slumping ones speed up.

Accuracy of IMF's Economic Growth Forecasts, 2000-2014



32

The primary purpose of the passage is to

- A) describe methods of economic forecasting and their various weaknesses.
- B) propose a synthesis of the two main methods of economic forecasting.
- C) discuss how methods of economic forecasting have changed over time.
- D) advocate for one of the two leading methods of economic forecasting.

33

In line 5-6, the author uses the phrase "seen and unseen" most likely to

- A) support the claim that economic forecasts rely on both explicit and unstated assumptions.
- B) draw a distinction between tangible and intangible outputs of economic activity.
- C) suggest that some factors affecting economic output are known while others are not.
- D) allude to the two different approaches economists take when making forecasts.

34

The authors most strongly suggests that some large economic institutions have relied on models that assume that

- A) the behavior of households and firms has a larger effect on economies than it truly does.
- B) data-based forecasts evaluate more economic variables than they truly do.
- C) statistical problems with data-based forecasts are worse than they truly do.
- D) individuals and companies act in ways that are more predictable than they truly are.

35

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

- A) Lines 22-24 ("These... firms")
- B) Lines 27-30 ("Data-based... January")
- C) Lines 34-36 ("DSGE... January")
- D) Lines 37-40 ("In a... problems")

36

The passage indicates that Mankiw has criticized data-based forecasts on the grounds that they

- A) cannot confidently determine how all economic variables interact.
- B) include many economic variables that are likely to be of no importance.
- C) Assume that economic variable will be largely unchanged from year to year.
- D) fail to consider economic variables that are included in theory-based forecasts.

37

Which choice best experience the different meanings of “strong” as it is used in line 47 and line 61, respectively?

- A) Close, persuasive
- B) Clear, robust
- C) Forceful, firm
- D) Healthy, intense

38

As used in line 57, “produce” most nearly means

- A) create
- B) exhibit
- C) cause
- D) extend

39

According to the World Bank, only of the world’s ten fastest-growing economies in 2009 was among the world’s ten fastest-growing economies in 2014. Which lines from the passage best support the idea that economists should not find that fact surprising?

- A) Lines 63-66 (“A recent... forecasts”)
- B) Lines 68-69 (“Not...2014”)
- C) Lines 71-73 (“It is... crawling”)
- D) Lines 77-78 (“In other... speed up”)

40

According to the graph, the mean absolute difference between the actual growth rate and the growth rate predicted by IMF forecasts issued three months before the year being forecast was approximately

- A) 1.5 percentages points
- B) 2.0 percentages points
- C) 2.5 percentages points
- D) 3.0 percentages points

41

The data in the graph best support which conclusion about the IMF’s economic growth forecasts from 2000 to 2014?

- A) In general, they were less accurate in the early years of the period than were in the later years of the period.
- B) They tended to predict lower rates of economic growth than did forecasts issued by other institutions.
- C) Regardless of how many months they were issued before the period being forecast, they typically overestimated the growth rate by at least two percentage points.
- D) They tended to be more accurate when issued closer to the year being forecast than when issued farther in advance of the year being forecast.

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

This passage is adapted from Patricia Waldron, "The Herbivores Dilemma." ©2016 by Boyce Thompson Institute.

A recent study by Professor Georg Jander's group at the Boyce Thompson Institute (BTI), finds that corn plants may make serious trade-offs when defending themselves against multiple types of insects. Some corn varieties make themselves more vulnerable to aphids after generating defensive compounds against nibbling caterpillars. The results may lead to the development of corn plants that are naturally more resistant to certain insects.

"It's like a metabolic dilemma," said Vered Tzin, a first author and postdoctoral scientist in the Jander laboratory. "When caterpillars are feeding, there's a change in the metabolic pathway that makes chemical defense compounds that protect the plants from caterpillars. But when we studied aphids, it seems like the same compounds that make the plants caterpillar-resistant have the potential to make them aphid-susceptible."

Corn plants face an onslaught of different herbivorous insects that chew on leaves, pierce and suck out sap or plant cell fluids, bore into stems or consume the roots. Researchers estimate that insects consume 6–19 percent of the world corn crop each year, while also spreading bacteria and viruses between plants.

To defend against these attacks, corn plants have both physical and chemical defense mechanisms. To ward off aphids, plants make callose, a carbohydrate that can seal off openings between cells and to stop aphids from sucking out the sap from the tissues through their needle-like stylet. Callose formation is triggered by a defensive compound called DIMBOA. In the event of a caterpillar attack, plants produce a compound called MBOA that deters their feeding. Both MBOA and DIMBOA are in the same metabolic pathway and come from a molecule called a benzoxazinoid.

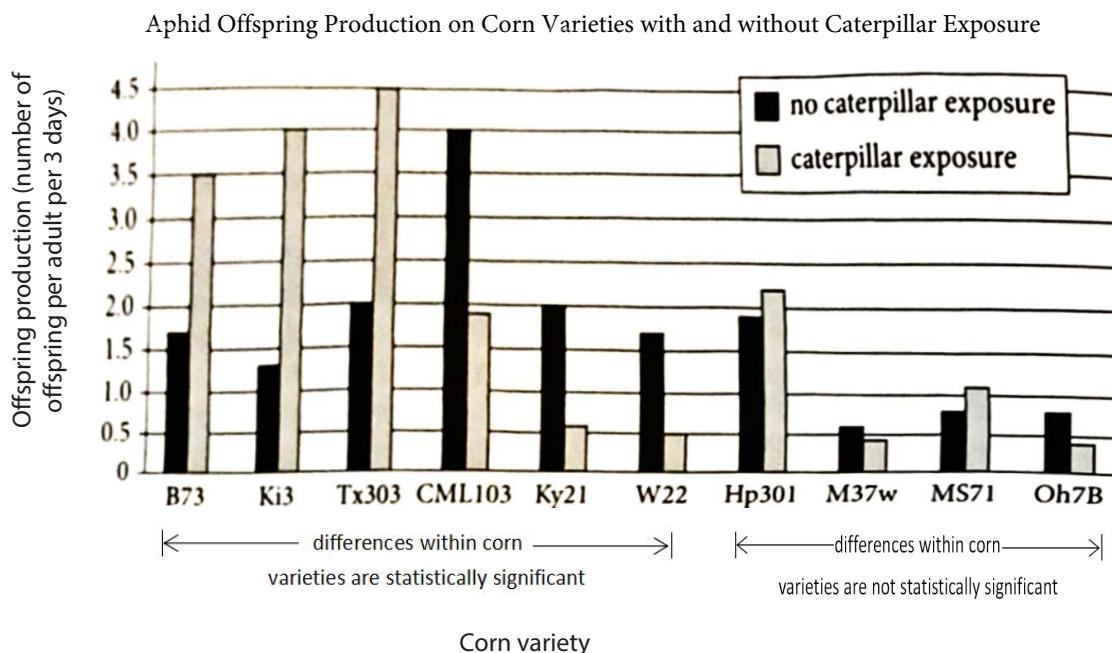
Because both defensive compounds come from the same parent molecule, the researchers suspected that feeding by one group of insects, such as chewing caterpillars, might affect the plant's ability to fight off another group, like aphids.

To test this idea, the researchers grew corn seedlings of a common variety, called B73, and exposed some to caterpillars. They then seeded them with aphids and counted the number of offspring that the aphids produced on pristine plants, compared to previously nibbled ones. The aphids consistently produced more offspring on corn that had been pre-chewed by caterpillars.

But, when the researcher tested other corn varieties, individual results would vary. They repeated the experiment with 17 different lines of corn from around the world. Like B73, some varieties supported more aphid offspring after a caterpillar feeding, while the pre-feeding reduced the number of aphids or had no effect on other varieties.

The variation they saw is likely due to the evolutionary history of the different corn varieties. Aphids tend to be more common in temperate areas, such as the Midwest, where they spread barley yellow dwarf virus and cereal yellow dwarf virus, while caterpillars are a larger problem in tropical areas. Different varieties likely arose from breeding programs aimed at fighting off the threats that corn faces in different environments.

To identify genes that may play a role in this interaction, the researchers bred B73 plants with another variety called Ky21, which hosted fewer aphid offspring after caterpillar feeding. Using a genetic approach, they identified three genome regions, on chromosomes 1, 7 and 10, that appear to have a significant impact on a corn plant's aphid susceptibility. By breeding for specific genetic variations that naturally reduce caterpillar and aphid damage, scientists can develop new crop varieties that will require fewer pesticide applications.



Adapt from Vered Tzin et al., "Genetic Mapping Shows Intraspecific Variation and Transgressive Segregation for Caterpillar-Induced Resistance in Maize." ©2015 by John Wiley & Sons Ltd.

42

- The main purpose of the passage is to
- present research findings that may have practical applications for corn producers.
 - argue that pesticide using by corn producers has made corn plants susceptible to insect infestation.
 - demonstrates a need to develop corn varieties that can thrive in a range of climates.
 - summarize research that led to the discovery of two defensive compounds found in corn plants.

43

- Which situation is most similar to the one described in lines 5-7 ("Some... caterpillars")?
- A bird expands energy searching for food but glides to conserve energy whenever possible.
 - A tortoise develops a heavy shell for protection but sacrifices some mobility in the process.
 - A bear hibernates in the winter and loses minimal body mass during that time.
 - A wolf eats more than its share of food and leaves the rest of its pack hungry.

44

- By describing the corn plants as “pristine” in line 47, the author most likely means that the plants
- A) had defended themselves successfully against aphids.
 - B) were developed in the laboratory using bioengineering.
 - C) had no exposure to caterpillars before being seeded with aphids.
 - D) showed no evidence of either bacterial or viral infection.

45

- As used in line 53, “lines” most nearly means
- A) rows
 - B) fields
 - C) strains
 - D) routes

46

- Which choice is an accurate statement regarding the relationship between the researchers’ initial hypothesis and the results of a experiment discussed in the passage?
- A) The results of the experiments fully confirmed the initial hypothesis.
 - B) The results of the experiments partially supported the initial hypothesis.
 - C) The results of the experiments suggested that the initial hypothesis was unclear.
 - D) The results of the experiments definitely disproved the initial hypothesis.

47

- Which choice provides the best evidence for the answer to the previous question?
- A) Line 43-45 (“To test... caterpillars”)
 - B) Line 45-47 (“They... ones”)
 - C) Line 52-54 (“They... world”)
 - D) Line 54-57 (“Like... varieties”)

48

- According to the passage, the difference varieties of corn might have arisen from a need for corn producers to
- A) guard against local dangerous.
 - B) increase nutritional value.
 - C) standardize the quality of production.
 - D) record evolutionary tendencies.

49

- According to the graph on which corn variety without caterpillar exposure was the aphid offspring production greatest?
- A) B73
 - B) Ki3
 - C) Tx303
 - D) CML103

50

According to the graph, which statements regarding aphid offspring is accurate?

- A) On each of Ky21 and W22, the number of aphid offspring approximately the same with caterpillar exposure as it is without caterpillar exposure.
- B) Without caterpillar exposure, the number of aphid offspring on B73 is greater than the number of Ki3, but with caterpillar exposure the reverse is true.
- C) On Tx303, the number of aphid offspring for both caterpillar exposure and no caterpillar exposure is greater than that of any other corn variety.
- D) With caterpillar exposure, the number of aphid offspring on CML103 is greater than the number on Ki3, but without caterpillar exposure the difference is less pronounced.

51

Based on information provided in the passage and the data in the graph, it be reasonable to surmise that B73 and Ki3

- A) can thrive in similar conditions
- B) are common in a wide variety of habitats
- C) require the use of artificial pesticides
- D) have uncertain evolutionary histories?

52

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

- A) Lines 35-37 (“Both... benzoxazinoid”)
- B) Lines 64-66 (“Different... environment”)
- C) Lines 67-70 (“To identify... feeding”)
- D) Lines 74-77 (“By breeding... applications”)

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.

Money goes Grow on Trees

According to a 2012 report by the US Forest Service, the number of trees in America cities 1 have been in sharp decline, with an estimated loss of about 4 million tress each year. This loss is due to many 2 factors. Two of these factors are urban development and lack of replanting when tree die of natural clauses. While their value is often overlooked, trees are an environmental and economic asset; trees, like the building s around them, form a vital part of a city’s infrastructure , making their preservation well worth the investment.

1

- A) NO CHANGE
- B) are
- C) is
- D) were

2

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

- A) factors, among which are the following two:
- B) factors; two of them are
- C) factors; among these factors are
- D) factors, including

Tree create healthier urban ecosystems. Mitigating the air pollution that often results from urban development, city trees remove an estimated 700 million metric tons of carbon dioxide (CO₂) from the air each year and also produce atmospheric **3** oxygen.

Increasing the amount of oxygen available for humans and other organisms. Trees also help moderate extreme conditions, regulating temperatures by blocking summer sunlight and blunting winter winds and reducing flooding by absorbing rainwater.

3

- A) NO CHANGE
- B) oxygen, this increases
- C) oxygen, increasing
- D) oxygen, thus, they increase

These environmental benefits **4** amount to significant saving for cities. Mature trees near buildings reduce annual cooling and heating costs by up to 12 percent, cities that cultivate trees are also **5** able, additionally, to offset the expense of water-management systems and minimize costs associated with flood damage. For example, according to a 2007 study by the Portland, Oregon, Parks and Recreation Department, trees reduce energy costs by \$75,1000 annually, save the city \$11.5 million in storm-water processing, and **6** contributing \$13.7 million in aesthetic benefits. Perceived as a cleaner, more attractive place to live and work, **7** many trees bring a city the added benefits of higher property values.

4

Which choice best introduces the topic of the paragraph?

- A) NO CHANGE
- B) extend to rural settings across the United States.
- C) have been challenged, however, by a number of recent studies.
- D) mean that trees should never be taken for granted.

5

- A) NO CHANGE
- B) able to offset, in terms of cost, the expense of
- C) able to offset and compensate for
- D) able to offset the expense of

6

- A) NO CHANGE
- B) the contribution of
- C) to contribute
- D) contribute

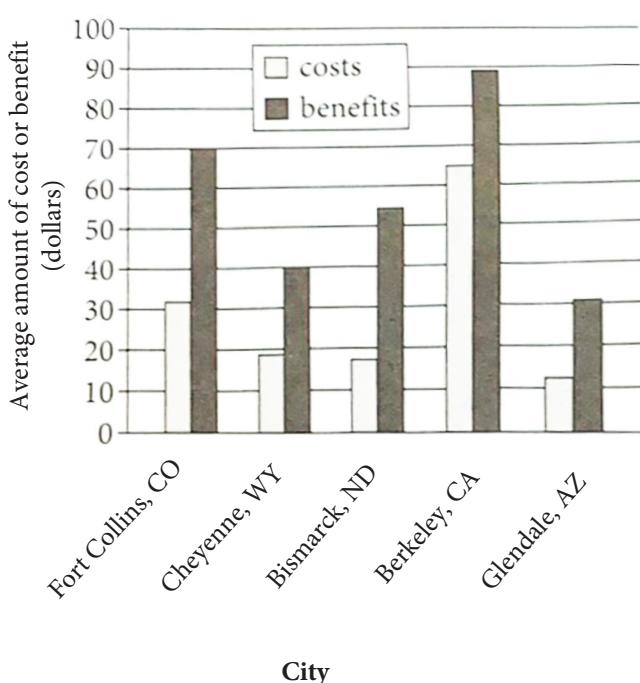
7

- A) NO CHANGE
- B) a city with many trees also benefits from higher property values
- C) higher property values are another benefit brought to a city with many trees.
- D) in a city with many trees, higher property values are an added benefit.

Some claim that maintain trees is too expensive, as a city incurs costs for such things as planting, pruning, and tree-waste removal. **8** For example, a 2005 study of tree costs and benefits in five US cities demonstrated that trees offer an ample return on investment. In each city, the financial benefits of trees(including energy savings, atmospheric CO₂ reductions, and air quality benefits)exceeded costs, on average. Fort Collins, Colorado, for instance, incurred **9** about \$32 in costs per tree, but each tree produced about \$70 in benefits.

10 Furthermore, the city of Glendale, Arizona, spent the least money: a mere \$12 per tree, roughly.

Average Annual Costs and Benefits per Tree in Five US Cities.

**8**

- A) NO CHANGE
- B) Alternatively,
- C) However,
- D) After all,

9

Which choice provides accurate information from the graph?

- A) NO CHANGE
- B) less in costs than did Bismarck, North Dakota
- C) about \$18 in costs per tree
- D) more in costs than did Berkeley, California

10

The writer wants to include information from the graph that supports the paragraph's point about the relationship between costs and benefits. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) The cities of Cheyenne, Wyoming, and Bismarck, North Dakota, spent close to the same average among per tree, about \$19 and \$18 , respectively.
- C) Neither the costs nor the benefits in any of the five cities exceeded about \$90 per tree.
- D) Though the city of Berkeley, California, spent most money (about \$65 per tree), it also saw large benefits (about \$89 per tree).

Overall, every dollar spent on 11 trees, generates between \$1.37 and \$3.09 in economic benefits. With tree's vast potential to enhance the ecological and fiscal health of cities, it is clear that money spent on trees is money well spent.

11

- A) NO CHANGE
- B) trees generates
- C) trees generates,
- D) trees, generates:

Questions 12–22 are based on the following passage.

Voynich Manuscript: The world's Hardest Puzzle

The Voynich Manuscript is a book of nearly 200 pages of fantastical illustrations and elegant calligraphy that might provide valuable information to historians and linguists alike; the problem is that no one can read it. Name for the 12 bookseller, who found it in a Italian monastery in 1912, the manuscript is widely believed to have been written in the fifteenth century. The manuscript is sometimes considered to be a 13 hoax. This is because it is written in what is either an unknown language or gibberish. Despite the fact that 14 image's of the pages of the manuscript are widely available on the 15 Internet; no one has yet been able to definitively determine the meaning or purpose of the book. The public nature of the mystery provides the most likely avenue for its solution: the more people who examine the manuscript, the 16 longer it may take for its secrets to be detailed.

12

- A) NO CHANGE
- B) bookseller; who
- C) bookseller—who,
- D) bookseller who

13

Which choice best combines the sentences at the underlined portion?

- A) hoax; therefore, it
- B) hoax, as it
- C) hoax, and what makes it so is that it
- D) hoax, being that manuscript

14

- A) NO CHANGE
- B) image's of the pages'
- C) images of the pages
- D) images' of the pages

15

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

16

The writer wants to clarify the idea stated in the first part of the sentence. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) more its secrets are likely to remain hidden
- C) more often its secrets may be appreciated
- D) sooner its secrets may be revealed

Researchers from many different fields have taken on the task of deciphering the manuscript. Approaching it as an encrypted message to decode, 17 the manuscript has been examined by cryptologists using every available decryption method, not one of which has been successful. Most cryptologists, 18 alternately, have concluded that the manuscript either is not written in code at all or is written in a code so complex that it is impervious to current decoding techniques.

17

- A) NO CHANGE
- B) cryptologists have examined the manuscripts using
- C) examination of the manuscript by cryptologists has used
- D) the manuscript's examination by cryptologists has used

18

- A) NO CHANGE
- B) instead,
- C) therefore,
- D) similarly,

Other researchers have taken a more statistical approach, examining how frequently different arrangements of letters occur in various sections of the manuscript. **19** Considering a different theory, physicist Marcelo Montemurro found that certain arrangements appear with greater frequency in certain sections. This phenomenon occurs naturally in texts written in real languages, and it is very difficult to fake, which has convinced Montemurro and others that the manuscript is probably not, in fact, pure nonsense.

Instead of focusing on the text of the manuscript, some investigators have concentrated chiefly on the ornate illustrations of plants that are unrecognizable to modern-day botanists. The presence of so many botanical illustrations has led some researchers to claim that the manuscript's purpose was to disseminate ancient Greek ideas about the **20** structures, functions, and how plants were used. These researchers may have determined a plausible reason for the text even if they cannot read what, if anything, it says. **21**

19

- A) NO CHANGE
- B) Despite this method's advantages,
- C) Instead of advocating that approach,
- D) In one recent analysis,

20

- A) NO CHANGE
- B) plant structures, their functions, and use.
- C) structures, functions, and uses of plants.
- D) structures, the functions of plants, and their uses.

21

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

The ancient text *De Pnatis* by Nicolaus of Damascus, some speculate, could be the source for the botanical ideas in the manuscript.

Should the writer make this addition here?

- A) Yes, because it offers an effective conclusion to the main idea of the paragraph.
- B) Yes, because it gives proof of the manuscript's purpose as indicated earlier in the paragraph.
- C) No, because it undermines the main idea developed in the paragraph.
- D) No, because it introduces a detail that is not sufficiently developed or logically placed in the paragraph.

Satisfactory answers to all the questions raised by the manuscript have yet to be found , but as continued research adds to the cumulative knowledge about this curious document, we inch ever closer to the answers. With international specialists and hobbyists drawing on their varied areas of expertise, the Voynich Manuscript may not keep its secrets forever.

22

- A) NO CHANGE
- B) inquisitive
- C) meddlesome
- D) enthusiastic

Question 23-33 are based on the following passage.

Illuminating the Future with Blue LEDs

Japanese researchers Isamu Akasaki, Hiroshi Amano, and Shuji Nakamura solved a problem that had puzzled scientists for decades: **23** figuring out what a blue LED(light-emitting diode) is. Though blue LEDs—necessary to produce white light as well as a full spectrum of color when combined with red and green LEDs—had been theoretically possible, no one had been able to build a stable and practical version until these researchers succeeded, making a major contribution to consumer electronics.

23

Which choice most effectively sets up the discussion that follows in the passage?

- A) NO CHANCE
- B) how to make a blue LED(light-emitting diode).
- C) finding a use for blue LEDs(light-emitting diodes).
- D) how to combine red and green LEDs (light-emitting diodes) to create blue light.

[1] LEDs were first developed in the 1950s by scientists [24] playing around with semiconductors, crystals that have increased electrical conductivity at high temperatures or after impurities [25] have been added to the crystalline structure.[2] LEDs are composed of layers of semiconducting compounds. [3] One layer, called the n-layer, is negatively charged, meaning it has excess electrons.[4] The other layer, the p-layer, has positively charged “holes”, which are locations that lack electrons.[5] Between the two layers [26] are an additional layer of active material that regulates how electrons flow between the n-layer and the p-layer.[6] When a voltage is applied, this drives the excess electrons of the n-layer and the holes of the p-layer into the active layer.[7] The type of semiconducting compound determines the amount of energy the electrons lose and thus the wavelength, and color, of the light produced. [27]

24

Which choice most closely matches the style and tone established earlier in the passage?

- A) NO CHANCE
- B) experimenting
- C) messing
- D) trying out this and that

25

- A) NO CHANCE
- B) are being
- C) had been
- D) will be

26

- A) NO CHANCE
- B) were
- C) is
- D) was

27

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

As the excess electrons combine with the holes, the electrons lose energy and emit light.
To make the paragraph most logical, the sentence should be placed

- A) after sentence 2.
- B) after sentence 4.
- C) after sentence 5.
- D) after sentence 6.

Using gallium arsenide and other compounds, scientists were able to produce red and green LEDs; **28** however, a third color, blue, was needed to produce white light and full color. Researchers believed the semiconductor gallium nitride (GaN) would produce blue light, but **29** one could not create GaN crystals that were **30** suitably large. Most scientists gave up on GaN, but working at Nagoya University, Akasaki and his graduate student Amano remained convinced that it could be used to create blue LEDs.

28

- A) NO CHANCE
- B) in fact,
- C) indeed,
- D) conversely,

29

- A) NO CHANCE
- B) you
- C) they
- D) he or she

30

- A) NO CHANCE
- B) agreeably
- C) truly
- D) legitimately

In 1986 [31] Akasaki and Amano, found that they could get large GaN crystals to grow if they started the growth on an intermediate layer of sapphire. At around the same time, Nakumura, a scientist at Nichia Corporation, started creating large GaN crystals by growing a thin GaN layer at a low temperature and then growing additional layers at higher temperatures. [32] By 1992 both the Akasaki-Amano team and Nakumura had created blue LEDs using GaN, and Nakumura ‘s manufacturing techniques made it possible to mass-produce blue LEDs. Because of these researchers’ persistence, it is now possible to produce white light using LEDs, and the screens on many of today’s electronics show a full array of colors achieved through the mixing of red, [33] green, and, once-elusive blue light.

31

- A) NO CHANCE
- B) Akasaki, and Amano found
- C) Akasaki and Amano found
- D) Akasaki and Amano found:

32

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

Akasaki, Amano, and Nakamura would win the 2014 Nobel Prize in Physics for their work on blue LEDs.

Should the writer make this addition here?

- A) Yes, because it anticipates a potential objection to the passage’s main point.
- B) Yes, because it elaborates on a statement made in the previous paragraph.
- C) No, because it fails to provide useful information for understanding the impact of the researchers’ work.
- D) No, because it disrupts the paragraph’s pattern of development.

33

- A) NO CHANCE
- B) green; and
- C) green; and,
- D) green, and

Questions 34-44 are based on the following passage.

A (Co-)Optimal Workplace

Traditionally, businesses are run by owners who finance the company with large investments, take in most of the profits, and make major decisions about hiring and operations. Worker cooperatives(or co-ops) are different : rather than being owned by investors , co-ops are owned and operated by their workers. Co-op employees purchase an ownership stake in the company when they are hired and are therefore entitled to a share of profits and a voice in management **34** decisions. The co-op model is an effective way to balance the preferences of workers with the imperative for businesses to be competitive.

34

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

decisions,which are determined by worker consensus rather than by managers issuing directions.

Should the writer make this revision?

- A) Yes,because it supplies relevant information about one way in which co-ops differ from traditional models.
- B) Yes, because it provides clarification on why co-ops are more successful than traditional models.
- C) No, because it introduces new information about co-ops that is never explained in the passage.
- D) No, because it makes a claim about co-ops that undermines the information in the next paragraph.

Worker co-ops provide more opportunities and incentives for worker participation than traditional companies do. Whereas traditional companies sometimes have management that is removed from the day-to-day operations of the [35] business, but worker-managed co-ops typically [36] appoint a manager that all employees agree upon. Dana Curtis, a worker at the Black Star co-op, recalls how may good ideas her coworkers proposed to deal with long lines: "When we have struggles, we have really creative ways of solving them," she said, "we have so many minds that see the everyday work." Workers are [37] super excited to make the business more efficient because, as owners as well as employees, they directly benefit from any process improvements that may increase the company's profitability.

35

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

36

Which choice best sets up the discussion that follows in the paragraph?

- A) NO CHANGE
- B) demonstrate an excellent record of preventing job losses.
- C) maintain a positive approach to problems.
- D) draw on the firsthand experience of workers in order to promote effective practices.

37

- A) NO CHANGE
- B) ecstatically thrilled about making
- C) eager to make
- D) stoked about making

A study of the Spanish retail chain Eroski-part of Spain's worker co-op consortium Mondragon-
38 would provide data demonstrating the efficiency of co-ops. Eroski stores are operated on multiple ownership models so that 39 some are co-ops and others are traditional investor -owned businesses. Comparing the growth of stores that use the different models, researchers from the Institute for the Study OF labor in Bonn,Germany,found that the co-ops tended to expand as fast as or faster than 40 those of the other stores did. The researchers concluded that co-ops can be as effective as traditional businesses and are likely 41 for being especially competitive in 42 industries in which worker's level of motivation is critical.

38

- A) NO CHANGE
- B) had provided
- C) has provided
- D) will have provided

39

- A) NO CHANGE
- B) some, on the one hand ,are co-ops, and others, on the other hand,
- C) some Eroski stores are co-ops; other Eroski stores
- D) some are co-ops and others-the ones that are not co-ops—

40

- A) NO CHANGE
- B) the other stores did.
- C) they found at the other stores.
- D) the ones at the other stores did.

41

- A) NO CHANGE
- B) in being
- C) to be
- D) is to be

42

- A) NO CHANGE
- B) industries' in which workers'
- C) industries in which workers'
- D) industry's in which workers

Co-ops are not without their downsides. Increased participation in decision making can be frustrating or stressful for workers. **43** For example, Curtis recalls her annoyance at having to discuss ketchup dispensers—something she had no opinion on—over and over in meetings. Still, while acknowledging the drawbacks, Curtis insists that she is glad to work at a co-op. And it is easy to see why: co-ops provide an effective way to run a business that **44** allows employees to know that their hard work never goes just to benefit someone else.

43

- A) NO CHANGE
- B) However,
- C) In comparison,
- D) Furthermore,

44

The writer wants a concluding sentence that restates the main claim of the passage. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) guarantees employees financial stability even in times of economic stagnation.
- C) uplifts employees and offers them opportunities to further their careers.
- D) offers employees control over their work and an increased share of its rewards.

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 – No Calculator

25 MINUTES, 20 QUESTIONS

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

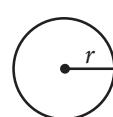
DIRECTIONS

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.

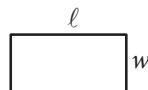
NOTES

- The use of a calculator is not permitted.
- All variables and expressions used represent real numbers unless otherwise indicated.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures lie in a plane unless otherwise indicated.
- 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.

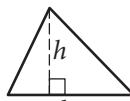
REFERENCE



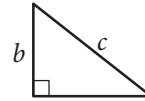
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



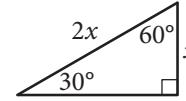
$$A = \ell w$$



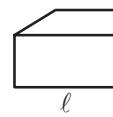
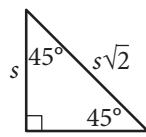
$$A = \frac{1}{2}bh$$



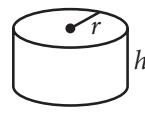
$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = \ell wh$$



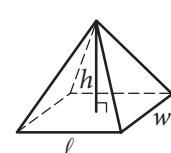
$$V = \pi r^2 h$$



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



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



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

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

If $x + 3 = 11$, what is $x + 9$?

- A) 17
- B) 20
- C) 23
- D) 33

3

Which of the following is equivalent to $(2u + 1)(4u + 3)$?

- A) $6u + 4$
- B) $6u^2 + 9u + 4$
- C) $8u^2 + 3$
- D) $8u^2 + 10u + 3$

2

$$T(m) = 4m + 20$$

The function T defined above models the temperature, in degrees Celsius ($^{\circ}\text{C}$), of the fluid in a beaker after m minutes of heating. Based on the model, what is the predicted temperature of the fluid after 11 minutes of heating?

- A) 24°C
- B) 31°C
- C) 35°C
- D) 64°C

4

Several values of the linear function f are shown in the table below.

x	$f(x)$
1	-15
5	-35
10	-60

Which of the following could represent f ?

- A) $f(x) = -5(5x - 2)$
- B) $f(x) = -5(5x - 3)$
- C) $f(x) = -5(x + 2)$
- D) $f(x) = -5(x - 3)$

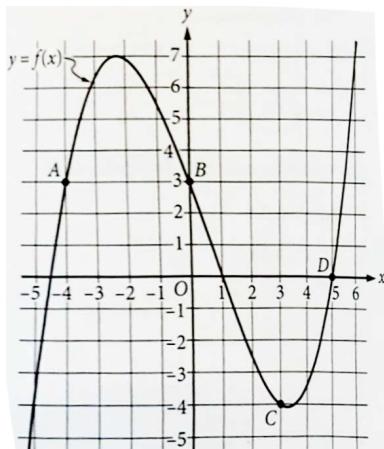


5

A rectangle has width w inches and area A square inches. The length, in inches, of the rectangle is 3 less than twice the width. Which of the following equations represents A in terms of w ?

- A) $A = 2w^2 - 3w$
- B) $A = 2w^2 + 3w$
- C) $A = 3w^2 - 2w$
- D) $A = 3w^2 + 2w$

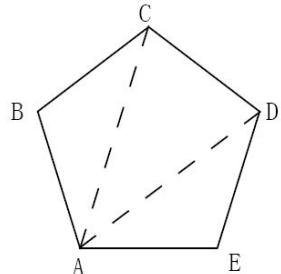
6



The graph of the function f is represented in the xy -plane above. Which of the following points indicates $f(-4) = 3$?

- A) Point A
- B) Point B
- C) Point C
- D) Point D

7



What is the sum of the measures of the interior angles of pentagon $ABCDE$ above?

- A) 360°
- B) 540°
- C) 720°
- D) 900°

8

$$\begin{aligned} 2x + y &= 4 \\ 6x + 5y &= 16 \end{aligned}$$

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

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



9

What is the x -intercept of the graph of $2x+4y=24$ in the xy -plane?

- A) (12,0)
- B) (6,0)
- C) (4,0)
- D) (2,0)

10

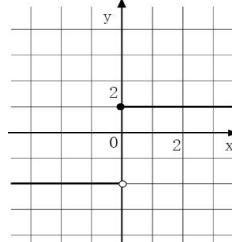
How many values of x satisfy the equation $\sqrt{x+2} = x$?

- A) None
- B) One
- C) Two
- D) More than two

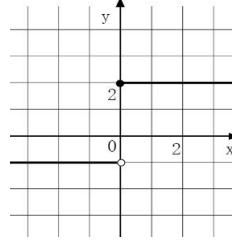
11

The piecewise-defined function h is defined by $h(x)=2$ for $x \leq 0$ and $h(x)=-1$ for $x > 0$. Which of the following represents the graph of $y = h(x)$ in the xy -plane?

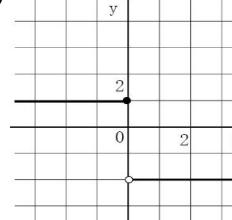
A)



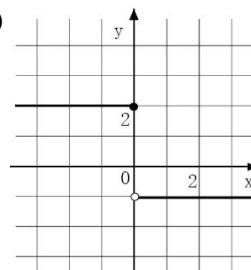
B)



C)



D)





12

$$f(x) = 6x - 0.4$$

The given function models the approximate age, in years of a particular species of oak tree with an x -inch trunk diameter, where $x > 2$. Which of the following is the best interpretation of $f(15) = 89.6$ in this context?

- A) An oak tree with a 15-inch trunk diameter is approximately 89.6 years old.
- B) An oak tree with an 89.6-inch trunk diameter is approximately 15 years old.
- C) The trunk diameter of an oak tree that is 15 years old is increasing at a rate of 89.6 inches per year.
- D) The trunk diameter of an oak tree that is 89.6 years old is increasing at a rate of 15 inches per year.

13

The function of f is defined by $f(x) = 75(0.5)^x$. Which of the following best describes the point $(0, f(0))$ in the xy -plane?

- A) It is the x -intercept of the graph of the function f .
- B) It is the y -intercept of the graph of the function f .
- C) It is the minimum value of the function f .
- D) It is the maximum value of the function f .

14

To study amoebae in pond water, a student completely filled two cube-shaped containers with samples of pond water. When filled, the first container held 27 cubic centimeters of pond water. The length of each side of the second container was twice the length of each side of the first container. How many cubic centimeters of pond water did the second container hold when filled?

- A) 54
- B) 108
- C) 216
- D) 729

15

A truck rental company charges a flat fee of \$ 84.99 for renting a truck and \$0.99 for every ten miles driven. Chantel paid a total of \$205.77 for a rental truck. If x is the number of miles that chantel drove the truck, which of the following equations represents this situation?

- A) $205.77 = 84.99x + 0.99$
- B) $205.77 = 84.99x + 0.099$
- C) $205.77 = 84.99 + 0.99x$
- D) $205.77 = 84.99 + 0.099x$

**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.
Grid in result.

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

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

Answer: 2.5

	2	.	5
.	/	/	.
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

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

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

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

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

3**3**

16

What is the positive solution of $|2x - 6| = 9$?

17

$$20x^2 - 13x + 2 = 0$$

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

18

$$x + 2y = 4$$

$$2x + ay = 8$$

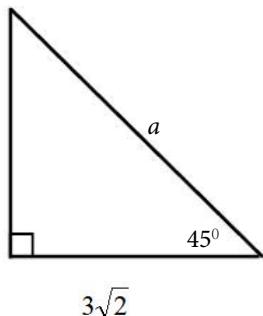
In the system of equations above, a is a constant. If the system has infinitely many solutions, what is the value of a ?

3



3

19



The side opposite the right angle in the triangle above has length a . What is the value of a ?

20

$$\frac{x^2}{x-3} = \frac{x+15}{2x-6}$$

The expression above is equivalent to $ax + b$ for all value of x , where $x \neq 3$ and a and b are constants. What is the value of b ?

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.

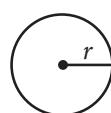
DIRECTIONS

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

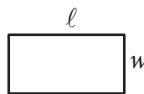
1. The use of a calculator is permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



$$A = \pi r^2$$

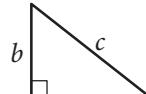
$$C = 2\pi r$$



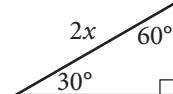
$$A = \ell w$$



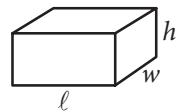
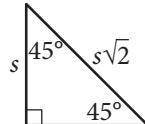
$$A = \frac{1}{2}bh$$



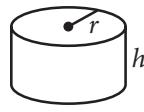
$$c^2 = a^2 + b^2$$



Special Right Triangles



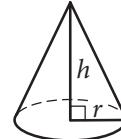
$$V = \ell wh$$



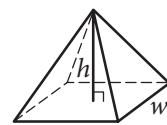
$$V = \pi r^2 h$$



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



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



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

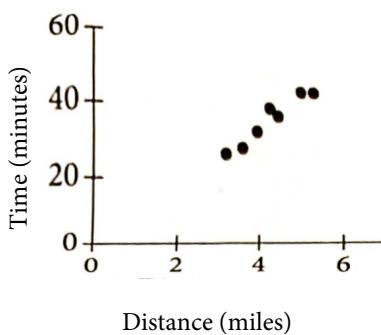
The number of degrees of arc in a circle is 360.

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

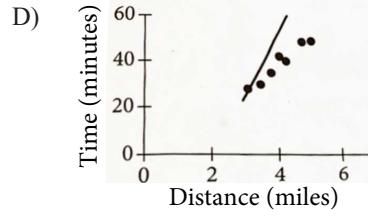
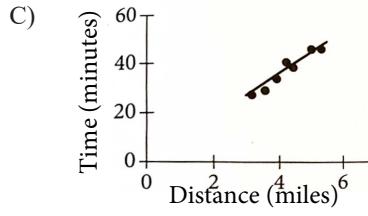
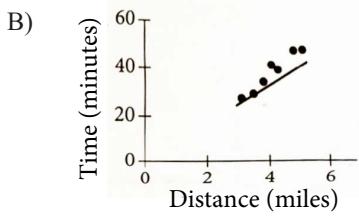
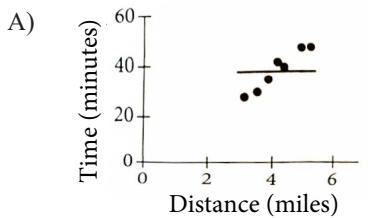
The sum of the measures in degrees of the angles of a triangle is 180.



1



The scatterplot above shows the relationship between the distance run, in miles, and the time, in minutes, for seven runners. Of the following, which includes the most appropriate linear model for the data?



2

A ruby-bearing rock sample weighing 1.36 metric tons was collected. On average, each metric ton of ruby-bearing rock yields approximately 250 grams of rubies. At this rate, approximately how many grams of rubies will the 1.36-metric-ton sample yield?

- A) 90
- B) 183
- C) 340
- D) 3400

**Question 3–5 refer to the following information.**

Jacqueline is planning to sell gumballs from machines she placed in front of 4 stores at no cost. She spent \$520 to purchase 4 empty gumball machines and 10,000 gumballs. (Assume there is no tax.)

3

Jacqueline expects to sell a total of 500 gumballs per week. At this rate, how many weeks will it take to sell all the gumballs from her initial gumball purchase?

- A) 5
- B) 19
- C) 20
- D) 130

4

If Jacqueline sells each gumball for \$0.25, how many gumballs must she sell to receive an amount of money equal to her total initial cost for the 4 empty gumball machines and the 10,000 gumballs?

- A) 21
- B) 130
- C) 400
- D) 2,080

5

Jacqueline's profit is the difference between her total revenue from selling gumballs and her total initial cost for the 4 empty gumball machines and the 10,000 gumballs. If she sells each gumball for \$0.25 and she sells x gumballs, which of the following functions P gives her profit?

- A) $P(x) = 0.25x - 520$
- B) $P(x) = \frac{x}{0.25} - 520$
- C) $P(x) = 520 - 0.25x$
- D) $P(x) = 520 - \frac{x}{0.25}$



6

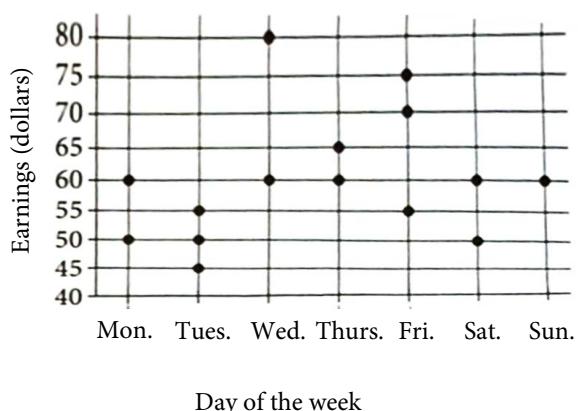
Number of Students, by Grade, at Two High Schools

		High School		Total
		A	B	
Grade	9th	131	145	276
	10th	142	183	325
	11th	184	152	336
	12th	110	150	260
	Total	567	630	1,197

The table above shows the number of students at High School A and High School B by grade. What fraction of the students in High School A are in the 9th grade

- A) $\frac{131}{276}$
- B) $\frac{131}{567}$
- C) $\frac{131}{1,197}$
- D) $\frac{276}{1,197}$

7

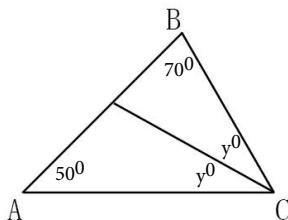


The graph above shows the amount of money, in dollars, that Jon earned on 15 of the 16 days he worked during the month of April. The money Jon earned on one of the two Sundays he worked is missing from the graph. The combined amount Jon earner on the two Sundays he worked was \$20 more than the combined amount he earned on the two Mondays her worked. How much did he earn on the Sunday that is missing from the graph?

- A) \$65
- B) \$70
- C) \$75
- D) \$80



8



In triangle ABC above, what is the value of y ?

- A) 30
- B) 40
- C) 50
- D) 60

10

$$\begin{aligned}3x^5 - 2x^2 \\-3x^5 - 2x^2\end{aligned}$$

Which of the following is equivalent to the sum of the two expressions above?

- A) 0
- B) $-4x^2$
- C) $6x^5$
- D) $6x^5 - 4x^2$

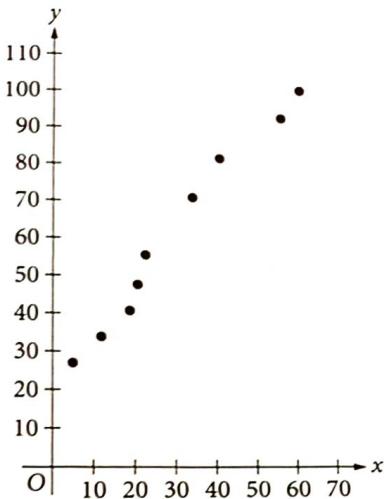
9

If $12x - 36 = -6$, what is the value of $x - 3$?

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



11



The scatterplot in the xy -plane above shows mine data points. Of the following, which best approximates an equation for a line of best fit (not shown) for the data?

- A) $y = 1.35x + 21$
- B) $y = 0.85x + 50$
- C) $y = -0.85x + 21$
- D) $y = -1.35x + 188$

12

During a sports tournament, teams compete during 4 rounds of play. There are 16 teams competing during the first round of the tournament. At the end of each round, half of the teams competing will be eliminated from the tournament. If r teams remain in the tournament after x rounds of play, which of the following gives r in terms of x ?

- A) $r = \frac{1}{2}(16^x)$
- B) $r = \frac{1}{2}x^{16}$
- C) $r = 16(\frac{1}{2})^x$
- D) $r = 16x^{\frac{1}{2}}$

13

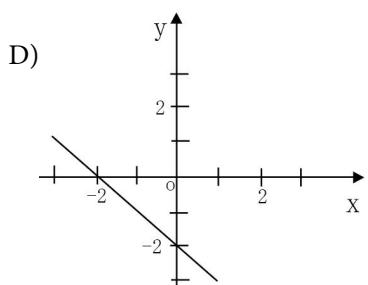
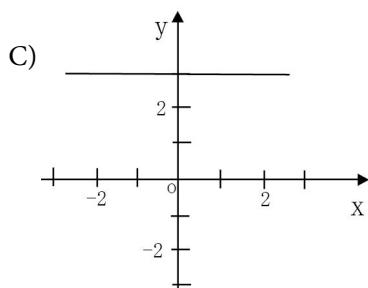
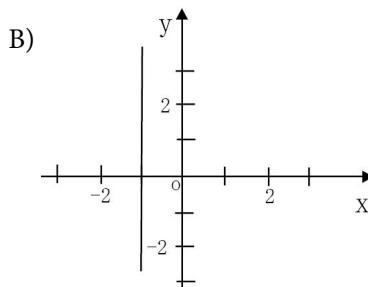
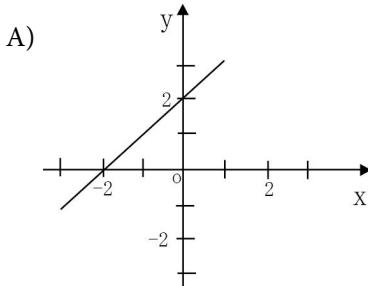
The volume of a right circular cylinder is 768 cubic inches, and the base of the cylinder has an area of 64 square inches. What is the height, in inches, of the cylinder?

- A) 10
- B) 12
- C) 14
- D) 16



14

In the xy -plane, line l is parallel to the line that has equation $y = -x + 3$. Which of the following could be the graph of line l ?



15

$$939,887,974 = 365.26x$$

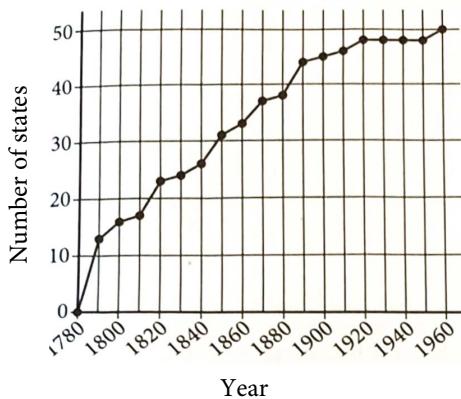
In the equation above, the number 939,887,987 represents the length, in kilometers (km), of Earth's orbit about the Sun and 365.26 represents the time, in days, that Earth takes to travel that distance. What does x represent in the equation?

- A) The radius, in km, of Earth's orbit
- B) The diameter, in km, of Earth's orbit
- C) The speed, in km/day, Earth travels around the Sun
- D) The distance, in km, Earth travels in one year



16

Total Number of States in the United States



The line graph above shows the total number of states in the United States at 10-year intervals from 1780 through 1960. Approximately what fraction of the 50 states in the United States became states after 1820 but before or during 1860?

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

17

Which of the following equations defines a line in the xy -plane that crosses the positive x -axis and the positive y -axis?

- A) $8x + 12y = 24$
- B) $6x - 4y = 18$
- C) $2x - 3y = -6$
- D) $-3x + 2y = 6$

18

A sample of 200 bags of flour was selected at random from a production line, and the weights of the bags were analyzed. The mean weight was found to be 79.82 ounces(oz.) The margin of error associated with the estimate is 0.24oz. Based on the estimate and margin of error , which of the following is the most plausible conclusion about the mean weight of all bags flour produced on the line?

- A) It is less than 79.82 oz.
- B) It is greater than 79.82 oz.
- C) It is less than 79.58 oz or greater than 80.06 oz.
- D) It is between 79.58 oz and 80.06 oz.



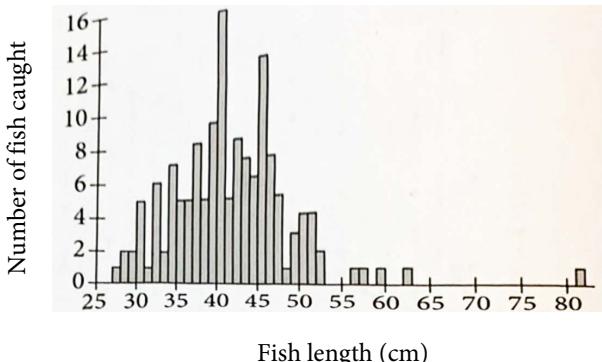
19

$$P(x) = \frac{20 + 5x}{x}$$

A gym charges a \$20 monthly membership fee and an additional \$5 per class. The function P defined above determines the average price paid per class , in dollars , for taking x classes. During the month of January, Esther paid an average of \$7.50 per class. How many classes at the gym did Esther take in January?

- A) 3
- B) 4
- C) 6
- D) 8

20



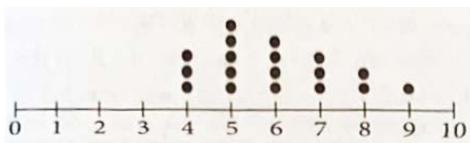
The recorded lengths , in centimeters(cm),of fish caught in a certain inlet during a particular year are shown in the histogram above. The largest fish caught that year was recorded as 82 cm but actually measured 65cm . How would the mean and median of the data be affected if the length of the largest fish had been recorded correctly?

- A) The mean and median would be less.
- B) The mean and median would remain the same.
- C) The mean would be less ,and median would remain the same.
- D) The mean would remain the same ,and median would be less.

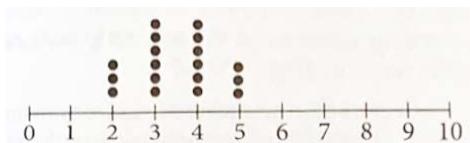


21

Data Set A



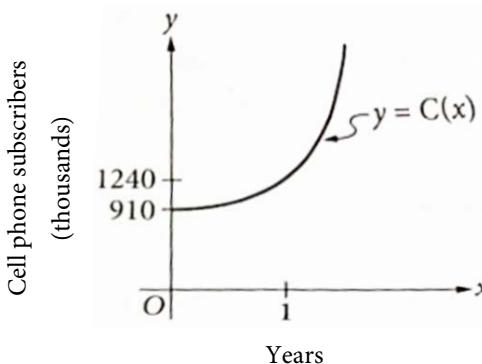
Data Set B



The dot plots above represent the distributions of two data sets. How do the mean and standard deviation of data set A compare with the mean and standard deviation of data set B?

- A) The mean of data set A is greater than that of data set B, and the standard deviation of data set A is less than that of data set B.
- B) The mean of data set A is greater than that of data set B, and the standard deviation of data set A is greater than that of data set B.
- C) The mean of data set A is less than that of data set B, and the standard deviation of data set A is less than that of data set B.
- D) The mean of data set A is less than that of data set B, and the standard deviation of data set A is greater than that of data set B.

22



The number of cell phone subscribers in the United States $C(x)$, in thousands, x years after 1985 can be modeled by $C(x)=910(b)^x$, where b is a constant and $0 \leq x \leq 25$. A graph of $y = C(x)$ in the xy -plane is shown in the figure above. According to the graph, which of the following could be the value of b ?

- A) 1.36
- B) 0.73
- C) -0.73
- D) -1.36

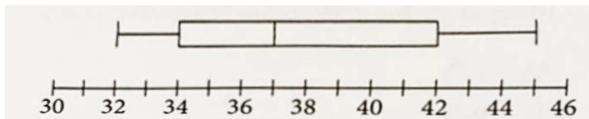


23

A line in the xy -plane contains the points $(k, 2k)$ and $(2k, 3k)$, where k is a nonzero constant. Which of the following is an equation of the line in terms of k ?

- A) $y = kx$
- B) $y = -kx$
- C) $y = x + k$
- D) $y = -x + k$

24



Shoal bass length

A marine biologist is studying a habitat that contains fish called shoal bass. The box plot above summarizes the lengths, in centimeters(cm),of a sample of 65 shoal bass from that habitat. What is the range, in cm, of the lengths of the shoal bass in the sample ?

- A) 8
- B) 13
- C) 28
- D) 37

25

To investigate whether the use of daily quizzes improves the academic performance of students at City High School, a sample of 100 of the 2,124 students at the school was selected to participate in a study. For the study, 50 of the students selected received a daily quiz and the rest establish a cause-and-effect relationship between the use of daily quizzes and the academic performance of students at City High School?

- I. Random selection of students from City High School to participate in the study
 - II. Random assignment of students to receive a daily quiz
- A) Neither
 - B) I only
 - C) II only
 - D) I and II



26

$$\frac{2x}{4x-6} - \frac{x}{2x-3} = 0$$

How many solutions does the equation above have?

- A) None
- B) One
- C) Two
- D) Infinitely many

27

x	-1	0	1
$F(x)$	0	1	2

For the linear function f , the table above shows several value of x and their corresponding values of $f(x)$. The function g is defined by $g(x)=x+b$, where b is a constant. If $g(x) > f(x)$ for all values of x , which of the following could be the value of b ?

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

28

On Arbor Day this year, a young dawn redwood tree was planted. A botanist predicts that the tree's height on Arbor Day next year will have increased 125% of its height when it was planted. If h represents the tree's height when planted, which of the following represents the botanist's predicted height of the tree on Arbor Day next year?

- A) 0.25h
- B) 1.25h
- C) 2.25h
- D) 12.25h



29

In the system of equations below, a is a constant.

$$\begin{aligned}4x - 3y &= 9 \\y &= ax + 2\end{aligned}$$

For which value of a will the system of equations have no solution (x, y)?

- A) $-\frac{4}{3}$
- B) $-\frac{3}{4}$
- C) $\frac{3}{4}$
- D) $\frac{4}{3}$

30

$$f(x) = -3x^2 + 24x - 36$$

The function f is defined by the equation above. In which of the following equivalent forms of the equation does the maximum value of $f(x)$ appear as a constant or coefficient?

- A) $f(x) = -3x^2 + 18x + 6x - 36$
- B) $f(x) = -3x(x - 6) + 6(x - 6)$
- C) $f(x) = -3(x - 4)^2 + 12$
- D) $f(x) = -3(x - 2)(x - 6)$

**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.

Grid in
result.

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

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

Fraction
line

Answer: 2.5

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

Decimal
point

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

2	/	3
●	●	●
0	0	0
1	1	1
2	●	2
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	●	●	●
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
7	7	7	●
8	8	8	8

Answer: 201 – either position is correct

2	0	1
●	●	●
0	0	0
1	1	1
2	●	2
3	3	3

2	0	1
●	●	●
0	0	0
1	1	1
2	●	2
3	3	3

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



31

A length of 520 meters is equal to how many decimeters? (1 meter = 10 decimeters)

32

$$\begin{aligned}4x+6y &= 20 \\y &= -8\end{aligned}$$

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

33

What is the result when 840 is increased 25 percent?

34

$$p=5(n-1)+20$$

The equation above represents the total number p of athletes inducted into a hall of fame by the end of its n th induction ceremony. If a total of 85 athletes have been inducted, how many induction ceremonies have occurred?



35

$$x^2 + y^2 = 0$$

$$y = 3 - x$$

If (x_1, y_1) is a solution to the system of equations above, what is a possible value for x_1 ?

36

$$x^2 - 6x + y^2 + 4y = 36$$

The equation above defines a circle in the xy -plane. What is the radius of the circle?

Question 37–38 refer to the following information.

Type and Color of Board Game Pieces

	Yellow	Blue	White	Tan	Brown	Purple	Total
Product	10	11	11	9	9	0	50
Building	0	7	8	3	3	29	50
Site	10	12	11	9	8	0	50
Total	20	30	30	21	20	29	150

The table above shows the distribution of a board game's pieces categorized by type and color. Each piece represents a product, a building, or a site on which a building can be constructed.

37

Each purple building piece is either large or small. All the other building pieces are small. If 10% of all building pieces in the game are large, how many of the purple building pieces in the game are small?

38

A piece representing a site is to be selected at random. What is the probability that it will be brown? (Grid your answer as a decimal or fraction, not as a percent.)

STOP

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

Reading Test

20 MINUTES, 16 QUESTIONS

Turn to Section 5 of your answer sheet to answer the questions in this section.

DIRECTIONS

The passage or pair of passages below is followed by a number of question. After reading the 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 1-16 are based on the following passage .

This passage is adapted from Nina Revoyr, *The Age of Dreaming*. ©2008 by Nina Revoyr. The narrator describes acting in silent films in the early 1900s. Moran owns the production company that employs the narrator.

It is amusing, in retrospect, to think how primitive our efforts were in those early years. For my first two films, all of the interiors were shot on outdoors sets, *Line* with canvases draped over them to soften the sun. All 5 copies of *Jamestown Junction* have long been lost, but if the film had survived, and if you could see it, you would notice that during the office scene the papers on my desk are disturbed by a mysterious breeze. And in the very next scene, caused by the canvas flapping in the wind. These were the conditions in which we 10 shot at that time, and because we worked without the benefit of artificial light, there was always a rush to complete the day's filming before the shadows grew too deep in the afternoon. In late May, when we 15 endured an unexpected heat wave, Moran had giant ice blocks delivered to the sets, and powerful fans places behind them to blow the cool air in the direction of the players. If it rained, filming would halt altogether, and we would scramble to move all the 20 furniture and props under the complex's few permanent roofs. But despite these challenges, everyone remained in good spirits. We were working, yes, but it felt like play, and it was hard to comprehend the tremendous good fortune that had 25 suddenly befallen me.

Through the making m^d mf d^jk q^{*F} l _i me_t c k c and q^r l r es g^b l ac^{*} u f g^f Gc_ecpjw_aacnrcb, ? l b G g^k k cbg_rcjwb_gacpl cb rf c bgd^bpcl ac` cru ccl k wqj^d _l s l rp_ g cb _k _rcs p^{*} l b _qc_qpl cb npnd^bqqgnl _j 30 u f mi l cu ct cpwrf g e ` ms r rf c _pr md^b_arg e, G bccb^{*} qf c u _q ncpf _nqr^bf c j_pecqr g djs cl ac nl k w bct cjm^bk cl r _q_ l _arnp,

Rf cpc g^bl m^ds bgl ac rmqcc wns * qf c q g^b nl c b_w g Hn_ l cq^b*_q Gecqrs pcb cvn_ l qt cjwrmam t cwk w 35 anguish at the death of one of my fellow soldiers. "You don't need to project like you would in the theater, as if you're trying to be seen by the person in the last row. Pretend the camera is the one man you're playing to."

On another occasion when I was perhaps too 40 understated, Hanako approached me after Moran called "cut." "You're painting a picture with your body," she said. "Think of pantomime. You must express physically what you can't with your voice. And use your face, your eyes. You have such eyes. They alone speak 45 volumes."

Moran nodded in agreement, although he couldn't have understood, and I adjusted my actions accordingly. I was surprised by the extent to which he let Hanako direct things—not only my own 50 performance, but also the placement of props, even the movements of the other actors. Yet all of her suggestions improved the films. And between her advice and Moran's direction, I was slowly learning what to do. The transition from theater, which depends 55 on dialogue, was more difficult than I had imagined—indeed, many stage actors, even those who didn't disdain the new medium of moving picture, did not

not make the change successfully. Hanako Minatoya was one of the few who was equally accomplished in both realms. I was learning under her tutelage every day.

On certain days, when we weren't in scenes, Hanako and I would leave the sets and walk into the hills. They were vibrant with color, with flowers wherever one looked-blue brodiaea and lupin, Mariposa lilacs, the wispy orange California poppies. The beauty of that landscape, when the air was cool, the sun glinting off the ocean, and the breeze carrying the scent of the flowers, was so dramatic I could hardly believe it real. And I was seeing it, feeling it, in the company of an artist whose work I had admired for years.

One day on our walk we were discussing a well-known actor, and Hanako surprised me by her reaction to his name. "He is nothing but a face for the fan magazines," she said dismissively. "He is not a genuine actor."

"What do you mean?" I asked, although I didn't disagree.

"It is impossible to distinguish one of his roles from another. He is always the same, and it is obvious why. In order to project a believable fiction, the actor himself must have substance. You must possess something *internally* to perform it externally. He has only a fraction of the talent of an artist such as you."

I was, of course, deeply flattered by her compliment, and I did not know how to respond. Hanako continued talking of this actor and that, without noting my reaction.

1

The passage is written from the perspective of someone who

- A) realizes he cannot meet the challenges of pivoting to a new career.
- B) regrets not making more of an effort to achieve his professional goals.
- C) is enthusiastic about recent technological developments affecting his profession.
- D) is nostalgic about experience toward the beginning of his career.

2

As used in line 1, "primitive" most nearly means

- A) basic.
- B) ancient.
- C) original.
- D) natural.

3

The narrator references *Jamestown Junction* (line 5) primarily in order to

- A) highlight a film that features acting that the narrator aims to emulate.
- B) provide context for the tensions that later surface between the narrator and others on the set.
- C) contrast the responsibilities of the director and the actors in film production.
- D) showcase the challenges posed by filming in an outdoor setting.

4

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

- A) diatant.
- B) hidden.
- C) profound.
- D) dark.

5

As described in lines 14-18 ("In late.....players), Moran's actions reveal him to be someone who is

- A) naively optimistic.
- B) thoughtfully resourceful.
- C) highly selfish.
- D) perpetually irritated.

6

It can most reasonably be inferred from the passage that, as a young man, the narrator attributed his employment in films to

- A) his wide range of acting skills.
- B) the fan base he acquired as a stage actor.
- C) a lucky happenstance.
- D) his friendship with Hanako.

7

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

- A) Lines 10-14 ("These...afternoon")
- B) Lines 22-25 ("We are...befallen me")
- C) Lines 26-27 ("Through...accepted")
- D) Lines 27-30 ("And I...acting")

8

As used in line 34, "covey" most nearly means

- A) communicate.
- B) conduct.
- C) guide.
- D) experience.

9

Based on their interaction, the relationship between Moran and Hanako can best be described as

- A) competitive, because Moran and Hanako follow contradictory approaches when working with new actors.
- B) awkward, because Hanako occasionally encroaches upon Moran's directorial authority.
- C) deferential, because Moran recognizes the value of Hanako having worked in films longer than he has.
- D) respectful, because Moran and Hanako share the goal of enhancing each film.

10

According to the passage, many stage actors

- A) use subdued dialogue and gestures onstage.
- B) have difficulty taking constructive criticism from a director.
- C) are contemptuous of the new field of film.
- D) seamlessly transition from acting onstage to acting in films.

11

Based on the passage, in what way does Hanako most directly influence the narrator's development?

- A) She praises his skill as an actor to boost his confidence.
- B) She advises him on balancing popularity with artistic integrity.
- C) She shares lessons learned from having made the same career shift that he is making.
- D) She convinces Moran to allow the narrator to take on more prominent roles in his films.

12

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

- A) Lines 51-54 ("Yet ...to do")
- B) Lines 58-60 ("Hanako ...day")
- C) Lines 61-62 ("On certain ...hills")
- D) Lines 84-85 ("I was ...respond")

13

The primary purpose of the sixth paragraph(lines 61-70) is to

- A) illustrate the heightened artistic intensity of the narrator's experience during his walks with Hanako.
- B) demonstrate that taking breaks from filming improves the narrator's acting.
- C) offer a comparison between Hanako's talent and the remarkable landscape she and the narrator see while walking.
- D) suggest that Hanako draws her artistic inspiration from nature.

14

The passage indicates that when Hanako criticizes a well-known actor, the narrator

- A) fears that Hanako will address him with the same criticism but is relieved when she praises him instead.
- B) concurs with Hanako's opinion of the actor but is curious about the reasoning behind her criticism.
- C) is disappointed that Hanako does not respect the actor but continues to admire the actor himself.
- D) understands Hanako's argument but respectfully disagrees with her characterization of the actor.

15

It can most reasonably be inferred from the passage that Hanako believes that an actor's merit depends on the

- A) caliber of training that the actor receives from mentors.
- B) depth of the actor's own feeling and perceptions.
- C) actor's willingness to take on roles that others find unappealing.
- D) actor's ability to overlook unfavorable audience reactions.

16

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

- A) Lines 33-35("There...soldiers")
- B) Lines 41-42("You're...pantomine")
- C) Lines 79-82("In order...externally")
- D) Lines 82-83("He has...as you")

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

No Test Material On This Page

As you read the passage below, consider how Bobby Braun uses

- evidence, such as facts or examples, to support claims.
- reasoning to develop ideas and to connect claims and evidence.
- stylistic or persuasive elements, such as word choice or appeals to emotion, to add power to the ideas expressed.

Adapted from Bobby Braun, “Space Technology: A Critical Investment for Our Nation’s Future.” ©2014 by Capitol Hill Publishing Corp. Originally published in the *Hill*, October 27, 2011.

- 1 Aerospace remains a strong component of our national fabric and is the largest positive contributor to our nation’s trade balance. However, this technological leadership position is not a given. To remain the leader in aerospace technology, we must continue to perform research and invest in the people who will create the breakthroughs of tomorrow, preserving a critical component of our nation’s economic competitiveness for future generations.
- 2 For NASA,¹ past cutting-edge technology investments led to design and flight of the Apollo missions, the space shuttle, the International Space Station and a myriad of robotic explorers that allowed us to reach destinations across our solar system and peer across the universe. NASA remains one of the nation’s premiere research and development agencies, pursuing breakthrough technologies that will expand the frontiers of aeronautics and space.
- 3 Unfortunately, the pioneering spirit embodied by this storied agency is endangered as a result of chronic underinvestment in basic and applied research. In a recent report on the state of NASA’s technology plans, the National Research Council offered a stark assessment: “Success in executing future NASA space missions will depend on advanced technology developments that should already be underway. However, it has been years since NASA has had a vigorous, broad-based program in advanced space technology. NASA’s technology base is largely depleted. Currently, available technology is insufficient to accomplish many intended space missions. Future U.S. leadership in space requires a foundation of sustained technology advances.”
- 4 America is beginning an exciting new chapter in human space exploration. This chapter centers on full use of the International Space Station, maturation of multiple American vehicles for delivering astronauts and cargo to low-Earth orbit, development of a crew vehicle and an evolvable heavy-lift rocket—two critical building blocks for our nation’s deep-space exploration future—and advancement of a suite of new in-space technologies that will allow us to send explorers safely into deep space for the first time.

¹ National Aeronautics and Space Administration

- 5 By investing in the high payoff, transformative technology that the aerospace industry cannot tackle today, NASA will mature the systems required for its future missions while proving the capabilities and lowering the cost of other government agency and commercial space activities. Developing these solutions will create high-tech jobs.
- 6 NASA's technology investments continue to make a difference in the world around us. Knowledge provided by weather and navigational spacecraft, efficiency improvements in both ground and air transportation, super computers, solar- and wind-generated energy, the cameras found in many of today's cellphones, improved biomedical applications including advanced medical imaging and more nutritious infant formula, and the protective gear that keeps our military, firefighters and police safe, have all benefitted from our nation's investments in aerospace technology.
- 7 For many of the tens of thousands of engineering and science students in our nation's universities today, the space program provides the opportunity to invent technologies today that will form the foundation for humanity's next great leap across the solar system. For this new generation of engineers and scientists, and for those working across NASA at this moment, the future starts today. Modest, sustained federal investment in space technology, at a funding level approaching 5 percent of NASA's budget (well below the R & D² budget of many corporations), is the key ingredient to their success. A NASA that is reaching for grand challenges and operating at the cutting-edge is critical not only for our country's future in space but also for America's technological leadership position in the world.
- 8 Nearly 50 years ago, a young president gave NASA a grand challenge—one chosen not for its simplicity, but for its audacity, not for its ultimate goal or destination, but to "organize and measure the best of our energies and skills." In accomplishing that goal, NASA not only defined what we now call "rocket science," but also made a lasting imprint on the economic, national security and geopolitical landscape of the time.
- 9 NASA can do the same today. This is the task for which this agency was built. This is the task this agency can complete. America expects no less.

Write an essay in which you explain how Bobby Braun builds an argument to persuade his audience that the US government must continue to invest in NASA. In your essay, analyze how Braun uses one or more of the features listed in the box above (or features of your own choice) to strengthen the logic and persuasiveness of his argument. Be sure that your analysis focuses on the most relevant features of the passage.

Your essay should not explain whether you agree with Braun's claims, but rather explain how Braun builds an argument to persuade his audience.

² Research and development

November SAT 2018 US Answer Key



SAT ENGLISH SECTIONS								SAT MATH SECTIONS				
Reading Test S1				Writing and Language Test S2				Math No Calc. S3		Math Calc. S4		
Question	Answer	Question	Answer	Question	Answer	Question	Answer	Question	Answer	Question	Answer	
1.	A	41.	D	1.	C	41.	C	1.	A	1.	C	
2.	D	42.	A	2.	D	42.	C	2.	D	2.	C	
3.	A	43.	B	3.	C	43.	A	3.	D	3.	C	
4.	C	44.	C	4.	A	44.	D	4.	C	4.	D	
5.	A	45.	C	5.	D	NOTES:		5.	A	5.	A	
6.	B	46.	B	6.	D			6.	A	6.	B	
7.	C	47.	D	7.	B			7.	B	7.	B	
8.	B	48.	A	8.	C			8.	C	8.	A	
9.	C	49.	D	9.	A			9.	A	9.	B	
10.	D	50.	B	10.	D			10.	B	10.	B	
11.	C	51.	C	11.	B			11.	D	11.	A	
12.	B	52.	D	12.	D			12.	A	12.	C	
13.	B	NOTES:		13.	B			13.	B	13.	B	
14.	A			14.	C			14.	C	14.	D	
15.	C			15.	B			15.	D	15.	C	
16.	B			16.	D			16.	7.5 ; 15/2	16.	A	
17.	D			17.	B			17.	2/5 ; 1/4	17.	A	
18.	C			18.	C			18.	4	18.	D	
19.	B			19.	D			19.	6	19.	D	
20.	D			20.	C			20.	5	20.	C	
21.	C			21.	D	NOTES: For Question Number 17, the possible answers can be as following: 0.4 ; .4 ; 2/5 ; 0.25 ; .25 ; 1/4.						
22.	D			22.	A	21.	B	22.	A			
23.	C			23.	B	22.	A	23.	C			
24.	A			24.	B	24.	B	24.	B			
25.	B			25.	A	25.	D	25.	D			
26.	B			26.	C	26.	D	26.	D			
27.	D			27.	D	27.	A	27.	A			
28.	C			28.	A	28.	C	28.	C			
29.	A			29.	C	29.	D	29.	D			
30.	C			30.	A	30.	C	30.	C			
31.	B			31.	C	31.	5200	31.	5200			
32.	A			32.	D	32.	17	32.	17			
33.	C			33.	D	33.	1050	33.	1050			
34.	D			34.	A	34.	14	34.	14			
35.	C			35.	B	35.	MQ*	35.	MQ*			
36.	A			36.	D	36.	7	36.	7			
37.	B			37.	C	37.	24	37.	24			
38.	A			38.	C	38.	4/25 ; 0.16	38.	4/25 ; 0.16			
39.	D			39.	A	MQ* => Wrong Question						
40.	A			40.	B							

