PSAT™ 8/9

Practice Test #1

Make time to take the practice test.
It is one of the best ways to get ready for the PSAT 8/9.

After you have taken the practice test, score it right away with the scoring guide at **psat.org/8-9-scoring**.

Test begins on the next page.

Reading Test

55 MINUTES, 42 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 1-8 are based on the following passage.

This passage is adapted from the story "The Flowers of Shiraz" by Goli Taraghi. ©2013 by Goli Taraghi. Translation ©2013 by Sara Khalili. The passage is set in Tehran, Iran, in 1953. The Flowers of Shiraz is a teenage dance group. Gol-Maryam is the schoolmate of the other young characters in the passage.

Finally, with fear and foreboding, she agrees. She says she will come early and leave early.

"Maybe I'll come with my father," she says.

Line "Forget it! Are you nuts? Your dad on a bicycle?
5 With us?"

She laughs and hangs up.

Wednesday afternoon, right on time, she arrives at Zafaranieh Street with her chauffeur Javad Agha. She doesn't have a bicycle. She dismisses Javad Agha
10 and stands next to me like someone who has never seen a street, a car, or creatures with two legs. She is afraid of crossing the street, she screams and grabs hold of the back of my bicycle. Our group consists of a few classmates, two of the Flowers of Shiraz (so far,
15 all girls), two of my cousins (boys), and two of the neighborhood guys (Homayoun and Parviz). Gol-Maryam feels out of place. She regrets having come, but she has no way back. She is happier with her father. The jokes, the pranks, the screaming and
20 shouting, and everything we talk about is new to her. She doesn't understand our language. Worst of all, she doesn't have a bicycle. She climbs up behind me. She fidgets. She's scared and wants to get off. At the corner, she jumps off before I have time to stop. She
25 loses her balance and falls. We stop. The cousins start grumbling. Gol-Maryam has scratches on her hands and her knee and she is limping. Parviz holds her under the arm. He takes out his handkerchief and ties it around her knee. The Flowers of Shiraz smirk
30 and snicker out of spite and jealousy. Parviz's bicycle is large. We put Gol-Maryam behind him. She is clumsy and shy and doesn't know what to do with her hands. She is holding her legs out and away from the back wheel and she won't sit tight against Parviz.
35 I'm sure they will fall. We set off. I hear Gol-Maryam scream, but I don't look back. We speed down the incline of Baghe Ferdows. Parviz overtakes everyone. Gol-Maryam, her eyes wide with fear and her mouth open and ready to scream, is staring straight ahead.
40 She has wrapped her arms tight around Parviz's waist. The wind is blowing through her hair and under her skirt. The Flowers of Shiraz are still smirking. The narrow alley and back roads of Elahieh are filled with pleasant shadows. We stop in front of
45 Amini Garden. There is a wide stream that flows at the foot of the garden walls and under the trees. The water is cool and clear. It comes from Mrs. Fakhrodolleh's reservoir. We take off our shoes, put our feet in the stream, and wash our face and hands.
50 Gol-Maryam's face is flushed and she's panting. She pats some water on her face and then she, too, takes off her shoes and dips her feet in the stream. The Flowers of Shiraz splash water on each other and chase after one another. It is a pleasant game on such
55 a hot day. Gol-Maryam hides behind a huge tree. I think she will start crying any minute now. But no. She hops from behind one tree to the next and splashes water on Parviz and laughs.

We ride out to Rumi Bridge and turn back. We
60 make plans to go to Tajrish Bridge on Friday night.

CONTINUE

1

Which choice best describes a main theme of the passage?

A) Courage emerges when close friends are near.

B) Trust is the basis upon which friendships are built.

C) It is easier for one to choose what is comfortable instead of what the majority wants.

D) Facing one's fears leads to new and meaningful experiences.

2

The author includes the conversation in lines 1-6 ("Finally . . . hangs up") most likely to

A) create a tense mood by showing that Gol-Maryam's decisions are in contrast to her father's advice.

B) set the scene by revealing that Gol-Maryam is not comfortable with what she is about to do.

C) lay a foundation for the plot by explaining why Gol-Maryam is uneasy around other people.

D) introduce the setting to provide context for Gol-Maryam's actions.

3

Which choice best supports the idea that Gol-Maryam "feels out of place" (line 17) when she is with her schoolmates?

A) Lines 19-20 ("The jokes . . . her")

B) Lines 23-24 ("At the corner . . . stop")

C) Lines 25-27 ("The cousins . . . limping")

D) Lines 53-55 ("The Flowers . . . tree")

4

According to the passage, The Flowers of Shiraz mock Gol-Maryam because

A) she does not know how to swim.

B) they resent and envy her.

C) she does not have a bicycle.

D) they dislike her family.

5

As used in line 37, "overtakes" most nearly means

A) frightens.

B) passes.

C) surprises.

D) tricks.

6

As used in line 38, "eyes wide with fear" most strongly suggests that Gol-Maryam

A) is worried about getting in trouble with her father.

B) has a look of excitement on her face.

C) can see danger that others cannot.

D) is startled and anxious about what is happening.

CONTINUE

7

At the end of the passage, it can reasonably be inferred that the narrator

A) is surprised by Gol-Maryam's playfulness.

B) is angry that Gol-Maryam is splashing Parviz.

C) realizes that Gol-Maryam was only pretending to be afraid.

D) feels bad that the girls had misjudged Gol-Maryam's character.

8

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

A) Line 31 ("We put . . . him")

B) Lines 42-43 ("The Flowers . . . smirking")

C) Line 56 ("I think . . . no")

D) Lines 57-58 ("She hops . . . laughs")

Questions 9-16 are based on the following passage and supplementary material.

This passage is adapted from Patrick Tucker, "The Over-Mediated World." ©2007 by The World Future Society.

The average American spends more time using media—an iPod, computer, radio, television, etc.—than in any other wakeful activity, almost nine hours a day. Ubiquitous news, e-mail, and entertainment are facts of modern life and, not surprisingly, most of us feel that convenient and consistent access to the digital world is a good thing.

But what if our new "connected age" is actually pushing us further apart, making us not more informed, but less so? This is the concern of Michael Bugeja, director of the Greenlee School of Journalism and Communication at Iowa State University and author of *Interpersonal Divide: The Search for Community in the Technological Age* (Oxford, 2005).

"Family time at the dinner table used to be sacrosanct. Nutritionists and psychologists will tell you that having dinner together uninterrupted is a good thing. We moved from that to 'quality time,' where both parents were working. Now we've gone from family time to quality time to media time, or defining activities around media. We spend time together by using media in proximity to one another, in the same house or in the same car, but the media itself is often separate," says Bugeja. By way of example, he points to the common sight of parents driving and talking on their cell phones while their kids sit in the backseat and watch a DVD.

"The more we use technology, the less time we have to nurture our primary relationships," says Bugeja. "The reason is simple: Communications systems alter value systems. We're spending more time communicating via social networks, ignoring those in our immediate environment. Meanwhile, television viewing devours leisure time. Of course we're lonely most of the day. We're searching for meaningful relationships in front of screens and monitors."

The amount of time we spend immersed in the media environment affects the way we behave and interact outside of that space. Students who have wireless capability on their laptops feel more entitled to log onto social networking Web sites during lectures. The intern who has a video game loaded onto his cell phone is most likely to be the one

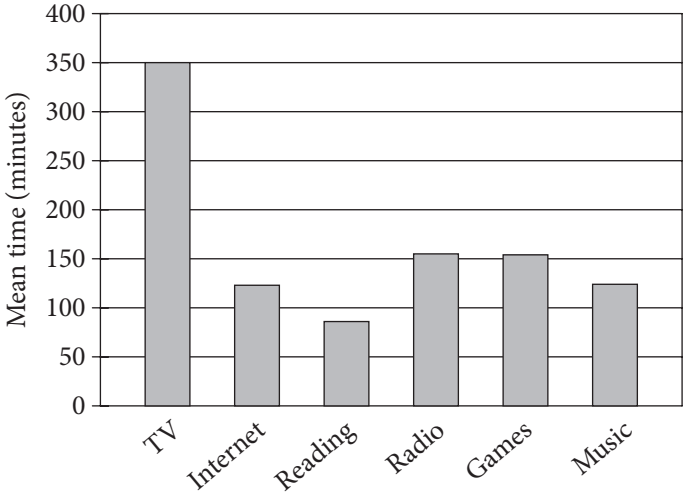
CONTINUE

playing the game under the table during an important meeting. The harried professional is more inclined to take a call in the middle of a concert, during dinner, or at some other inappropriate time. Media, in its very availability, invites abuse, according to Bugeja. When such techno-abuses become commonplace they cease to be taboo, a phenomenon Bugeja refers to as "digital displacement."

He describes digital displacement as what happens when the demands of the real world conflict with those of the virtual, resulting in too many people paying too much attention to gadgets and ignoring reality, such as drivers interfacing with navigation computers instead of looking out for pedestrians.

While Bugeja doesn't imagine the situation will change quickly or easily, he does acknowledge that a solution exists. "The key is to nurture interpersonal intelligence," he says. "That's the ability to know when, where, and for what purpose technology is appropriate or inappropriate. I don't believe this is a problem of the emerging generation. I think this is a problem of the profiteers of new media. I believe the solution is, as it's always been in this country, education and information."

Time Spent (in minutes) with Media per Person per Day



Adapted from Robert A. Papper et al., "Middletown Media Studies." ©2004 by International Digital Media & Art Association.

CONTINUE

9

The main idea of the passage is that

A) social media are helping people replace old relationships with new ones.

B) media are causing people to interact less with others in the real world.

C) social media are affecting the way in which young people relate to adults.

D) media are helping people establish relationships with people all around the world.

10

The author uses the example in lines 25-28 ("By way . . . DVD") mainly to support the assertion that families today

A) are spending time together in less meaningful ways than they used to.

B) no longer spend time with each other in the same house.

C) are finding positive ways to include media in the time they spend together.

D) no longer have dinner together without the intrusion of technology.

11

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

A) Lines 17-19 ("Nutritionists . . . thing")

B) Lines 19-20 ("We moved . . . working")

C) Lines 20-22 ("Now . . . around media")

D) Lines 35-36 ("Of course . . . day")

12

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

A) guiding.

B) extremely basic.

C) original.

D) most important.

13

As used in line 35, "devours" most nearly means

A) affects.

B) consumes.

C) destroys.

D) overcomes.

14

In the passage, Michael Bugeja indicates that

A) media are inappropriate to use except in an emergency situation.

B) future generations will know better how to generate income from media.

C) teachers find it useful to have students use media for learning in a classroom setting.

D) people are focused more on media than on their immediate surroundings.

15

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

A) Lines 39-41 ("The amount . . . space")

B) Lines 50-51 ("Media . . . Bugeja")

C) Lines 55-61 ("He describes . . . pedestrians")

D) Lines 68-69 ("I think . . . media")

16

According to the graph, on average, a person spends more time per day using the Internet than

A) watching television.

B) reading.

C) listening to the radio.

D) playing games.

CONTINUE

Questions 17-25 are based on the following passage and supplementary material.

This passage is adapted from Charles Q. Choi, "Strange Life Found in Underwater Caves." ©2013 by TechMedia Network.

Clues to how life evolved, not only on this planet but also possibly on alien worlds, might be found in underwater caves in the Bahamas, researchers say.

Line

The caves in question are called "blue holes," so-named because from the air, their entrances appear circular in shape, with different shades of blue water in and around them. There are estimated to be more than 1,000 such caves in the Bahamas, the greatest concentration of blue holes in the world.

"It's really incredible to be swimming down a passage that no one has ever been in before, to experience that thrill of discovery," said researcher Tom Iliffe, a marine biologist at Texas A&M University at Galveston. "At the bottom of a cave, there's no telling what might be around the next corner."

Iliffe and his colleagues examined three inland blue holes in the Bahamas. They discovered that layers of bacteria exist in all three, but each of these water-filled sinkholes had significantly different microbes living in them from the others.

"We're finding new forms of life that are totally unknown elsewhere on Earth," Iliffe told OurAmazingPlanet.

Blue hole bacteria

Within each blue hole, the microbes the researchers found varied depending on the depth, owing to how the water in them was separated into distinct fresh- and saltwater layers as well as oxygen-poor or virtually completely oxygen-depleted layers. The blue holes also varied from each other due to differences such as food sources.

"We examined two caves on Abaco Island and one on Andros Island," Iliffe said. "One on Abaco, at a depth of about 100 feet (30 meters), had sheets of bacteria that were attached to the walls of the caves, almost one inch (2.5 centimeters) thick. Another cave on the same island had bacteria living within poisonous clouds of hydrogen sulfide at the boundary between fresh- and saltwater. These caves had different forms of bacteria, with the types and density changing as the light source from above grew dimmer and dimmer."

"In the cave on Andros, we expected to find something similar, but the hydrogen sulfide layer there contained different types of bacteria," Iliffe added. "It shows that the caves tend to have life forms that adapt to that particular habitat, and we found that some types of the bacteria could live in environments where no other forms of life could survive. This research shows how these bacteria have evolved over millions of years and have found a way to live under these extreme conditions."

'Natural laboratories'

The fact that each cave has different conditions from the others and thus a different palette of life helps scientists analyze the diverse routes life might have taken on Earth, given slight tweaks in their initial brews.

"These bacterial forms of life may be similar to microbes that existed on early Earth and thus provide a glimpse of how life evolved on this planet," Iliffe explained. "These caves are natural laboratories where we can study life existing under conditions analogous to what was present many millions of years ago."

Specifically, "these caves have no light and therefore no photosynthetic production of oxygen, which means the dissolved oxygen levels are either low or nonexistent, similar to the environments that probably existed on the early Earth," Iliffe said.

These findings might also shed light on how life might have developed on distant planets and moons.

"As far as we know, no surface waters currently exist anywhere else in our solar system, but there might be water beneath the surface, say on Mars or moons like Europa," Iliffe said. "These are areas of total darkness, and so the caves on Earth we are exploring might be similar."

CONTINUE

Bacterial Cells per Milliliter in a Blue Hole
(Lucayan Caverns, Grand Bahama Island, Bahamas)

Depth below water surface (m)	Sample location				
	Water adjacent to cave wall	Rock core at a distance into cave wall of			
		2.0 cm	4.0 cm	6.0 cm	8.0 cm
13.9 (freshwater)	68,077	737,904	479,843	144,045	32,945
14.0 (freshwater/ salt water mix)	88,024	1,321,295	325,611	33,458	19,756
15.9 (salt water)	157,326	510,504	193,642	75,787	23,291

Adapted from S. J. Schwabe, R. Herbert, and J. L. Carew, "A Hypothesis for Biogenic Cave Formation: A Study Conducted in the Bahamas." ©2008 by Gerace Research Center.

17

Which statement best describes the overall structure of the passage?

A) The author describes a discovery in underwater caves, and then explains why the discovery is important.

B) The author presents an argument for conducting additional research in underwater caves, and then gives evidence to support the argument.

C) The author presents a series of events that occurs in underwater caves, and then describes how the events are related.

D) The author describes a phenomenon found in underwater caves, and then explains what caused the phenomenon.

18

Based on the passage, Iliffe's perspective on studying the blue holes is that it is

A) challenging to understand why the water in the caves has such unique properties.

B) perplexing to find so many strange life-forms in unexpected places.

C) dangerous to venture into unexplored territories.

D) exciting to explore the unknown.

19

What does Iliffe's use of the phrase "sheets of bacteria" (lines 34-35) suggest about the blue hole?

A) There was a limited variety of bacterial forms in the blue hole.

B) There was a great amount of bacteria in the blue hole.

C) The bacteria in the blue hole were compressed at deep levels.

D) The bacteria in the blue hole had multiple layers of food supplies.

CONTINUE

20

Which choice best supports the conclusion that different types of bacteria in the deeper layers of blue holes have adapted to varying levels of darkness?

A) Lines 25-30 ("Within . . . layers")

B) Lines 36-39 ("Another . . . saltwater")

C) Lines 39-42 ("These . . . dimmer")

D) Lines 53-56 ("The fact . . . Earth")

21

As used in line 52, "extreme" most nearly means

A) outermost.

B) severe.

C) thrilling.

D) ultimate.

22

According to the passage, blue holes could help reveal how life may have evolved on this planet because the bacteria in the blue holes

A) can live in complete darkness.

B) can survive without food sources.

C) cannot survive without some form of air.

D) cannot be found anywhere else in the world.

23

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

A) Lines 43-46 ("In the cave . . . added")

B) Lines 58-61 ("These bacterial . . . explained")

C) Lines 65-69 ("Specifically . . . said")

D) Lines 72-75 ("As far . . . said")

24

Based on the table, which of the following supports the greatest bacterial growth?

A) Salt water adjacent to the cave wall

B) A mix of freshwater and salt water adjacent to the cave wall

C) A distance of 2.0 cm into the cave wall at a depth where freshwater and salt water mix

D) A distance of 8.0 cm into the cave wall at a depth where there is only freshwater

25

Which idea from the passage is supported by the information in the table?

A) Bacteria in blue holes differ from one another due to varying food sources.

B) Bacteria have evolved over millions of years.

C) The density of the bacteria varies across water depths in blue holes.

D) The types of bacteria living in each blue hole differ significantly.

CONTINUE

Questions 26-34 are based on the following passage.

This passage is adapted from Nelson Mandela's presidential inaugural address, delivered on May 10, 1994. For many years, Mandela led a peaceful and nonviolent campaign against the South African government and its policies of racial oppression.

Today, all of us do, by our presence here, and by our celebrations in other parts of our country and the world, confer glory and hope to newborn liberty.

Out of the experience of an extraordinary human disaster that lasted too long, must be born a society of which all humanity will be proud.

Our daily deeds as ordinary South Africans must produce an actual South African reality that will reinforce humanity's belief in justice, strengthen its confidence in the nobility of the human soul and sustain all our hopes for a glorious life for all.

All this we owe both to ourselves and to the peoples of the world who are so well represented here today.

To my compatriots, I have no hesitation in saying that each one of us is as intimately attached to the soil of this beautiful country as are the famous jacaranda trees of Pretoria and the mimosa trees of the bushveld.

Each time one of us touches the soil of this land, we feel a sense of personal renewal. The national mood changes as the seasons change.

We are moved by a sense of joy and exhilaration when the grass turns green and the flowers bloom.

That spiritual and physical oneness we all share with this common homeland explains the depth of the pain we all carried in our hearts as we saw our country tear itself apart in a terrible conflict, and as we saw it spurned, outlawed and isolated by the peoples of the world, precisely because it has become the universal base of the pernicious ideology and practice of racism and racial oppression.

We, the people of South Africa, feel fulfilled that humanity has taken us back into its bosom, that we, who were outlaws not so long ago, have today been given the rare privilege to be host to the nations of the world on our own soil. . . .

The time for the healing of the wounds has come.

The moment to bridge the chasms that divide us has come.

The time to build is upon us.

We have, at last, achieved our political emancipation. We pledge ourselves to liberate all our people from the continuing bondage of poverty, deprivation, suffering, gender and other discrimination.

We succeeded to take our last steps to freedom in conditions of relative peace. We commit ourselves to the construction of a complete, just and lasting peace.

We have triumphed in the effort to implant hope in the breasts of the millions of our people. We enter into a covenant that we shall build the society in which all South Africans, both black and white, will be able to walk tall, without any fear in their hearts, assured of their inalienable right to human dignity—a rainbow nation at peace with itself and the world.

As a token of its commitment to the renewal of our country, the new Interim Government of National Unity will, as a matter of urgency, address the issue of amnesty for various categories of our people who are currently serving terms of imprisonment.

We dedicate this day to all the heroes and heroines in this country and the rest of the world who sacrificed in many ways and surrendered their lives so that we could be free.

Their dreams have become reality. Freedom is their reward.

We are both humbled and elevated by the honour and privilege that you, the people of South Africa, have bestowed on us, as the first President of a united, democratic, non-racial and non-sexist South Africa, to lead our country out of the valley of darkness.

We understand it still that there is no easy road to freedom.

We know it well that none of us acting alone can achieve success.

We must therefore act together as a united people, for national reconciliation, for nation building, for the birth of a new world.

CONTINUE

26

The main purpose of the passage is to

A) convince the South African people to support a new form of government.

B) reprimand other countries for abandoning South Africa in a time of great need.

C) remember the hardships the South African people overcame to secure freedom.

D) encourage the South African people to come together in rebuilding their nation.

27

Which choice best summarizes the passage?

A) Humankind is capable of evil under oppression and greatness when granted freedom.

B) It was the sacrifices of ordinary citizens that ended the conflict in the nation of South Africa.

C) Although racial oppression wounded the country of South Africa, a new season of peace and liberty will heal it.

D) Although nations across the globe promised to work together to put an end to racism, many countries failed to respond to South Africa's plea for help.

28

Mandela includes the statement in lines 4-6 most likely to convey the idea that

A) time will eventually heal the wounds of South Africa's broken society.

B) extraordinary South African heroes have emerged from extraordinary hardships.

C) the best way to overcome disaster is to resist the urge to focus on South Africa's past.

D) South African society must learn from its failings in order to shape a better future.

29

Mandela implies that for the nation to achieve its potential, it is most important that

A) the South African people regain confidence in their political system.

B) the South African people live each day with integrity.

C) other countries send representatives to make peace with South Africa.

D) other countries recognize South Africa as a free country.

30

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

A) Lines 7-11 ("Our . . . for all")

B) Lines 12-14 ("All . . . today")

C) Lines 33-37 ("We, the people . . . soil")

D) Lines 42-43 ("We have . . . emancipation")

31

As used in line 23, "moved" most nearly means

A) changed.

B) stirred.

C) relocated.

D) postponed.

32

Mandela's purpose for repeating the phrases "the time" and "has come" in lines 38-41 is most likely to

A) suggest that building something new will cause faster healing.

B) reinforce the claim that old wounds must be healed before people can move forward.

C) emphasize the idea that the time for action is the present.

D) contrast the difference between times of war and times of peace.

CONTINUE

33

Based on the passage, which choice most closely describes Mandela's perspective on freedom?

A) Freedom is a privilege people earn, not a right they have from birth.

B) Freedom is not easily attainable, but it is worth fighting for.

C) The freedom enjoyed in times of peace must be sacrificed in times of war.

D) The freedom of a nation is more important than the freedom of individuals.

34

Which of the following does Mandela suggest is most important to ensuring South Africa's continued progress?

A) Unity among the people

B) Pride in the land

C) Celebration of fallen heroes and heroines

D) Investigation of past wrongs

Questions 35-42 are based on the following passages.

Passage 1 is adapted from Lori J. Keesey, "Blacker Than Black." Published December 2010 on NASA's website. Passage 2 is adapted from Clifford A. Pickover, *The Physics Book: From the Big Bang to Quantum Resurrection, 250 Milestones in the History of Physics*. ©2011 by Clifford A. Pickover.

Passage 1

Black is black, right? Not so, according to a team of NASA engineers now developing a blacker-than-pitch material that will help scientists gather hard-to-obtain scientific measurements or observe currently unseen astronomical objects, like Earth-sized planets in orbit around other stars.

The nanotech-based material now being developed by a team of 10 technologists at the NASA Goddard Space Flight Center in Greenbelt, Md., is a thin coating of multi-walled carbon nanotubes—tiny hollow tubes made of pure carbon about 10,000 times thinner than a strand of human hair. Nanotubes have a multitude of potential uses, particularly in electronics and advanced materials due to their unique electrical properties and extraordinary strength. But in this application, NASA is interested in using the technology to help suppress errant light that has a funny way of ricocheting off instrument components and contaminating measurements.

"This is a technology that offers a lot of payback," said engineer Leroy Sparr, who is assessing its effectiveness on the Ocean Radiometer for Carbon Assessment (ORCA), a next-generation instrument that is designed to measure marine photosynthesis. "It's about 10 times better than black paint" typically used by NASA instrument designers to suppress stray light, he said.

The technology works because of its super-absorption abilities. The nanotubes themselves are packed vertically much like a shag rug. The tiny gaps between the tubes absorb 99.5 percent of the light that hits them. In other words, very few photons are reflected off the carbon-nanotube coating, which means that stray light cannot reflect off surfaces and interfere with the light that scientists actually want to measure. The human eye sees the material as black because only a small fraction of light reflects off the material.

CONTINUE

The team began working on the technology in 2007. Unbeknownst to the group, the New York–based Rensselaer Polytechnic Institute also had initiated a similar effort and announced in 2008 that its researchers had developed the darkest carbon nanotube-based material ever made—more than three times darker than the previous record. "Our material isn't quite as dark as theirs," said John Hagopian, the principal investigator leading the development team. "But what we're developing is 10 times blacker than current NASA paints that suppress system stray light. Furthermore, it will be robust for space applications," he said.

That is an important distinction, said Carl Stahle, assistant chief of technology for Goddard's Instrument Systems and Technology Division. Not all technology can be used in space because of the harsh environmental conditions encountered there. "That's the real strength of this effort," Stahle said. "The group is finding ways to apply new technology and fly it on our instruments."

Passage 2

All manmade materials, even asphalt and charcoal, reflect some amount of light—but this has not prevented futurists from dreaming of a perfect black material that absorbs all the colors of light while reflecting nothing back. In 2008, reports began to circulate about a group of U.S. scientists who had made the "blackest black," a superblack—the "darkest ever" substance known to science. The exotic material was created from carbon nanotubes that resemble sheets of carbon, only an atom thick, curled into a cylindrical shape. Theoretically, a perfect black material would absorb light of any wavelength shined on it at all angles.

Researchers at Rensselaer Polytechnic Institute and Rice University had constructed and studied a microscopic carpet of the nanotubes. In some sense, we can think of the "roughness" of this carpet as being adjusted to minimize the reflectance of light.

The black carpet contained tiny nanotubes that reflect only 0.045 percent of all light shined upon the substance. This black is more than 100 times darker than black paint! This "ultimate black" may one day be used to more efficiently capture energy from the Sun or to design more sensitive optical instruments. To limit reflection of light shining upon the superblack material, the researchers made the surface of the nanotube carpet irregular and rough. A significant portion of light is "trapped" in the tiny gaps between the loosely packed carpet strands.

35

Based on Passage 1, what can be reasonably inferred about the nanotubes in NASA's new black material?

A) They are the strongest nanomaterial yet to be discovered.

B) They efficiently create electricity by attracting energy.

C) They are able to take measurements in space.

D) They are invisible to the naked eye.

36

Which choice from Passage 1 provides the best evidence for the answer to the previous question?

A) Lines 7-12 ("The nanotech-based . . . hair")

B) Lines 13-16 ("Nanotubes . . . strength")

C) Lines 29-30 ("The technology . . . abilities")

D) Lines 59-60 ("The group . . . instruments")

37

The author uses the word "funny" in line 18 to most likely

A) convey that the light's behavior is unpredictable.

B) suggest that the scientists' work is humorous.

C) describe the strangeness of a new technology.

D) criticize a new technology as insufficient.

CONTINUE

38

As used in line 51, "suppress" most nearly means

A) conceal.

B) eliminate.

C) censor.

D) overpower.

39

The last paragraph of Passage 2 serves mainly to

A) reveal how the material's new properties were discovered.

B) reinforce the author's point about the complexity of nanotechnology.

C) emphasize the significance of the innovation.

D) summarize the scientists' research.

40

What main purpose do Passages 1 and 2 share?

A) To convince readers of the importance of space exploration

B) To explain to readers the processes used in the development of nanomaterials

C) To describe a recent advance in one area of nanotechnology

D) To show the need for partnership among the different branches of science

41

The authors of Passage 1 and Passage 2 would most likely agree that

A) scientists need to work harder to discover more new technologies.

B) materials that resemble human-made objects are the most effective for measuring space.

C) superblack nanotubes have the potential to help in fields other than space exploration.

D) any type of new scientific discovery requires years of hard work.

42

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

A) Lines 61-65 ("All . . . back")

B) Lines 74-76 ("Researchers . . . nanotubes")

C) Lines 79-81 ("The black . . . substance")

D) Lines 82-84 ("This . . . instruments")

STOP

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

No Test Material On This Page

Writing and Language Test

30 MINUTES, 40 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 1-10 are based on the following passage.

The Shipment to Jefferson

In 1805, United States President Thomas Jefferson received a shipment that he had been eagerly anticipating. It included four boxes, two trunks, and three cages. Inside these containers were hundreds of items that explorers Meriwether Lewis and William Clark had 1 collected. During their exploration of the nation's westernmost territories. Opening the containers,

1

A) NO CHANGE
B) collected; during
C) collected, it was during
D) collected during

CONTINUE

Jefferson found such items as pressed plants, soil, bones, and even live animals. The collection also 2 included in addition to the plants, soil, bones, and animals objects that Lewis and Clark had acquired through their dealings with American Indian tribes. 3

One goal of Lewis and Clark's journey, which extended from St. Louis, Missouri, all the way to the Pacific Ocean, 4 were forging relationships with the American Indian tribes who lived in those areas. During

2

A) NO CHANGE
B) included, along with the plants, soil, bones, and animals,
C) included, besides the plants, soil, bones, and animals,
D) included

3

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

> The Jefferson administration had purchased 827,000 square miles of land west of the Mississippi from France for about 15 million dollars.

Should the writer make this addition here?

A) Yes, because it provides details that support the previous sentence's claim about acquiring objects.
B) Yes, because it helps explain why Lewis and Clark's journey was historically important.
C) No, because it contains information that repeats what has already been stated.
D) No, because it interrupts the discussion of Lewis and Clark's collection with a poorly integrated detail.

4

A) NO CHANGE
B) was
C) are
D) is

CONTINUE

their travels, Lewis and Clark encountered over fifty 5 tribes. With each interaction, Lewis and Clark exchanged gifts with the tribe members as a gesture of respect and indication of their willingness to trade.

[1] The gifts from Lewis and Clark to the tribes included 6 weapons, kettles for cooking, and medicine. [2] In exchange, the tribe members gave them feather and quill garments, pipes, and canoes, among other 7 objects they gave them. [3] One notable gift in the collection was a Mandan buffalo robe. [4] Lewis and Clark included a note in the shipment explaining that the robe represented a legendary battle involving the Mandan tribe. [5] Jefferson designated these gifts as "tokens of friendship." 8

5

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

> tribes, including the Sioux, Mandan, Shoshone, and Nez Perce.

Should the writer make this revision?

A) Yes, because it provides additional relevant information about Lewis and Clark's encounters with American Indian tribes.

B) Yes, because it gives details that tell more about Lewis and Clark's daily life on the journey.

C) No, because it provides information that is unrelated to the paragraph's point about the American Indian tribes.

D) No, because it doesn't fully explain why the tribes would exchange gifts with Lewis and Clark.

6

A) NO CHANGE

B) weapons; kettles for cooking and

C) weapons, kettles for cooking; and

D) weapons, kettles for cooking, and,

7

A) NO CHANGE

B) stuff they gave.

C) objects.

D) stuff.

8

To make this paragraph most logical, sentence 2 should be placed

A) where it is now.

B) after sentence 3.

C) after sentence 4.

D) after sentence 5.

CONTINUE

Jefferson had a deep interest in the objects Lewis and Clark had shipped to him. In the entrance hall of his home, Monticello, he displayed the artifacts that Lewis and Clark had sent him, including the Mandan robe.

9 Jefferson donated some of the items to different museums and kept others at Monticello, but over the years many of the items were lost, destroyed, or stolen. However, modern artists have been able to re-create the Monticello exhibit by fabricating artifacts such **10** as: weaponry, paintings, hide robes, and a replica of the famous Mandan buffalo robe.

9

Which sentence, if added here, would most effectively introduce the topic of the paragraph?

A) Jefferson hoped to sell many of the items in hopes of paying off the national debt of the United States.

B) One original item from the Jefferson shipment still displayed at Monticello is the set of elk antlers Lewis and Clark sent.

C) Unfortunately, the contents of the shipment, including the Indian artifacts, have not been preserved intact.

D) Other artifacts that Jefferson displayed at his home were items from Egypt and maps from all over the world.

10

A) NO CHANGE

B) as

C) as;

D) as—

CONTINUE

Questions 11-20 are based on the following passage.

Learning about Lemurs

Lemurs, a type of primate whose ancestors came to the island of Madagascar roughly 65 million years ago, have lived there ever since in isolation from other primates. Those other primates, who stayed behind on the African mainland, evolved into the simian group: monkeys and apes. **11** Scientists have compared the cognitive traits of lemurs to those of the simian primates to gain a better understanding of primate evolution.

According to psychologist Laurie Santos, who studies modern primates to determine when certain cognitive abilities evolved, "Lemurs are our best living model of the earliest primate mind." Earlier research had suggested that lemurs' learning capacities were less sophisticated than those of apes and monkeys. Neuroscientist Elizabeth Brannon's initial research, however, gave scientists new insight into lemur intelligence. **12**

11

Which sentence provides the best transition to the next paragraph?

A) NO CHANGE

B) Scientists are studying why the lemurs left the African mainland in order to understand the animals' cognitive evolution.

C) Scientists are excited to discover the cognitive abilities of both lemurs and simian primates.

D) Scientists have studied the cognitive abilities of simian primates to gain a better understanding of lemurs and their isolated evolution.

12

The writer is considering revising the paragraph to remove the quotation from Santos. Assuming that the revision would result in a complete sentence, should the quotation be kept or deleted?

A) Kept, because it fully explains the scientific process Santos used.

B) Kept, because it helps explain why lemurs have been viewed as valuable research subjects.

C) Deleted, because it blurs the focus of the paragraph by giving information that is not necessary at that point.

D) Deleted, because it does not support the paragraph's main point about the relationship between lemurs and simian primates.

CONTINUE

Both Santos and Brannon have observed behaviors that suggest lemurs are skilled with ordered **13** sequences—a high-level cognitive trait known to be present in simian primates. **14** Lemurs, it seems, appear to have quantitative abilities similar to those of apes and monkeys, even though they diverged from **15** there ancestors so long ago. This information suggests that those cognitive traits were present in the primate ancestors.

13

A) NO CHANGE
B) sequences a
C) sequences, and a
D) sequences. A

14

A) NO CHANGE
B) Lemurs, apparently,
C) Lemurs, evidently,
D) Lemurs

15

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

CONTINUE

[1] In one set of trials at Brannon's cognitive neuroscience lab, lemurs watched a researcher place grapes one by one into an opaque bucket. [2] Brannon and her team observed that the amount of time the lemurs spent searching for the fruit depended on whether **16** they thought there should be more grapes left in the bucket. [3] **17** For halves of those trials, the researcher put some of the grapes into a false bottom inside the bucket. [4] Santos has conducted similar experiments with lemurs. [5] Both scientists concluded that the lemurs have quantitative reasoning skills. [6] They based their findings on the way the lemurs seemed to keep track of the objects they were shown. [7] They observed the same type of reaction when a numerical outcome was different from what the lemurs had expected. **18**

Scientists **19** daydream that future research will show whether lemurs have additional characteristics of high-level cognition, such as social behaviors or the ability to use language. **20** As the work of Santos and Brannon shows, lemurs appear to be a key link to understanding the origin of primate cognition.

16

A) NO CHANGE
B) he or she
C) it
D) you

17

A) NO CHANGE
B) Four halves
C) For have
D) For half

18

To make this paragraph most logical, sentence 3 should be placed

A) where it is now.
B) after sentence 1.
C) after sentence 5.
D) after sentence 6.

19

A) NO CHANGE
B) pine away for future research to
C) hope that future research will
D) search with desire for future research to

20

A) NO CHANGE
B) Because of the work of Santos and Brannon,
C) Nonetheless, the work of Santos and Brannon shows that
D) As an example of the work of Santos and Brannon,

CONTINUE

Questions 21-30 are based on the following passage and supplementary material.

Connecting in the Twenty-First Century

Videoconferencing is a technology **21** allowing for people in different locations to hold face-to-face meetings. With videoconferencing, people can see and talk to each other on computer or television screens almost as if they were in the same room. Although this technology first became available for commercial use in the United **22** States, in the early 1970s, it took several decades for videoconferencing to become a practical substitute for business travel. Videoconferencing programs have significantly changed the business **23** world. They have made it faster and easier for colleagues in different locations to hold discussions and share information.

Getting to and from out-of-town meetings can be expensive and exhausting. The good news is that by making a relatively small investment in videoconferencing technologies, most companies can save a **24** distinguished amount of money and time. According to a report by the Carbon Disclosure Project, a business with $1 billion or more in annual revenue could save nearly 900 business trips in the first year by equipping four rooms as centers for videoconference meetings. **25** The report, however, projects that a company could start making money back on its investment in as little as fifteen months.

21

A) NO CHANGE
B) while allowing
C) that allows
D) allowed by

22

A) NO CHANGE
B) States in the early 1970s,
C) States, in the early 1970s
D) States in the early 1970s

23

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

A) world that made
B) world, although they make
C) world, which makes
D) world by making

24

A) NO CHANGE
B) heavy
C) significant
D) weighty

25

A) NO CHANGE
B) First of all, the report
C) The report also
D) As mentioned previously, the report

CONTINUE

Once they are fully utilizing videoconferencing technology, most companies **26** were very pleased with the results. To better understand business **27** executive's attitudes about using videoconferencing technology, *Forbes* magazine conducted a survey in 2009. Of the 760 business executives who responded, 92 percent reported that videoconferencing saves time, and **28** 88 percent responded that videoconferencing saves money. In addition, **29** some of the respondents reported that they prefer videoconferences because they increase productivity.

26

A) NO CHANGE
B) has been
C) was
D) are

27

A) NO CHANGE
B) executives' attitudes
C) executives attitude's
D) executives attitudes'

28

Which choice most accurately represents the data in the chart?

A) NO CHANGE
B) executives noted that videoconferencing reduced their budgets by 88 percent.
C) another 88 percent agreed that videoconferencing is more convenient.
D) executives use videoconferencing for 88 percent of their meetings.

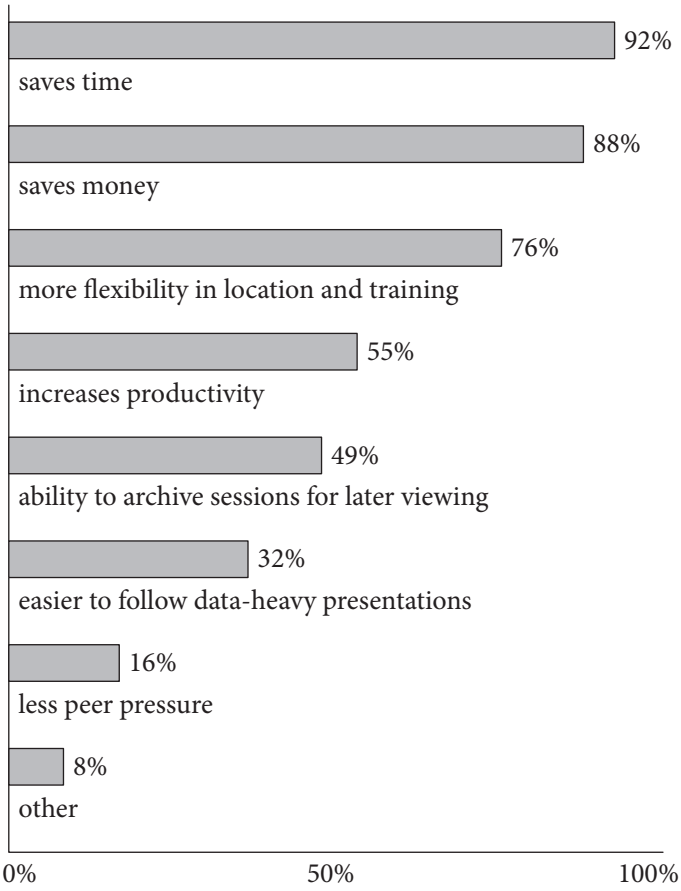
29

Which choice most accurately and precisely provides specific data from the chart?

A) NO CHANGE
B) 55 percent of respondents
C) other executives surveyed
D) 55 executives

CONTINUE

Responses of 760 Business Executives to Questions about Why They Prefer Videoconferences



Adapted from Jeff Koyen, "Business Meetings." ©2009 by Forbes Insights.

Videoconferencing helps companies to bridge geographical divides and save time, not to mention the wear and tear on employees who have to travel long distances for meetings. **30** Rather, it also preserves the irreplaceable value of a face-to-face relationship in today's global business world.

30

A) NO CHANGE
B) Therefore,
C) For this very reason,
D) At the same time,

CONTINUE

Questions 31-40 are based on the following passage.

"It's Showtime!"

There was a brisk wind **31** blowing, on November 21, 1934, as a fifteen-year-old Ella Fitzgerald made her way down 125th Street in New York City's Harlem district. Up ahead, Ella could see the Apollo Theater's prominent neon sign. The light blazing from its white background and purple letters flooded the night sky.

32 At the age of legal racial segregation, the Apollo Theater was one of the few settings in which hopeful African American performers could show off their talent. At that time, if you were white and hoped to become an entertainer, you went to Broadway, but if you were black, like Ella, **33** she went to amateur night at the Apollo. Ella knew that winning the amateur night talent show could launch her career, as it had launched the careers of so many entertainers before her. **34**

31

A) NO CHANGE
B) blowing on
C) blowing: on
D) blowing, on,

32

A) NO CHANGE
B) During the age
C) For the era
D) At the moment

33

A) NO CHANGE
B) they
C) you
D) he or she

34

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

> To this day, amateur night at the Apollo remains an institution, one that has been instrumental in promoting the careers of such famous talents as Michael Jackson and Stevie Wonder.

Should the writer make this addition here?

A) Yes, because it reinforces the paragraph's point about the Apollo's significance.
B) Yes, because it adds a historical detail to remind the reader that the passage is nonfiction.
C) No, because it blurs the paragraph's focus on explaining racial segregation.
D) No, because it is irrelevant to the passage's focus on how Fitzgerald got her start as an entertainer.

CONTINUE

As Ella walked toward the theater's door, she stared aghast at the long line of people waiting to take their seats. These were the **35** people, who would choose the evening's winner by the volume of their applause. **36**

From backstage, Ella watched as a pair of dancers dazzled the audience. Her heart sank as she realized her dance routine couldn't compete with this performance. It was her turn next to perform, but Ella was so petrified that she could barely force herself to walk out onto the stage.

[1] After Ella was introduced, she heard people in the audience wondering what she was going to do. [2] Then, she made a sudden decision to sing instead of dance. [3] She began shakily, and after a few sour notes of "The Object of My Affection" stumbled out of her mouth, Ella stopped short. [4] With this song, Ella's bold, singular voice brought the house down. [5] She tried again, but this time she went with a song called "Judi." [6] As she finished, a wave of applause swept over her. [7] The audience demanded an encore **37** because they wanted her to sing again. **38**

35

A) NO CHANGE
B) people, who would choose the evening's winner,
C) people who would choose the evening's winner
D) people who would choose the evening's winner,

36

Which choice, if added here, would most effectively explain why Ella might be nervous?

A) Ella knew that audiences at amateur night were notoriously tough on the entertainers.
B) Most entertainers simply ignored the audience's reaction and kept on performing.
C) Even now the audience at the Apollo is not shy about voicing its opinions about the performers.
D) Ella had often sat in those seats and wondered when it would be her turn to be on stage.

37

A) NO CHANGE
B) to show they thought she was a great singer.
C) because they wanted to hear more from her.
D) DELETE the underlined portion and end the sentence with a period.

38

To make this paragraph most logical, sentence 5 should be placed

A) where it is now.
B) after sentence 2.
C) after sentence 3.
D) after sentence 6.

CONTINUE

The appearance Ella made at the Apollo Theater that night **39** undertook her career. She was invited to sing with a well-known swing band and eventually started a solo career. She became one of the top international jazz performers and won many awards for her recordings. **40**

39

A) NO CHANGE
B) ignited
C) caused
D) introduced

40

The writer wants to conclude with a thought that emphasizes the idea of Ella Fitzgerald as an important entertainer. Which sentence, if added here, would best accomplish this goal?

A) Ella Fitzgerald always knew that the Apollo would be the key to achieving her dream.
B) To many, Ella Fitzgerald is still "the first lady of song."
C) Though it wasn't her original plan, Ella Fitzgerald's choice to sing was the right one.
D) Ella Fitzgerald would always remember that first night at the Apollo.

STOP

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

No Test Material On This Page

Math Test – No Calculator

20 MINUTES, 13 QUESTIONS

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

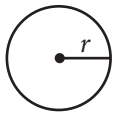
DIRECTIONS

For questions 1-10, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 11-13**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 11 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

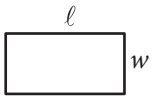
NOTES

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

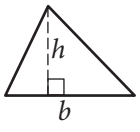
REFERENCE



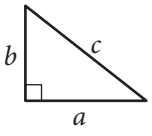
$A = \pi r^2$
$C = 2\pi r$



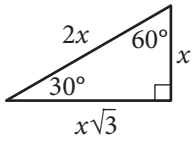
$A = \ell w$

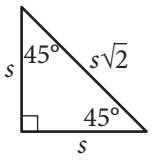


$A = \frac{1}{2}bh$

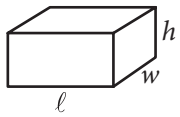


$c^2 = a^2 + b^2$

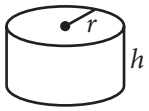




Special Right Triangles

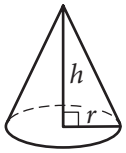


$V = \ell wh$

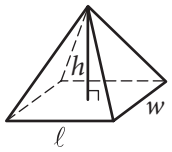


$V = \pi r^2 h$

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



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



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

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

CONTINUE

1

$$\frac{3}{4} = \frac{x}{60}$$

In the equation above, what is the value of x ?

A) 25

B) 30

C) 40

D) 45

2

x	y
1	5
2	7
3	9
4	11

The table above shows some pairs of x values and y values. Which of the following equations could represent the relationship between x and y ?

A) $y = 2x + 3$

B) $y = 3x - 2$

C) $y = 4x - 1$

D) $y = 5x$

3

A discount airline sells a certain number of tickets, x, for a flight for \$90 each. It sells the number of remaining tickets, y, for \$250 each. For a particular flight, the airline sold 120 tickets and collected a total of \$27,600 from the sale of those tickets. Which system of equations represents this relationship between x and y?

A) $\begin{cases} x + y = 120 \\ 90x + 250y = 27{,}600 \end{cases}$

B) $\begin{cases} x + y = 120 \\ 90x + 250y = 120(27{,}600) \end{cases}$

C) $\begin{cases} x + y = 27{,}600 \\ 90x + 250y = 120(27{,}600) \end{cases}$

D) $\begin{cases} 90x = 250y \\ 120x + 120y = 27{,}600 \end{cases}$

4

$$x^2 - 17x - 60$$

Which of the following is equivalent to the expression above?

A) $(x - 5)(x - 12)$

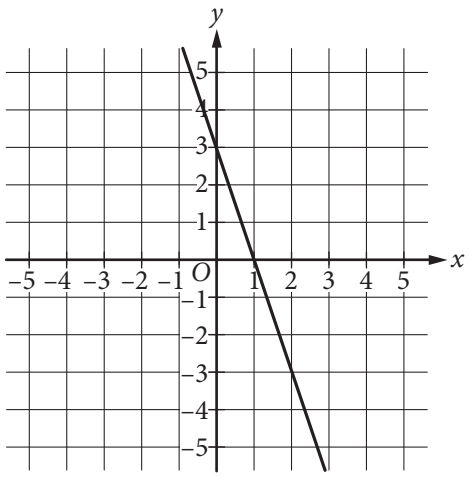
B) $(x + 5)(x - 12)$

C) $(x - 3)(x - 20)$

D) $(x + 3)(x - 20)$

CONTINUE

5



What is the equation of the line shown in the xy-plane above?

A) $y = 3x - 3$

B) $y = -3x + 3$

C) $y = \frac{1}{3}x - 3$

D) $y = -\frac{1}{3}x + 3$

6

$$(-11x + 31y) - 2(-x + 5y)$$

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

A) $-13x + 21y$

B) $-13x + 36y$

C) $-9x + 21y$

D) $-9x + 36y$

7

The formula for determining the pressure, p, exerted on an object at a depth, h, below the surface of a liquid is $p = s + dgh$, where s is the atmospheric pressure, d is the density of the liquid, and g is the acceleration due to gravity. Which formula represents h in terms of p, s, d, and g ?

A) $h = \frac{p}{s} + dg$

B) $h = \frac{p - s}{dg}$

C) $h = ps - dg$

D) $h = ps + dg$

8

Rachel's costs for automobile maintenance and fuel are shown in the table below.

Cost of Automobile Ownership

Type of cost	Average cost
maintenance	5 cents per mile
fuel	14 cents per mile

In addition to fuel and maintenance, Rachel pays $1,000 a year for insurance. The equation $C = (0.05 + 0.14)x + 1{,}000$ shows the cost C, in dollars, of owning and operating the car for a year as a function of x, the number of miles driven in a year. What does the slope of the graph of this function represent?

A) The cost of insurance for a year

B) The cost of fuel and insurance for a year

C) The cost of owning and operating per mile

D) The cost of maintenance and fuel per mile

CONTINUE

9

$$(-4x + 5) - (6x + 7) = 0$$

What is the solution to the equation above?

A) $x = 6$

B) $x = 1$

C) $x = -0.2$

D) $x = -1.2$

10

A manufacturer makes two different sizes of spherical ball bearings for use in motors. If the radius of the larger ball bearing is twice the radius of the smaller one, then the volume of the larger ball bearing is how many times the volume of the smaller one?

A) 2

B) 3

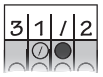
C) 6

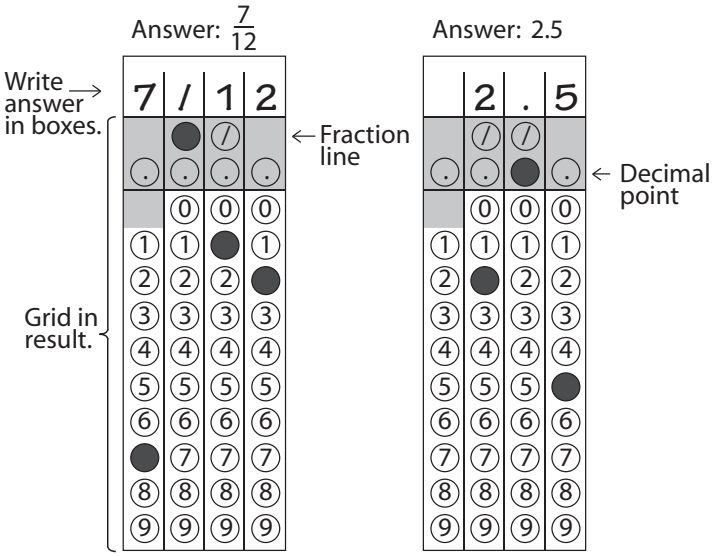
D) 8

CONTINUE

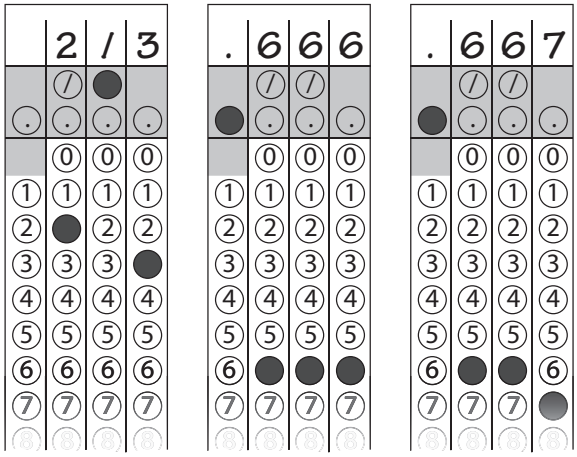
DIRECTIONS

For questions 11–13, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

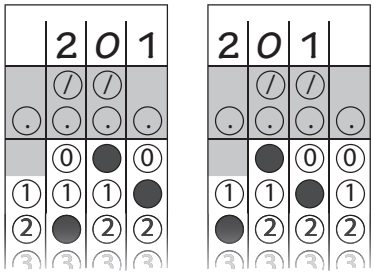
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.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



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



Answer: 201 – either position is correct



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

CONTINUE

11

If the equation $y = 2x^2 - 5x + 3$ is graphed in the xy-plane, what is the value of its y-intercept?

12

The solution to the system of equations below is (x, y).

$$3x + y = 13$$
$$2x - 4y = 18$$

What is the value of x ?

13

A group of 12 friends went bowling. They each rented shoes for $3.00 a pair, and 4 friends bowled 2 games each, while 8 friends bowled 3 games each. Each game bowled cost each person the same amount. The total cost for the shoe rentals and the games bowled was $212.00. What was the cost, in dollars, of each game bowled? (Note: Disregard the $ sign when gridding your answer.)

STOP

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

Math Test – Calculator

40 MINUTES, 25 QUESTIONS

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

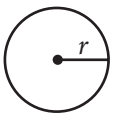
DIRECTIONS

For questions 1-21, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 22-25,** solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 22 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

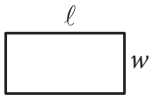
NOTES

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

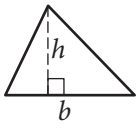
REFERENCE



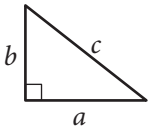
$A = \pi r^2$
$C = 2\pi r$



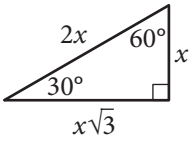
$A = \ell w$

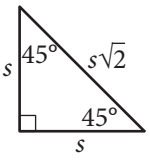


$A = \frac{1}{2}bh$

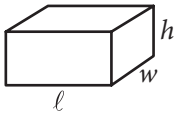


$c^2 = a^2 + b^2$

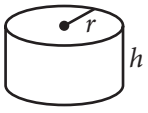




Special Right Triangles

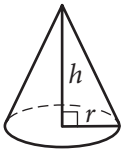


$V = \ell wh$

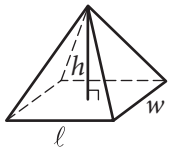


$V = \pi r^2 h$

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



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



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

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

CONTINUE

1

Charissa ordered 3 cans of lemonade for each person at her party. She also ordered 1 pizza for every 4 people. If she ordered 6 pizzas, which of the following could be the number of cans of lemonade she ordered?

A) 36

B) 48

C) 60

D) 72

2

A bakery sells trays of cookies. Each tray contains at least 50 cookies but no more than 60. Which of the following could be the total number of cookies on 4 trays of cookies?

A) 165

B) 205

C) 245

D) 285

3

A survey taken by 1,000 students at a school asked whether they played school sports. The table below summarizes all 1,000 responses from the students surveyed.

	Males	Females
Play a school sport	312	220
Do not play a school sport	?	216

How many of the males surveyed responded that they do not play a school sport?

A) 109

B) 252

C) 468

D) 688

4

A waiter receives tips from each customer. On average, the tip is 15% of the customer's bill. At this rate, which of the following is closest to the tip the waiter can expect when a customer has a bill that is $78.20 ?

A) $8.00

B) $10.00

C) $12.00

D) $14.00

CONTINUE

5

The table below shows the high and low temperatures in Houston, Texas, during a five-day period.

Temperatures in Houston, Texas
(degrees Fahrenheit)

	Monday	Tuesday	Wednesday	Thursday	Friday
High temperature	73	56	62	75	81
Low temperature	49	37	41	54	63

What was the mean low temperature, in degrees Fahrenheit, during the five-day period?

A) 48.8

B) 49

C) 59

D) 59.1

CONTINUE

6

A random sample of 50 people from a town with a population of 14,878 were asked to name their favorite flavor of ice cream. If 7 people in the sample named chocolate as their favorite ice-cream flavor, about how many people in the town would be expected to name chocolate?

A) 350

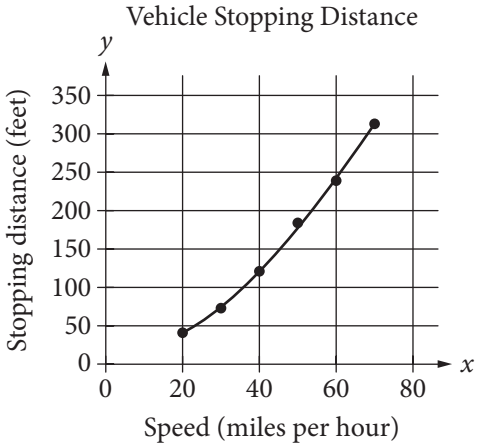
B) 2,100

C) 7,500

D) 10,500

7

A study was done to determine a new car's stopping distance when it was traveling at different speeds. The study was done on a dry road with good surface conditions. The results are shown below, along with the graph of a quadratic function that models the data.



According to the model, which of the following is the best estimate for the stopping distance, in feet, if the vehicle was traveling 55 miles per hour?

A) 25

B) 30

C) 210

D) 250

CONTINUE

8

The equations below show the total amount of water in gallons, y, that has flowed through two different types of showerheads after x minutes of use.

Type A: $y = 1.25x$

Type B: $y = 2.50x$

Based on these equations, which of the following statements is a correct comparison?

A) For each minute of use, the amount of water that flowed through Type B is twice the amount that flowed through Type A.

B) For each minute of use, the amount of water that flowed through Type A is twice the amount that flowed through Type B.

C) The amount of water that flowed through Type A per minute increased at a faster rate than the amount of water that flowed through Type B per minute.

D) The amount of water that flowed through Type B per minute increased at a faster rate than the amount of water that flowed through Type A per minute.

9

A certain number of cubic yards of concrete will be poured to form a driveway. The concrete will fill a space that is a right rectangular prism that is 18 feet wide, 42 feet long, and 6 inches thick. What are the dimensions of this space (width by length by thickness) in yards? (Note: 1 foot = 12 inches and 1 yard = 3 feet)

A) 6 yards by 14 yards by $\frac{1}{6}$ yard

B) 6 yards by 14 yards by $\frac{1}{2}$ yard

C) 54 yards by 126 yards by 72 yards

D) 54 yards by 126 yards by 216 yards

CONTINUE

10

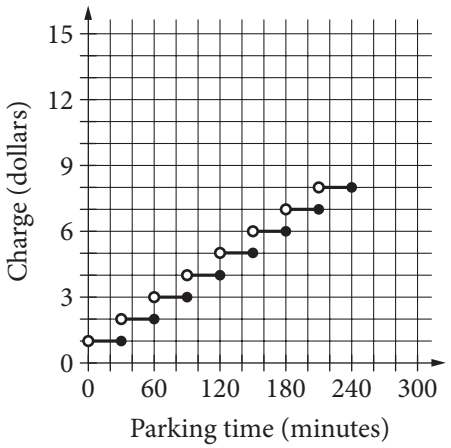
The charges for a parking garage are shown below.

Parking Garage Charges
(maximum of 4 hours)

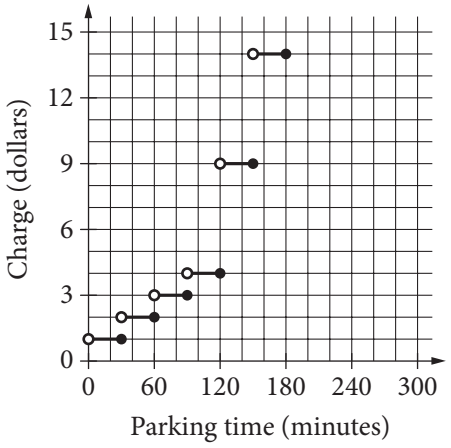
Charge ($)	Parking time (minutes)
1	up to 30
2	over 30 and up to 60
3	over 60 and up to 90
4	over 90 and up to 120
9	over 120 and up to 180
14	over 180 and up to 240

Which graph shows the relationship between the parking time, in minutes, and the charge, in dollars?

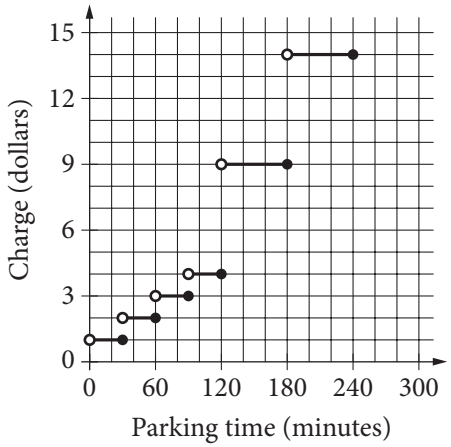
A)



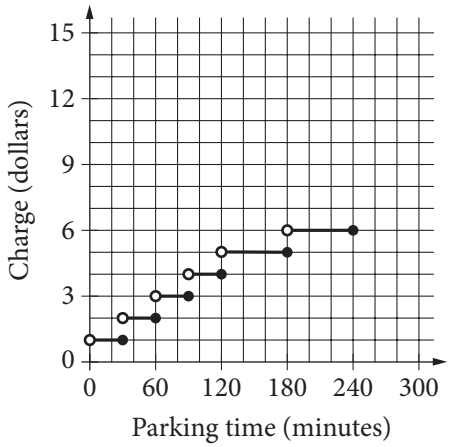
B)



C)



D)



11

A sterling silver platter is made up of a mixture of silver and copper. The ratio of silver to copper is 37 : 3 by mass. If the platter has a mass of 600 grams, what is the mass, in grams, of the copper in the platter?

A) 18

B) 45

C) 222

D) 555

CONTINUE

Questions 12-14 refer to the following information.

Rocco is saving money to buy his first car. He works 15 hours each week and saves $10 for each hour he works. Rocco has already saved $3,500 and plans to save at least $5,300. He knows there will be an 8.5% sales tax on the purchase price of the car and a title transfer fee of $15. He will use the formula below to determine his gas mileage, y, in miles per gallon, from the number of miles, m, the car can be driven using g gallons of gas.

$$y = \frac{m}{g}$$

12

Rocco will need to pay a total of $5,246.87 for the car, including the sales tax and transfer fee. To the nearest dollar, what is the purchase price of the car Rocco plans to buy?

A) $4,787

B) $4,822

C) $5,223

D) $5,708

13

Which formula can Rocco use to determine the number of miles he can expect to drive using a certain number of gallons of gas?

A) $m = \frac{y}{g}$

B) $m = \frac{g}{y}$

C) $m = g + y$

D) $m = gy$

14

Which inequality can Rocco use to model the number of weeks remaining, x, that he will need to work before he has saved at least $5,300 ?

A) $3{,}500 + 150x \geq 5{,}300$

B) $3{,}500 \leq 150x + 5{,}300$

C) $3{,}500 \leq 150 + 5{,}300x$

D) $3{,}500x + 150 \geq 5{,}300$

CONTINUE

15

The table below shows the lengths in centimeters (cm) of a sample of 5 leaves from a tree.

Leaf	Length (cm)
1	14.2
2	13.8
3	12.6
4	13.4
5	11.5
6	?

A 6th leaf is added to the sample and its length is measured. Its measure increases the mean value of the sample of leaves but decreases the median value of the sample of leaves. What is a possible measurement for the length of the 6th leaf?

A) 13.1 cm

B) 13.3 cm

C) 13.4 cm

D) 13.7 cm

16

A theater is showing one movie today. A media research company randomly selected people coming out of the theater to rate, on a 5-star scale, the movie they just saw. The results of the survey are shown in the table below.

Movie Ratings

Rating	Frequency
★	8
★ ★	12
★ ★ ★	17
★ ★ ★ ★	19
★ ★ ★ ★ ★	14

A total of 325 people saw the movie in that theater. Based on the survey results, about how many of the people who saw the movie would have rated it with 3 or more stars?

A) 50

B) 80

C) 230

D) 305

CONTINUE

Questions 17 and 18 refer to the following information.

Experts say vitamin C is a nutrient that provides many health benefits. The amount of vitamin C, in milligrams (mg), found in 100 grams (g) of each of several fruits is shown in the table below.

Vitamin C Content in Fruits

Type of fruit	Amount of vitamin C in 100 g of fruit
Acerola cherries	1,678 mg
Black currants	181 mg
Guava	228 mg
Kiwifruit	105 mg
Pineapple	56 mg
Strawberries	59 mg

17

Which quantity of fruit contains an amount of vitamin C closest to the combined amount of vitamin C in 50 g of acerola cherries and 150 g of kiwifruit?

A) 2,000 g of black currants

B) 800 g of guava

C) 1,800 g of pineapple

D) 600 g of strawberries

18

A fruit salad was prepared containing 100 g of acerola cherries, 100 g of kiwifruit, 300 g of pineapple, and 200 g of strawberries. What is the total amount of vitamin C, in grams, that is contained in the listed fruits?

A) 0.7 g

B) 2.069 g

C) 700 g

D) 2,069 g

CONTINUE

19

A quality-control specialist for an electronics manufacturer estimates that 0.25% of the televisions produced each day by her company are defective. If the manufacturer produces an average of 450 televisions each day, which of the following is the best estimate of the total number of defective televisions produced in 30 working days?

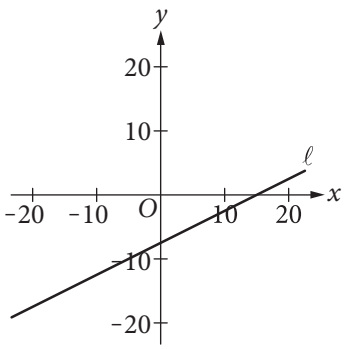
A) 1

B) 34

C) 113

D) 3,375

20



Line ℓ is shown on the xy-plane above. If the corresponding equation for line ℓ is $y = ax + b$, where a and b are constants, which set of inequalities is true about a and b?

A) $\begin{cases} 0 < a < 1 \\ b < 1 \end{cases}$

B) $\begin{cases} -1 < a < 0 \\ b > -10 \end{cases}$

C) $\begin{cases} a < 0 \\ b < 1 \end{cases}$

D) $\begin{cases} a > 0 \\ b > 10 \end{cases}$

CONTINUE

21

Mr. LePage spent $25,000 to buy a new truck for his construction business. He estimated the value of the truck after each of the next 5 years, as shown in the table below.

Truck Value after Each Year of Ownership

Year (x)	Truck Value (y)
1	$22,000
2	$19,000
3	$16,000
4	$13,000
5	$10,000

If the line passing through the points defined by the values in the table is graphed in the xy-plane, which of the following is the best interpretation of the y-intercept in the context of the problem?

A) The number of years for which the value of the truck will decrease

B) The amount that the value of the truck is decreasing each year

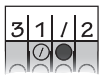
C) The value of the truck after the sixth year of ownership

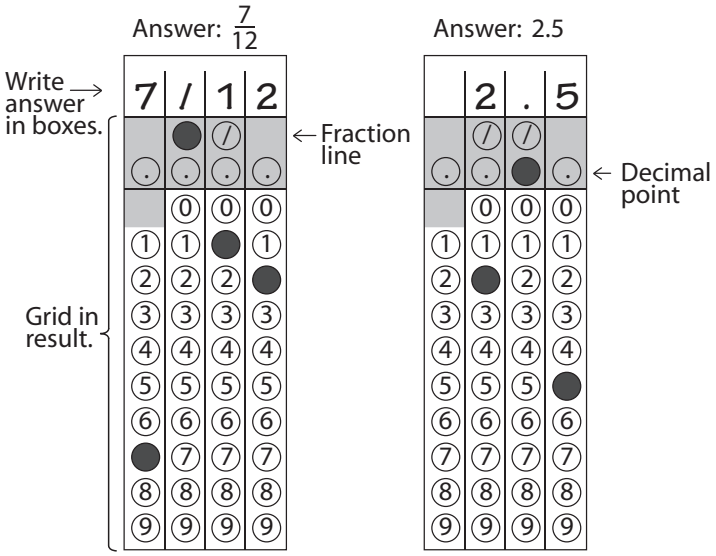
D) The value of the truck when it was new

CONTINUE

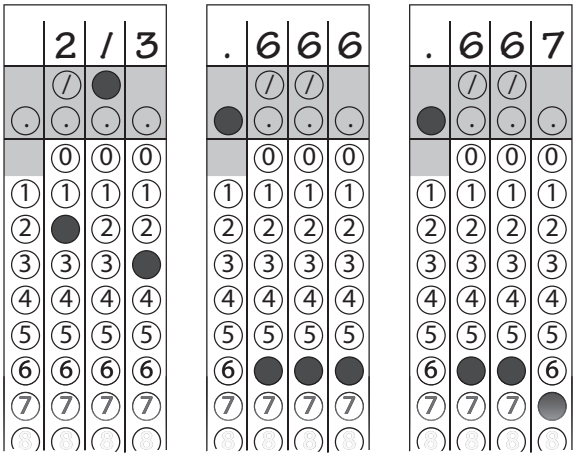
DIRECTIONS

For questions 22-25, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

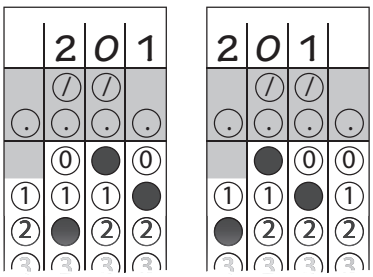
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.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



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



Answer: 201 – either position is correct



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

CONTINUE

22

The solution to the system of equations below is (x, y).

$$5x - 6y = 2.7$$
$$10x + 7y = 1.6$$

What is the value of x ?

23

A dinner was held to raise money for a children's museum. A ticket for one person cost $200 and a ticket for a couple (two people) cost $350. A total of 130 people attended the dinner, and the ticket sales total was $24,000. What is the total number of tickets that were sold?

CONTINUE

Questions 24 and 25 refer to the following information.

The United States Senate first convened in the year 1789. From 1789 through 2013, a total of 44 women served as US senators. The partially completed table below shows the number of women senators by political party and geographical region.

Number of Women US Senators through 2013

		Political party		
		Democratic	Republican	Total
Geographical region	Midwest		7	
	Northeast	4		8
	South		3	
	West	6		7
	Total			44

24

What is the total number of women from the Democratic Party who served as US senators from 1789 through 2013 ?

25

From 1789 through 2013, of the women from only the Democratic Party who served as US senators, 34.5% have been from the South region. What is the total number of Democratic and Republican women US senators who represented the Midwest in this time period?

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

No Test Material On This Page

Answer Sheet — Multiple-Choice Questions and Student-Produced Responses

You must use a No. 2 pencil. It is important that marks are dark and complete. Do not use a mechanical pencil. If you need to change a response, erase as completely as possible. Incomplete marks or erasures may affect your score.

Complete Mark:

Incomplete Marks:

Section 1

1 Ⓐ Ⓑ Ⓒ Ⓓ	9 Ⓐ Ⓑ Ⓒ Ⓓ	17 Ⓐ Ⓑ Ⓒ Ⓓ	25 Ⓐ Ⓑ Ⓒ Ⓓ	33 Ⓐ Ⓑ Ⓒ Ⓓ	41 Ⓐ Ⓑ Ⓒ Ⓓ
2 Ⓐ Ⓑ Ⓒ Ⓓ	10 Ⓐ Ⓑ Ⓒ Ⓓ	18 Ⓐ Ⓑ Ⓒ Ⓓ	26 Ⓐ Ⓑ Ⓒ Ⓓ	34 Ⓐ Ⓑ Ⓒ Ⓓ	42 Ⓐ Ⓑ Ⓒ Ⓓ
3 Ⓐ Ⓑ Ⓒ Ⓓ	11 Ⓐ Ⓑ Ⓒ Ⓓ	19 Ⓐ Ⓑ Ⓒ Ⓓ	27 Ⓐ Ⓑ Ⓒ Ⓓ	35 Ⓐ Ⓑ Ⓒ Ⓓ	
4 Ⓐ Ⓑ Ⓒ Ⓓ	12 Ⓐ Ⓑ Ⓒ Ⓓ	20 Ⓐ Ⓑ Ⓒ Ⓓ	28 Ⓐ Ⓑ Ⓒ Ⓓ	36 Ⓐ Ⓑ Ⓒ Ⓓ	
5 Ⓐ Ⓑ Ⓒ Ⓓ	13 Ⓐ Ⓑ Ⓒ Ⓓ	21 Ⓐ Ⓑ Ⓒ Ⓓ	29 Ⓐ Ⓑ Ⓒ Ⓓ	37 Ⓐ Ⓑ Ⓒ Ⓓ	
6 Ⓐ Ⓑ Ⓒ Ⓓ	14 Ⓐ Ⓑ Ⓒ Ⓓ	22 Ⓐ Ⓑ Ⓒ Ⓓ	30 Ⓐ Ⓑ Ⓒ Ⓓ	38 Ⓐ Ⓑ Ⓒ Ⓓ	
7 Ⓐ Ⓑ Ⓒ Ⓓ	15 Ⓐ Ⓑ Ⓒ Ⓓ	23 Ⓐ Ⓑ Ⓒ Ⓓ	31 Ⓐ Ⓑ Ⓒ Ⓓ	39 Ⓐ Ⓑ Ⓒ Ⓓ	
8 Ⓐ Ⓑ Ⓒ Ⓓ	16 Ⓐ Ⓑ Ⓒ Ⓓ	24 Ⓐ Ⓑ Ⓒ Ⓓ	32 Ⓐ Ⓑ Ⓒ Ⓓ	40 Ⓐ Ⓑ Ⓒ Ⓓ	

Section 2

1 Ⓐ Ⓑ Ⓒ Ⓓ	9 Ⓐ Ⓑ Ⓒ Ⓓ	17 Ⓐ Ⓑ Ⓒ Ⓓ	25 Ⓐ Ⓑ Ⓒ Ⓓ	33 Ⓐ Ⓑ Ⓒ Ⓓ
2 Ⓐ Ⓑ Ⓒ Ⓓ	10 Ⓐ Ⓑ Ⓒ Ⓓ	18 Ⓐ Ⓑ Ⓒ Ⓓ	26 Ⓐ Ⓑ Ⓒ Ⓓ	34 Ⓐ Ⓑ Ⓒ Ⓓ
3 Ⓐ Ⓑ Ⓒ Ⓓ	11 Ⓐ Ⓑ Ⓒ Ⓓ	19 Ⓐ Ⓑ Ⓒ Ⓓ	27 Ⓐ Ⓑ Ⓒ Ⓓ	35 Ⓐ Ⓑ Ⓒ Ⓓ
4 Ⓐ Ⓑ Ⓒ Ⓓ	12 Ⓐ Ⓑ Ⓒ Ⓓ	20 Ⓐ Ⓑ Ⓒ Ⓓ	28 Ⓐ Ⓑ Ⓒ Ⓓ	36 Ⓐ Ⓑ Ⓒ Ⓓ
5 Ⓐ Ⓑ Ⓒ Ⓓ	13 Ⓐ Ⓑ Ⓒ Ⓓ	21 Ⓐ Ⓑ Ⓒ Ⓓ	29 Ⓐ Ⓑ Ⓒ Ⓓ	37 Ⓐ Ⓑ Ⓒ Ⓓ
6 Ⓐ Ⓑ Ⓒ Ⓓ	14 Ⓐ Ⓑ Ⓒ Ⓓ	22 Ⓐ Ⓑ Ⓒ Ⓓ	30 Ⓐ Ⓑ Ⓒ Ⓓ	38 Ⓐ Ⓑ Ⓒ Ⓓ
7 Ⓐ Ⓑ Ⓒ Ⓓ	15 Ⓐ Ⓑ Ⓒ Ⓓ	23 Ⓐ Ⓑ Ⓒ Ⓓ	31 Ⓐ Ⓑ Ⓒ Ⓓ	39 Ⓐ Ⓑ Ⓒ Ⓓ
8 Ⓐ Ⓑ Ⓒ Ⓓ	16 Ⓐ Ⓑ Ⓒ Ⓓ	24 Ⓐ Ⓑ Ⓒ Ⓓ	32 Ⓐ Ⓑ Ⓒ Ⓓ	40 Ⓐ Ⓑ Ⓒ Ⓓ

Section 3

1 Ⓐ Ⓑ Ⓒ Ⓓ	8 Ⓐ Ⓑ Ⓒ Ⓓ	
2 Ⓐ Ⓑ Ⓒ Ⓓ	9 Ⓐ Ⓑ Ⓒ Ⓓ	
3 Ⓐ Ⓑ Ⓒ Ⓓ	10 Ⓐ Ⓑ Ⓒ Ⓓ	
4 Ⓐ Ⓑ Ⓒ Ⓓ		
5 Ⓐ Ⓑ Ⓒ Ⓓ		
6 Ⓐ Ⓑ Ⓒ Ⓓ		
7 Ⓐ Ⓑ Ⓒ Ⓓ		

Student-Produced Responses Enter answers as directed in your test book. Answers must be bubbled to be scored. You will not receive credit for anything written in the boxes.

11

	/	/	
•	•	•	•
	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

12

	/	/	
•	•	•	•
	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

13

	/	/	
•	•	•	•
	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

Section 4

1 Ⓐ Ⓑ Ⓒ Ⓓ	15 Ⓐ Ⓑ Ⓒ Ⓓ	
2 Ⓐ Ⓑ Ⓒ Ⓓ	16 Ⓐ Ⓑ Ⓒ Ⓓ	
3 Ⓐ Ⓑ Ⓒ Ⓓ	17 Ⓐ Ⓑ Ⓒ Ⓓ	
4 Ⓐ Ⓑ Ⓒ Ⓓ	18 Ⓐ Ⓑ Ⓒ Ⓓ	
5 Ⓐ Ⓑ Ⓒ Ⓓ	19 Ⓐ Ⓑ Ⓒ Ⓓ	
6 Ⓐ Ⓑ Ⓒ Ⓓ	20 Ⓐ Ⓑ Ⓒ Ⓓ	
7 Ⓐ Ⓑ Ⓒ Ⓓ	21 Ⓐ Ⓑ Ⓒ Ⓓ	
8 Ⓐ Ⓑ Ⓒ Ⓓ		
9 Ⓐ Ⓑ Ⓒ Ⓓ		
10 Ⓐ Ⓑ Ⓒ Ⓓ		
11 Ⓐ Ⓑ Ⓒ Ⓓ		
12 Ⓐ Ⓑ Ⓒ Ⓓ		
13 Ⓐ Ⓑ Ⓒ Ⓓ		
14 Ⓐ Ⓑ Ⓒ Ⓓ		

Student-Produced Responses Enter answers as directed in your test book. Answers must be bubbled to be scored. You will not receive credit for anything written in the boxes.

22

	/	/	
•	•	•	•
	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

23

	/	/	
•	•	•	•
	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

24

	/	/	
•	•	•	•
	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

25

	/	/	
•	•	•	•
	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