Chapter 15
Practice Test 2

Reading Test

60 MINUTES, 47 QUESTIONS

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

Questions 1–9 are based on the following passage.

This passage is adapted from Henry James, "The Beast in the Jungle." Originally published in 1903. The passage describes the meeting, after many years, of John Marcher and May Bertram.

"You know you told me something I've never forgotten and that again and again has made me think of you since; it was that tremendously hot day when we
Line went to Sorrento, across the bay, for the breeze. What I
5   allude to was what you said to me, on the way back, as we sat under the awning of the boat enjoying the cool. Have you forgotten?"

He had forgotten and was even more surprised than ashamed. But the great thing was that he saw
10 in this no vulgar reminder of any "sweet" speech. The vanity of women had long memories, but she was making no claim on him of a compliment or a mistake. With another woman, a totally different one, he might have feared the recall possibly even of some
15 imbecile "offer." So, in having to say that he had indeed forgotten, he was conscious rather of a loss than of a gain; he already saw an interest in the matter of her mention. "I try to think—but I give up. Yet I remember that Sorrento day."
20   "I'm not very sure you do," May Bertram after a moment said; "and I'm not very sure I ought to want you to. It's dreadful to bring a person back at any time to what he was ten years before. If you've lived away from it," she smiled, "so much the better."
25   "Ah, if *you* haven't why should I?" he asked.
"Lived away, you mean, from what I myself was?"
"From what *I* was. I was of course [a boor],"

Marcher went on; "but I would rather know from you just the sort of [boor] I was than—from the
30 moment you have something in your mind—not know anything."

Still, however, she hesitated. "But if you've completely ceased to be that sort—?"

"Why I can then all the more bear to know. Besides,
35 perhaps I haven't."

"Perhaps. Yet if you haven't," she added, "I should suppose you'd remember. Not indeed that *I* in the least connect with my impression the invidious name you use. If I had only thought you foolish," she explained,
40 "the thing I speak of wouldn't so have remained with me. It was about yourself." She waited as if it might come to him; but as, only meeting her eyes in wonder, he gave no sign, she burnt her ships. "Has it ever happened?"
45   Then it was that, while he continued to stare, a light broke for him and the blood slowly came to his face, which began to burn with recognition. "Do you mean I told you—?" But he faltered, lest what came to him shouldn't be right, lest he should only give himself
50 away.

"It was something about yourself that it was natural one shouldn't forget—that is if one remembered you at all. That's why I ask you," she smiled, "if the thing you then spoke of has ever come to pass?"
55   Oh then he saw, but he was lost in wonder and found himself embarrassed. This, he also saw, made her sorry for him, as if her allusion had been a mistake. It took him but a moment, however, to feel it hadn't

CONTINUE ▶

been, much as it had been a surprise. After the first
60 little shock of it her knowledge on the contrary began,
even if rather strangely, to taste sweet to him. She was
the only other person in the world then who would
have it, and she had had it all these years, while the fact
of his having so breathed his secret had unaccountably
65 faded from him. No wonder they couldn't have met
as if nothing had happened. "I judge," he finally said,
"that I know what you mean. Only I had strangely
enough lost any sense of having taken you so far into
my confidence."

1

The point of view from which the passage is written
can best be described as

A) a first-person narrator telling his life story.

B) a disinterested reporter listing objective facts.

C) a critical observer who judges Marcher's actions.

D) a sympathetic chronicler who relates to Marcher's
feelings.

2

Over the course of the passage, the emotions of John
Marcher shift from

A) incredulity to begrudging acceptance.

B) confusion to disconcerted recognition.

C) disdain to unrequited love.

D) amazement to painful embarrassment.

3

Information in the passage suggests that John
Marcher and May Bertram are

A) comforting one another over mistakes made
during the previous ten years.

B) trusting one another with sensitive personal
information.

C) reminiscing about former times and
conversations.

D) expressing their true feelings for one another.

4

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

A) Lines 1–4 ("You know . . . breeze")

B) Lines 20–22 ("I'm not . . . to")

C) Lines 45–47 ("Then . . . recognition")

D) Lines 55–57 ("Oh then . . . mistake")

5

As used in line 12, "claim" most nearly means

A) application.

B) remark.

C) appeal.

D) demand.

6

In the second paragraph, the "loss" (line 16) Marcher
feels most likely refers to

A) a connection over an interest he has in common
with May.

B) a missed opportunity to compliment May.

C) his longing to return to the warm weather in
Sorrento.

D) May's rejection of his speech declaring love for
her.

7

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

A) indication.

B) notice.

C) symbol.

D) gesture.

CONTINUE

8

The conversation between Marcher and May Bertram suggests that Marcher had previously told May about which of the following?

A) A troublesome puzzle

B) A romantic confession

C) A forgotten trifle

D) A personal secret

9

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

A) Lines 4–6 ("What . . . cool")

B) Lines 11–13 ("The vanity . . . mistake")

C) Lines 42–44 ("She waited . . . ships")

D) Lines 67–69 ("Only . . . confidence")

CONTINUE

Questions 10–18 are based on the following passage.

This passage is adapted from a speech delivered in 1940 by Winston Churchill. Churchill was Prime Minister of the United Kingdom. This speech was his first address to the House of Commons, in which he asks the House to support his new administration.

I beg to move,

That this House welcomes the formation of a Government representing the united and inflexible resolve of the nation to prosecute the war with

5   Germany to a victorious conclusion.

On Friday evening last I received His Majesty's commission to form a new Administration. It [w]as the evident wish and will of Parliament and the nation that this should be conceived on the broadest possible basis

10 and that it should include all parties, both those who supported the late Government and also the parties of the Opposition. I have completed the most important part of this task. A War Cabinet has been formed of five Members, representing, with the Opposition

15 Liberals, the unity of the nation. The three party Leaders have agreed to serve, either in the War Cabinet or in high executive office. The three Fighting Services have been filled. It was necessary that this should be done in one single day, on account of the extreme

20 urgency and rigour of events. A number of other positions, key positions, were filled yesterday, and I am submitting a further list to His Majesty to-night. I hope to complete the appointment of the principal Ministers during to-morrow. The appointment of the

25 other Ministers usually takes a little longer, but I trust that, when Parliament meets again, this part of my task will be completed, and that the administration will be complete in all respects.

I considered it in the public interest to suggest

30 that the House should be summoned to meet today. Mr. Speaker agreed, and took the necessary steps, in accordance with the powers conferred upon him by the Resolution of the House. At the end of the proceedings today, the Adjournment of the House will

35 be proposed until Tuesday, 21st May, with, of course, provision for earlier meeting, if need be. The business to be considered during that week will be notified to Members at the earliest opportunity. I now invite the House, by the Motion which stands in my name, to

40 record its approval of the steps taken and to declare its confidence in the new Government.

To form an Administration of this scale and complexity is a serious undertaking in itself, but it must be remembered that we are in the preliminary

45 stage of one of the greatest battles in history, that we are in action at many other points in Norway and in Holland, that we have to be prepared in the Mediterranean, that the air battle is continuous and that many preparations, such as have been indicated

50 by my hon. Friend below the Gangway, have to be made here at home. In this crisis I hope I may be pardoned if I do not address the House at any length today. I hope that any of my friends and colleagues, or former colleagues, who are affected by the political

55 reconstruction, will make allowance, all allowance, for any lack of ceremony with which it has been necessary to act. I would say to the House, as I said to those who have joined this government: "I have nothing to offer but blood, toil, tears and sweat."

60 We have before us an ordeal of the most grievous kind. We have before us many, many long months of struggle and of suffering. You ask, what is our policy? I can say: It is to wage war, by sea, land and air, with all our might and with all the strength that God can

65 give us; to wage war against a monstrous tyranny, never surpassed in the dark, lamentable catalogue of human crime. That is our policy. You ask, what is our aim? I can answer in one word: It is victory, victory at all costs, victory in spite of all terror, victory, however

70 long and hard the road may be; for without victory, there is no survival. Let that be realised; no survival for the British Empire, no survival for all that the British Empire has stood for, no survival for the urge and impulse of the ages, that mankind will move forward

75 towards its goal. But I take up my task with buoyancy and hope. I feel sure that our cause will not be suffered to fail among men. At this time I feel entitled to claim the aid of all, and I say, "come then, let us go forward together with our united strength."

CONTINUE ▶

10

Over the course of the speech, Churchill's focus shifts from

A) defeating Germany to reconstructing the government.

B) forming a War Cabinet to establishing war policy.

C) appointing an Administration to bolstering spirits.

D) reconciling differences to accepting defeat.

11

In the speech, Churchill claims that his administration must be formed more quickly than usual because

A) the king has told him to act with haste.

B) Parliament has been united under three party leaders.

C) the British Empire is in danger of losing the war.

D) the international political situation requires unusual measures.

12

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

A) Lines 6–7 ("On Friday . . . Administration")

B) Lines 18–20 ("It was . . . events")

C) Lines 53–57 ("I hope . . . act")

D) Lines 71–75 ("Let that . . . goal")

13

It can be inferred from the passage that Churchill's administration

A) is likely to be controversial.

B) will meet with approval from all members of the House of Commons.

C) is dominated by Opposition Liberals.

D) has some unfilled positions.

14

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

A) Lines 13–15 ("A war . . . nation")

B) Lines 24–28 ("The appointment . . . respects")

C) Lines 31–33 ("Mr. Speaker . . . House")

D) Lines 60–62 ("We have . . . suffering")

15

As used in line 29, "interest" most nearly means

A) well-being.

B) curiosity.

C) claim.

D) business.

16

Churchill makes the statement "I have nothing to offer but blood, toil, tears and sweat" (lines 58–59) primarily to

A) convey his deep level of commitment to the war effort.

B) indicate that he believes Britain has little hope of winning the war.

C) suggest that there is not much he can offer in support of the military.

D) offer evidence of his dedication to a governing coalition.

CONTINUE

17

The primary rhetorical effect of the repetition of the words "victory" and "no survival" in the last paragraph is to

A) emphasize the hopeless nature of Britain's struggle.

B) clarify the administration's war strategy.

C) underscore the long-term implications of the outcome of the war.

D) maintain the sense of optimism introduced earlier in the speech.

18

As used in line 76, "suffered" most nearly means

A) endured.

B) allowed.

C) tolerated.

D) endorsed.

CONTINUE

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

This passage is adapted from Alex Kotlowitz, *Never a City So Real.* ©2004 by Alex Kotlowitz.

Fourteen miles southeast of the Loop, at the base of Lake Michigan, the city's easternmost corner, one finds a fistful of neighborhoods with hearty names
*Line* like Irondale, Hegewisch, The Bush, and Slag Valley.
5 This is South Chicago. Apart from Altgeld Gardens—a vast public housing complex virtually hidden from the rest of the world by towering mountains of garbage and often referred to as Chicago's Soweto—South Chicago is the city's most isolated community, its most
10 removed. The labor lawyer and author Tom Geoghegan has called it "a secret city." The vast majority of Chicagoans have never set foot here, and as if to ensure such detachment, above the compact redbrick bungalows with postage-stamp-size yards looms the
15 Chicago Skyway, a highway on stilts, which takes the prosperous to their cottages along the Indiana and Michigan shorelines. The neighborhoods below are modest in appearance, a collection of small homes and small taverns and diners with simple names like Steve's,
20 Pete's Hideaway, Who Cares?, Small World Inn, and Maria's Den. There's nothing fanciful about this area. As one observer wrote: "Streets named Commercial and Exchange offer testimony that people came here to make a buck, not admire the scenery."
25 And yet the scenery, so to speak, is awe-inspiring, the man-made equivalent of the Rockies. Dark, low-to-the-ground muscular structures, some three times the size of a football field, sprawl across the landscape, sprouting chimneys so tall that they're equipped
30 with blinking lights to alert wayward aircraft. These chimneys shoot full-bodied flames thirty feet into the sky; at night they appear almost magical, like giant torches heating the moon. Billows of smoke linger in the air like phantom dirges. It used to be, when the
35 steel mills were going strong, that these smokestacks spat out particles of graphite that would dust the streets and cars and rooftops like snow, catching the sun and setting the neighborhood aglitter. Suspended conveyor belts, pipes, and railroad overpasses weave in, out, and
40 over the behemoth buildings. The noise is crushing, the stench of sulfur so powerful that not even a closed car window can keep it at bay. Had Rube Goldberg lost his sense of humor, this is, I imagine, what he would have produced.

45 This is the heart of American industrial might, or what's left of it. The first of the mills was built in the 1850s, and within a hundred years more steel was produced in this stretch of land than anywhere else in the world. The freighters delivered iron ore
50 from Minnesota's Mesabi Range, and the mills turned the mineral into steel, shipping it west by rail and eventually east by the St. Lawrence Seaway. By the 1960s, the mills employed eighty thousand men and women; they cascaded in from Poland, from
55 Yugoslavia, from Mexico, and from the American South. Steel mills and refineries lined up along the dredged Calumet River and along the Lake Michigan shoreline, extending twenty-two miles from South Chicago to Gary, Indiana. This stretch of boiling steel
60 was the equivalent of an industrial mountain stream, the source for can openers and knives, refrigerators and cars, bridges and skyscrapers. It fed this country's insatiable hunger for consumption and comfort. It was, in short, the nation's lifeblood.
65 The local population is still so dependent on the mills that the daily newspaper in Hammond, Indiana, which is just over the Chicago border, runs a box score every Wednesday of the region's steel tonnage and capacity. Nonetheless, there are only fifteen
70 thousand working in the mills now; the owners grew complacent, so accustomed to their oligopoly that they forgot how to compete. Between the mills that still roll steel, there are hundreds of acres of vacant land littered with abandoned factory buildings stripped
75 of their exteriors, brick coke houses collapsing in on themselves, and railroad tracks and bridges that have turned a muddy brown from rust.

Domestic Steel Production, 1950–2000
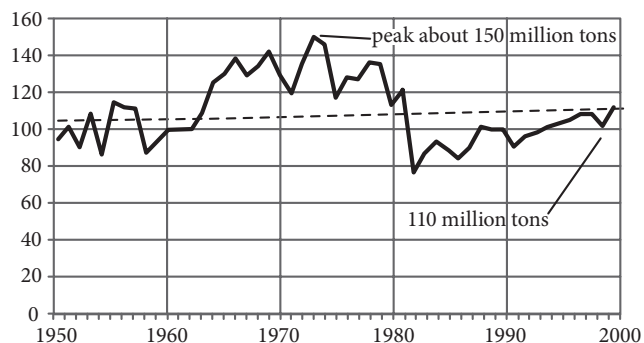
Source: American Iron and Steel Institute

CONTINUE ▶

19

The author of the passage most likely believes South Chicago

A) should be a more popular vacation destination.

B) will soon have no working steel mills.

C) is isolated from the rest of the city.

D) is a typical example of the polluted American city.

20

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

A) Lines 5–10 ("Apart . . . removed")

B) Lines 26–30 ("Dark . . . aircraft")

C) Lines 40–42 ("The noise . . . bay")

D) Lines 45–46 ("This . . . it")

21

The author includes a list of restaurant names (lines 19–21) primarily to

A) emphasize the modest nature of the neighborhood.

B) recommend places for visitors to have a meal.

C) suggest that there is little variety in the eating establishments.

D) explain why most people never visit South Chicago.

22

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

A) contracting.

B) reflecting.

C) securing.

D) overtaking.

23

As used in line 38, "suspended" most nearly means

A) drooping.

B) hanging.

C) slumbering.

D) fixed.

24

The author compares South Chicago's steel mills to

A) the Rockies.

B) wayward aircraft.

C) a dusting of snow.

D) phantom dirges.

25

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

A) Lines 1–4 ("Fourteen . . . Valley")

B) Lines 11–17 ("The vast . . . shorelines")

C) Lines 25–26 ("And yet . . . Rockies")

D) Lines 49–52 ("The freighters . . . Seaway")

26

In the context of the passage as a whole, the primary purpose of the last paragraph is to

A) criticize the steel mill owners.

B) lament the state of abandoned property.

C) explain the current status of the steel mills.

D) suggest changes to the steel industry.

CONTINUE

27

Which claim about domestic steel production is supported by the graph?

A) Between 1950 and 2000, production consistently increased.

B) Production was stagnant between 1950 and 2000.

C) Production peaked in the 1960s, followed by a steep decline in the 1970s.

D) Average production increased slightly from 1950 to 2000.

28

It can reasonably be inferred from the passage and the graph that

A) U.S. steel mills reached their greatest productivity in the mid-1970s.

B) the U.S. steel industry experienced growth followed by significant decline during the 20th century.

C) all domestic steel mills cut their workforces by over 75% between 1950 and 2000.

D) air pollution in communities surrounding steel mills was worse in the 1970s than in 2000.

CONTINUE

Questions 29–37 are based on the following passage and supplementary material.

This passage is adapted from E. Gene Towne and Joseph M. Craine, "Ecological Consequences of Shifting the Timing of Burning Tallgrass Prairie." ©2014 by E. Gene Towne and Joseph M. Craine. A forb is an herbaceous flowering plant.

Periodic burning is required for the maintenance of tallgrass prairie. The responses of prairie vegetation to fire, however, can vary widely depending upon
Line when the fires occur. Management and conservation
5 objectives such as biomass production, livestock performance, wildlife habitat, and control of specific plant species, often influence when grasslands are burned. In some prairie regions, timing of seasonal burns have been used to manipulate the balance of C_3
10 and C_4 species, control woody species, stimulate grass flowering, and alter the proportion of plant functional groups. Most grassland fire research, however, has focused on either burn frequency or comparing growing season burns with dormant season burns,
15 and there are few studies that differentiate effects from seasonal burning within the dormant season. In the Kansas Flint Hills, when prairies are burned is an important management issue, but the ecological consequences of burning at different times are poorly
20 understood.

The Flint Hills are one of the last remaining regions supporting extensive native tallgrass prairie in North America and frequent burning is integral to its preservation and economic utilization. Since
25 the early 1970's, recommendations have been to burn Kansas Flint Hills grasslands annually in late spring, typically once the dominant grasses have emerged 1.25–5 cm above the soil surface. Although frequent late-spring burning has maintained the Flint Hills
30 grassland, the resultant smoke plumes from en masse burning often leads to air quality issues in nearby cities. Concentrated smoke from grass fires produces airborne particulates, volatile organic compounds, and nitrogen oxides that facilitate tropospheric ozone
35 production. Burning in late spring also generates more ozone than burning in winter or early spring due to the higher air temperatures and insolation.

If the Flint Hills tallgrass prairie, its economic utilization, and high air quality are all to be
40 maintained, a good understanding of the consequences of burning at different times of the year is necessary. Burning earlier in spring has been regarded as undesirable because it putatively reduces total biomass production, increases cool-season [grasses] and
45 undesirable forbs, is ineffective in controlling woody species, and lowers monthly weight gains of steers compared to burning in late spring. Consequently, burning exclusively in late spring has become ingrained in the cultural practices of grassland
50 management in the Flint Hills, and local ranchers often burn in unison when weather conditions are favorable.

Despite long-standing recommendations that tallgrass prairie be burned only in late spring, the data supporting this policy is equivocal. Total biomass
55 production was lower in plots burned in early spring than plots burned in late spring, but the weights included grasses, forbs, and shrubs. It was not known if [grass] biomass was reduced by early-spring burning or if the differences were a site effect rather than a
60 treatment effect. Burning in early spring also shifted community composition in a perceived negative pattern because it favored cool-season grasses and forbs. This shift in community composition, however, may actually be desirable because many cool-season
65 grasses have higher production and nutritional quality than warm-season grasses at certain times of the year, and many forb species are beneficial to the diet of grazers. Burning in late spring has been considered the most effective time to control invasive shrubs,
70 but *Symphoricarpos orbiculatus* was the only woody species that declined with repeated late spring burning. Finally, average weight gain of steers was lower in an unburned pasture than in burned pastures, but there was no significant difference in monthly weight gain
75 among cattle grazing in early-, mid-, or late-spring burned pastures.

The historical studies that formed the foundation for time of burning recommendations in tallgrass prairie are inconclusive because none had
80 experimental replications and most were spatially limited to small plots. All of these studies were interpreted as suggesting that shifting the time of burning by only a few weeks would negatively influence the plant community. A more recent large-
85 scale replicated study that compared the effects of annual burning in autumn, winter, and late spring found that the timing of burning had no significant effect on grass production and no reductions in the composition of desirable warm-season grasses.

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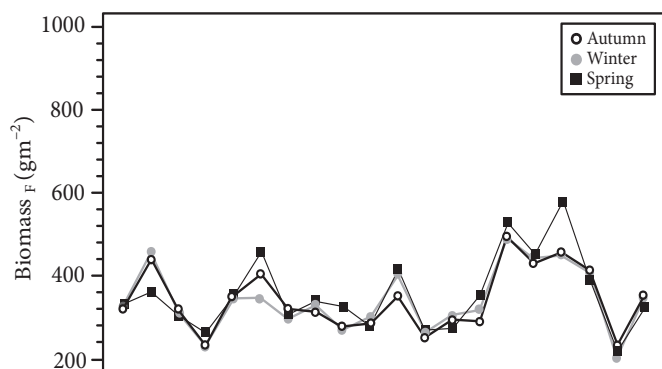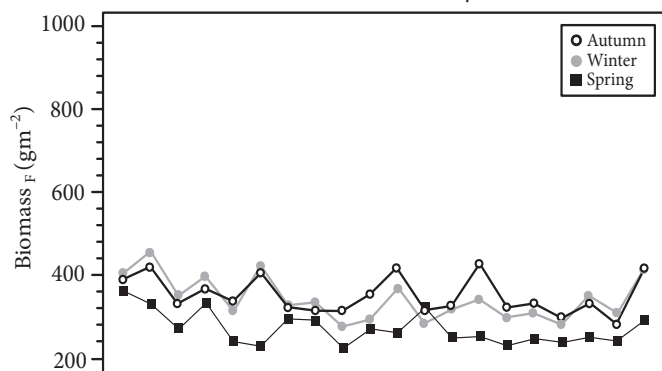**Figure 1**
Grass Productivity

Figure 2
Forb Productivity

Changes in Upland and Lowland Grass (1) and Forb (2) Productivity Over Time for Autumn-, Winter-, and Spring-Burned Watersheds

29

The authors of the passage would most likely agree that

A) burning should be done on a semiannual basis.

B) no burning should happen in the late spring.

C) late spring may not be the best time for burning.

D) changing burning schedules will negatively influence plants.

30

Which choice best supports the claim that the Kansas Flint Hills must be regularly burned to remain economically viable?

A) Lines 21–24 ("The Flint . . . utilization")

B) Lines 38–41 ("If the . . . necessary")

C) Lines 42–47 ("Burning . . . spring")

D) Lines 54–57 ("Total . . . shrubs")

31

According to the passage, ranchers may burn tallgrass prairie in late spring because they want to

A) avoid problems they have experienced first-hand.

B) reduce air pollution in nearby communities.

C) support weight gain in their cattle.

D) act in unison with their neighbors.

32

As used in line 49, "practices" most nearly means

A) traditions.

B) rehearsals.

C) accomplishments.

D) chores.

33

As used in line 71, "declined" most nearly means

A) descended.

B) wilted.

C) refused.

D) decreased.

CONTINUE

34

Based on the passage, it can be inferred that *Symphoricarpos orbiculatus* is

A) a forb species beneficial to grazers.

B) an invasive shrub.

C) a woody warm-season grass.

D) a late spring grass.

35

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

A) Lines 52–54 ("Despite . . . equivocal")

B) Lines 60–63 ("Burning . . . forbs")

C) Lines 63–68 ("This . . . grazers")

D) Lines 68–71 ("Burning . . . burning")

36

Which statement from the passage is best supported by figure 1?

A) Lines 1–2 ("Periodic . . . prairie")

B) Lines 24–28 ("Since . . . surface")

C) Lines 47–51 ("Consequently . . .favorable")

D) Lines 84–88 ("A more . . . production")

37

The data presented in figure 1 and figure 2 best supports the conclusion that

A) spring burning always results in higher biomass than does autumn or winter burning.

B) over time, biomass will increase only in prairies burned in spring.

C) the timing of burning has a slightly larger effect on the biomass of forbs than on the biomass of grass.

D) biomass of forbs and grass declined periodically during the study due to lower rainfall.

CONTINUE

Questions 38–47 are based on the following passages.

Passage 1 is adapted from University of Pennsylvania, "Physicists undo the 'coffee ring effect.'" ©2011 Science Daily. Passage 2 is adapted from KU Leuven, "Bacterium counteracts 'coffee ring effect.'" ©2013.

Passage 1

A team of University of Pennsylvania physicists has shown how to disrupt the "coffee ring effect"—the ring-shaped stain of particles leftover after coffee
Line drops evaporate—by changing the particle shape. The
5 discovery provides new tools for engineers to deposit uniform coatings.

The research was conducted by professor Arjun Yodh, director of the Laboratory for Research on the Structure of Matter; doctoral candidates Peter Yunker
10 and Matthew Lohr; and postdoctoral fellow Tim Still.

"The coffee ring effect is very common in everyday experience," Yunker said. "To avoid it, scientists have gone to great lengths designing paints and inks that produce an even coating upon evaporation. We found
15 that the effect can be eliminated simply by changing the shape of the particle."

University of Chicago physicists Sidney Nagel, Thomas Witten and their colleagues wrote an influential paper about this process in 1997, which
20 focused mainly on suspended spherical particles, but it was not until the Yodh team's recent experiments that the surprising role played by suspended particle shape was discovered.

Yodh's team used uniformly sized plastic particles
25 in their experiments. These particles were initially spherical but could be stretched into varying degrees of eccentricity, to ensure the experiments only tested the effect of the particle's shape on the drying pattern. The researchers were surprised at how big an effect particle
30 shape had on the drying phenomenon.

"Different particle geometries change the nature of the membrane at the air-water interface," Yodh said. "And that has big consequences." Spherical particles easily detach from the interface, and they flow past one
35 another easily because the spheres do not substantially deform the air-water interface. Ellipsoid particles, however, cause substantial undulation of the air-water interface that in turn induces very strong attractions between the ellipsoids. Thus the ellipsoids tend to get
40 stuck on the surface, and, while the stuck particles can continue to flow towards the drop's edges during

evaporation, they increasingly block each other, creating a traffic jam of particles that eventually covers the drop's surface.
45 After experimenting with suspended particle shape, the researchers added a surfactant, essentially soap, into the drops to show that interactions on the drop's surface were responsible for the effect. With the surfactant lowering the drop's surface tension, ellipsoid
50 particles did not get stuck at the interface and flowed freely to the edge.

"We were thinking it would be useful if you could just sprinkle in a few of these ellipsoid particles to remove the coffee ring effect," Yodh said, "and we
55 found that sometimes this idea works and sometimes it doesn't."

Passage 2

Researchers from the Departments of Chemical Engineering and Chemistry at KU Leuven have now discovered how to counteract coffee rings with
60 "surfactants," i.e., soap. The key to the discovery was not a kitchen towel, but a bacterium that counteracts the coffee ring effect at the microscopic level.

When a coffee ring dries, its edges become noticeably darker and thicker. This occurs because the
65 coffee particles move toward the edge of the stain while the water in the liquid evaporates. At a microscopic level, this coffee ring effect can also be seen in liquids with particles of other materials such as plastic and wood.
70 In various industrial applications—applying an even coat of paint or varnish, for example—the coffee ring effect can be particularly troublesome and scientists have long been seeking ways to counteract it. Raf De Dier and Wouter Sempels (Departments
75 of Chemical Engineering and Chemistry) have now described a solution based on examples found in nature. De Dier and Sempels carried out experiments and calculations on nanomaterials as well as on a particularly promising bacterium, *Pseudomonas*
80 *aeruginosa*.

Pseudomonas aeruginosa is a dangerous bacterium that can cause infections in open wounds. "A *Pseudomonas aeruginosa* bacteria colony wants to find as large a breeding ground as possible. To avoid
85 overconcentration on the edges of a wound when spreading itself during the drying-out process, the

CONTINUE

bacterium produces substances that counteract the coffee ring effect."

These surface-tension-disrupting substances are
90 called surfactants. Detergents such as soap are also surfactants. "Add soap to a stain—a coffee stain or any other stain—and you will still get a coffee ring effect. But at the same time the soap causes a counterflow from the edge back towards the centre of the stain
95 in such a way that the small particles—material or bacteria—end up in a kind of whirlwind. In this way, you get a more uniform distribution of particles as evaporation occurs."

38

The author of Passage 1 refers to a paper by University of Chicago physicists Sidney Nagel and Thomas Witten (lines 17–23) primarily to

A) imply that Nagel and Witten could have discovered the impact of ellipsoid particles.

B) describe an impediment to research on suspended spherical particles.

C) suggest that the study done by Nagel and Witten influenced the research by Yodh's team.

D) contrast the results of earlier, flawed research with the useful data obtained more recently.

39

Based on Passage 1, which additional information, if true, would challenge the conclusions drawn by Yodh's team?

A) The members of Yodh's team were unfamiliar with the previous study by Nagel and Witten.

B) The method the team used to stretch the particles caused some of them to break, making them smaller than the spherical particles that were originally tested.

C) Surfactants such as soap cannot be added to most paints and inks.

D) Particles with irregular shapes also cause substantial undulation of the air-water interface.

40

Which choice provides the best evidence for the previous question?

A) Lines 7–10 ("The research . . . Still")

B) Lines 24–28 ("Yodh's . . . pattern")

C) Lines 31–32 ("Different . . . said")

D) Lines 52–56 ("We were . . . doesn't")

41

What does Passage 2 most strongly suggest about the coffee ring effect?

A) It generates many studies on ways to thwart it.

B) It sends microscopic particles into a whirlwind.

C) It can be eliminated with the use of surfactants.

D) It has various industrial applications.

42

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

A) Lines 57–60 ("Researchers . . . soap")

B) Lines 60–62 ("The key . . . level")

C) Lines 66–69 ("At a . . . wood")

D) Lines 70–74 ("In various . . . it")

43

The author of Passage 2 most likely discusses *Pseudomonas aeruginosa* in order to

A) highlight one possible approach to countering the coffee ring effect.

B) alert companies that want surfactants for paint and varnish to the dangers of bacterium.

C) support the claim that surfactants are the most promising solution to the coffee ring effect.

D) contend that soap is a better surfactant so it is best to avoid using *Pseudomonas aeruginosa* until further studies have been done.

CONTINUE ▶

44

As used in line 97, "uniform" most nearly means

A) thin.

B) exact.

C) even.

D) clean.

45

The main purpose of both Passage 1 and Passage 2 is to

A) demonstrate that particle shape has a strong effect on surface tension.

B) compare potential industrial applications for surfactants.

C) question whether the drying process affects the even application of liquid.

D) discuss research that may be applied to solve a problem.

46

Would the author of Passage 1 most likely agree with the claims about surfactants made in Passage 2?

A) No, since Passage 1 shows that surfactants worsen the coffee ring effect.

B) No, since the study in Passage 1 describes how oblong spheres diminish the coffee ring effect.

C) Yes, since the study in Passage 1 demonstrates that surfactants have an effect on the movement of particles.

D) Yes, since the study in Passage 1 concludes that bacteria can be genetically modified in order to produce surfactants.

47

One difference between the studies described in the two passages is that unlike the researchers discussed in Passage 1, the researchers in Passage 2

A) stretch the *Pseudomonas aeruginosa* until they become surfactants.

B) utilize biological organisms to disrupt surface tension.

C) experiment on nanomaterials in order to breed *Pseudomonas aeruginosa*.

D) explore ways to change evaporation and particle flow.

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.

Getting a CLOe

Imagine you go to a restaurant you've never tried before. Now, let's say you **1** had a bad experience. What next? For many, the answer is **2** simple, get on social media and tell the world. Aside from telling all your

1

A) NO CHANGE
B) have had
C) were having
D) have

2

A) NO CHANGE
B) simple get
C) simple: get
D) simple, hop

CONTINUE

friends and followers about the experience on Twitter and Facebook, **3** you would probably decide not to return to that restaurant. In fact, you might have used these services to find the restaurant in the first place. And really, if a place has two out of five stars on Yelp when you look it up, what's the chance you'll go there in the first place?

Companies, not just restaurants, are starting to see that their biggest business generators are not TV or Internet ads anymore. **4** Today, "buzz" gets created on social media, and it is more important than ever for companies to **5** insure that they are showing the best possible face to the world on social media. Maintaining that public face has created a new job: Chief Listening Officer. Where a Social Media Manager might be in charge of a **6** companies output on Facebook and other sites, a Chief Listening Officer is on the other side. A CLO scours blogs, Pinterest, Tumblr, Facebook, Twitter, Google, Yelp, and whatever new site will be hot when you read this to make sure that a company's public image is under control.

3

Which of the following would best maintain the focus of this sentence and paragraph?

A) NO CHANGE

B) you might also go to a consumer-review site, such as Yelp, to tell future patrons.

C) it might make you feel better to tell your friends and relatives about the experience over the phone.

D) you could take the edge off by watching videos of animals doing funny stuff.

4

The author is considering deleting the phrase *not just restaurants* from the preceding sentence and adjusting the punctuation accordingly. Should the phrase be kept or deleted?

A) Kept, because it clarifies that the practice described in the essay is not limited to one industry.

B) Kept, because it encourages companies other than restaurants to hire Chief Listening Officers.

C) Deleted, because it incorrectly implies that patrons of other businesses discuss their experiences on social media.

D) Deleted, because the previous paragraph is all about restaurants, and this one is not.

5

A) NO CHANGE

B) assure the public

C) ensure

D) make insurance

6

A) NO CHANGE

B) companies'

C) company's

D) companys'

If a CLO sees a bad review on someone's blog, for instance, the CLO might contact a customer-service representative **7** and make it better to see if the situation can be remedied. On the other hand, if a company **8** unfurls a new advertising campaign and the ads are getting buzz on Twitter or many views on YouTube, the CLO might tell his marketing team to keep up the good work. The incredible **9** thing about this is that it is more detailed than market research has ever been before. People share their entire lives on social media, and a single post can reveal not only someone's positive or negative reaction but also **10** their age, gender, location, social status, friends, and so on.

7

A) NO CHANGE
B) and improve things
C) and say, "Get on it!",
D) DELETE the underlined portion.

8

A) NO CHANGE
B) rolls out
C) unrolls
D) roles out

9

A) NO CHANGE
B) thing about this kind of "market research"
C) thing
D) reality

10

A) NO CHANGE
B) they're
C) your
D) his or her

CONTINUE

Some criticize the CLO position as a fad, suggesting that companies are overreacting to the power of social media. **11** The fact of the matter is, however, CLOs will be needed as long as social media are around. After all, consumers are realizing that social-media reviews are often the purest of the pure—neither that of an overrefined food critic or tech geek nor that of someone in the pay of this or that company. The people are talking, and companies have at last made their "listening" official.

11

Which of the following most directly answers the criticism presented in the previous sentence?

A) NO CHANGE

B) They see social media as temporarily popular but not likely to endure.

C) Teachers say that students spend too much time on social media.

D) They say that some social media outlets are more effective than others.

CONTINUE

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

Gimme Fever…Actually, Please Don't

Medical science has created some modern miracles, but it can be difficult to appreciate just how miraculous some of them are. The Spanish Flu hit the United States in the 1910s, and [12] polio rocked the foundations of America in the 1930s and 1940s, but it is difficult to imagine an epidemic like the Philadelphia Yellow Fever Epidemic of 1793. The official register listed over 5,000 deaths between August 1st and November 9th of that year. These figures are staggering when we consider that Philadelphia city, [13] the largest city in the country today, had a population of over 1.5 million, and its surrounding areas had only about 50,000.

Rank	Place	Population
1	New York city, NY *	33,131
2	Philadelphia city, PA*	28,522
3	Boston town, MA*	18,320
4	Charleston city, SC	16,359
5	Baltimore town, MD	13,503
6	Northern Liberties township, PA*	9,913
7	Salem town, MA	7,921
8	Newport town, RI	6,716
9	Providence town, RI*	6,380
10	Marblehead town, MA	5,661
10	Southwark district, PA*	5,661
12	Gloucester town, MA	5,317
13	Newbury town, MA	4,837
14	Portsmouth town, NH	4,720
15	Sherburne town (Nantucket), MA*	4,620
16	Middleborough town, MA	4,526
17	New Haven city, CT*	4,487
18	Richmond city, VA	3,761
19	Albany city, NY	3,498
20	Norfolk borough, VA	2,959
21	Petersburg town, VA	2,828
22	Alexandria town, VA*	2,748
23	Hartford city, CT*	2,683
24	Hudson city, NY	2,584
* See Notes for Individual Places.		
Source: U.S. Bureau of the Census		
Internet Release date: June 15, 1998		

Population of the 24 Urban Places: 1790

12

Which of the following would provide a detail that would best maintain the focus of this paragraph?

A) NO CHANGE

B) many people died from this flu, especially soldiers in World War I,

C) it's possible to get flu vaccinations at your local drug store now,

D) it just faded away even though doctors could never cure it,

13

Which of the following gives information consistent with the chart?

A) NO CHANGE

B) the second largest city in the country at that time, had a population of only about 28,000,

C) second only to New York and Boston, had a population of over 28,000 at the time,

D) was larger than its neighboring New York City by nearly 10,000 people,

CONTINUE

It was not ultimately medical science that saved the day during this epidemic. Doctors tried various **14** things, but they were stalled by their inability to figure out both how the disease originated and how **15** it was spreading. It therefore seemed a godsend when the frost came in November, and the number of deaths tapered off. Medical historians now know that the disease was spread by mosquitoes, but this was **16** pretty shady until nearly a century after the disease had come and gone.

14

A) NO CHANGE
B) options
C) management models
D) treatment approaches

15

A) NO CHANGE
B) it spread.
C) it had been spread.
D) its spread.

16

A) NO CHANGE
B) stupid idiocy
C) not verified
D) downright wrong

CONTINUE

[1] In 1793, Philadelphia was the second largest city in the new nation of the United States. [2] As a result, all of the quarantine and curfew measures that **17** they tried to impose had failed. [3] Panicked politicians blamed immigration. [4] The city's College of Physicians published a letter in the city newspapers that spoke to the confusion. [5] They recognized the epidemic for what it was, but their eleven measures for prevention were haphazard and confused and included the avoidance of alcohol, hot **18** sun, and night air. [6] Philadelphia didn't know what had hit it. [7] Dr. Benjamin Rush, one of the earliest and most brilliant physicians in all of American history, blamed a rotten shipment of coffee that had come into Philadelphia's port. **19**

17

A) NO CHANGE
B) one
C) city authorities
D) some

18

A) NO CHANGE
B) sun and night air.
C) sun, and also night air.
D) sun, and the air of the night.

19

The best placement for sentence 7 would be

A) where it is now.
B) at the beginning of the paragraph.
C) after sentence 1.
D) after sentence 3.

It's difficult to imagine an epidemic on this kind of scale today. Moreover, Philadelphia's relative prominence and sophistication in that era should give us pause. The medical establishment sat back [20] helplessly: as the disease ravaged the city. The recent outbreak of the Ebola [21] virus, in West Africa, provides a terrifying reminder, of just how deadly certain diseases can be, when they are unchecked or inadequately understood. [22] By the same token, the Yellow Fever Epidemic provides a remarkable instance of a city's resilience in the face of adversity. As the population of the city was literally decimated, and other yellow-fever epidemics continued to ravage the city, Philadelphia persisted, and with it, the new nation grew stronger, just as it has in the face of crisis ever since.

20
A) NO CHANGE
B) helplessly,
C) helplessly
D) helplessly;

21
A) NO CHANGE
B) virus in West Africa provides a terrifying reminder of just how deadly certain diseases can be
C) virus, in West Africa provides a terrifying reminder, of just how deadly certain diseases can be
D) virus, in West Africa, provides a terrifying reminder of just how deadly certain diseases can be,

22
A) NO CHANGE
B) On the other hand,
C) Therefore,
D) Thus,

Questions 23–33 are based on the following passage.

The Singing Brakeman

The early days of recorded music can be hazy. Many people find it difficult to believe that artists recording before the radio boom in the 1930s, or even before the rock and roll boom in the 1950s, could have had any success at all **23** seems doubtful. Despite this misconception, there is a treasure trove of recorded music from that era, and not only by the greats of bebop and swing. **24**

The circumstances of Rodgers's birth **25** is obscure, but legend has it that he was born in Meridian, Mississippi in 1897. Little is known for **26** sure, but his father was a foreman on the Mobile and Ohio Railroad in Meridian. Jimmie eventually became a brakeman, but **27** a health issue cut his career short. He stayed alive for a few years after his dismissal in 1927, but he could no longer work the rails.

23

A) NO CHANGE

B) strikes us as odd.

C) appears improbable.

D) DELETE the underlined portion and end the sentence with a period.

24

Which of the following would most effectively conclude this paragraph by introducing the main subject of the essay as a whole?

A) It takes a real music connoisseur to know who was famous before Elvis Presley.

B) Most of the best-known names from the 1930s and 1940s are those of jazz singers.

C) One of these greats was Jimmie Rodgers, one of the first megastars of country music.

D) Some of the greats were Robert Johnson, Mississippi John Hurt, and Jimmie Rodgers.

25

A) NO CHANGE

B) are

C) has been

D) was

26

A) NO CHANGE

B) certain,

C) sure about his family,

D) sure about his mother, father, and siblings,

27

At this point, the writer wants to include a detail that provides specific information about Rodgers's illness. Which of the following would best fulfill that goal?

A) NO CHANGE

B) problems with his health

C) a bout of tuberculosis

D) one of the current diseases

CONTINUE

This inability to work, however, proved to be **28** fortuitous for Rodgers's great passion—music. At age 13, Rodgers had already secretly organized two traveling shows, only to be recovered and brought back to Meridian by his father. Once Jimmie could no longer work the **29** rails, however, he pursued his musical career in earnest. In Bristol, Tennessee, Rodgers organized his first band. That same year, the band was asked to record some songs for Ralph Peer of the Victor Talking Machine Company. The recordings survive today, though they feature a solo Jimmie Rodgers rather than his whole band, as a pre-recording quarrel led them to break up.

28

A) NO CHANGE
B) chancy
C) blessed
D) charmed

29

A) NO CHANGE
B) rails however
C) rails; however,
D) rails, however

CONTINUE

The recording had moderate success, and it sparked Rodgers to pursue his music career in earnest. In October of that year, after Rodgers chased his dream, Victor released "Blue Yodel," better known as "T for Texas," which sold 30 all the way to New York City half a million copies. Rodgers quickly became a household name, and his trademark yodel would be known the world over. By this 31 time, Rodgers had become the famous "Singing Brakeman," and his influence would be felt for many generations to come.

This influence would not be felt only in country music either: blues singer Howlin' Wolf cited Rodgers as an early influence, 32 like Elvis Presley. Ultimately losing his battle with tuberculosis at age 33, Rodgers may have lived a short life, 33 so it's no surprise that his music is seldom remembered today.

30

If the punctuation were to be adjusted accordingly, the best placement for the underlined portion would be

A) where it is now.

B) after the word *year*.

C) after the word *dream*.

D) after the word *copies*.

31

A) NO CHANGE

B) time, when

C) time, as

D) time:

32

A) NO CHANGE

B) as did

C) similar to

D) much like that of

33

Which choice best concludes the essay by reinforcing its main idea?

A) NO CHANGE

B) but many of his family members attended his funeral and honor him today.

C) but he was able to work as both a train brakeman and a musician.

D) but if the history of American music is an indication, his influence is still alive and well.

CONTINUE

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

Whale Grandmothers Know Best

We don't often think to apply gender differences to the animal kingdom. Certainly, males and females have **34** a distinct role, but these seem to be largely determined by biology and by the propagation of the species. As a result, many females do not live much beyond menopause, the phase after which females can no longer reproduce. The data below show that **35** only a handful of animals, such as the black-tailed prairie dog, have any post-reproductive life span at all. Some species, however, like humans, short-finned pilot whales, and killer whales, have females who typically live two or more decades after

34

A) NO CHANGE

B) a distinction,

C) a role that is distinct,

D) distinct roles,

35

Which of the following gives accurate data based on the graph?

A) NO CHANGE

B) most animals, including *homo sapiens*, tend to have some post-reproductive life span.

C) the common bottlenose dolphin has one of the shortest pre-reproductive life spans relative to other animals.

D) no rodent species has any post-reproductive life span at all.

Relationship Between Reproductive Phase and Life Span Across Species

Legend:
- Before reproduction
- Reproductive life span
- Post reproductive life span
- Record of longevity
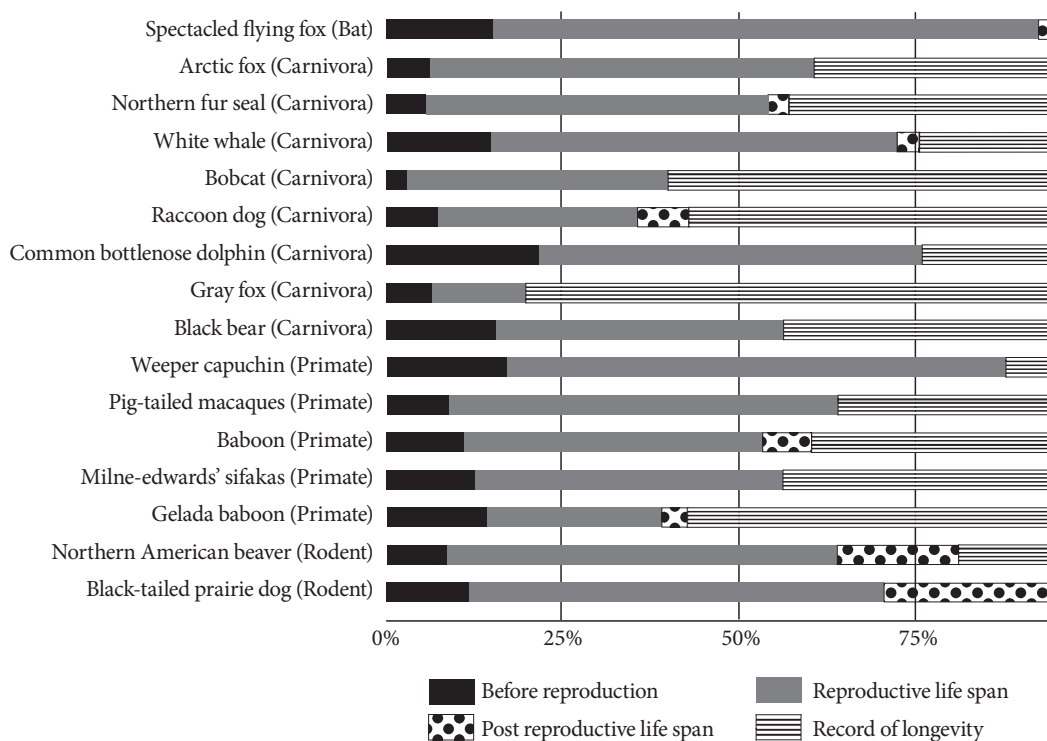
menopause. Scientists have long wondered why evolution has determined **36** they should live so much longer, sometimes to be as old as 90, than their counterparts in other species.

37 It seems that the social forces that define gender may apply to the animal kingdom as well, even though we consider animal behavior to be determined almost entirely by nature rather than nurture. After watching over 750 hours of video and observing the behaviors of pods of whales, **38** whale grandmothers were observed to have teaching behaviors by the scientists.

36

A) NO CHANGE
B) any of them
C) themselves
D) the female whales

37

Which of the following would provide the most effective transition from the previous paragraph to this paragraph?

A) The answer may have come from a recent study of killer whales.
B) Killer whales are some of the most fascinating marine species.
C) Pretty much everyone knows by now that whales are mammals, not fish.
D) Scientists will experiment and try new things until they find something interesting.

38

A) NO CHANGE
B) scientists observed that many of the teaching behaviors were performed by whale grandmothers.
C) whale grandmothers were the most likely to exhibit teaching behaviors.
D) teaching behaviors were observed from whale grandmothers that were shown to scientists.

CONTINUE

39 This knowledge is particularly useful for whale pods because the abundance of salmon is typically what determines whale life-cycles, both reproduction and mortality.

The scientists ascribe this behavior to what they refer to as the grandmothers' roles as "repositories of ecological **40** knowledge" in other words. Sharpened memories and long experience of learned behaviors make the older females extremely valuable to future generations. Without this knowledge, the younger whales would not be able to make the transition to maturity, and the species would not continue to propagate. The elder females have evolved this longevity because the species, simply put, needs it. **41**

39

At this point, the writer is considering adding the following true statement:

> The older female whales were the most likely to lead younger whales to salmon feeding grounds, particularly in the periods where the usually plentiful salmon were sparse.

Should the writer make this addition here?

A) Yes, because it clarifies some of the teaching behaviors mentioned in the previous sentence.

B) Yes, because it gives some credit to older whales, who were otherwise ignored in the study.

C) No, because the information conflicts with other information given later in the passage.

D) No, because the scientists' observations are not given as conclusive.

40

A) NO CHANGE

B) knowledge" in other words; sharpened

C) knowledge," in other words, sharpened

D) knowledge." In other words, sharpened

41

The writer is considering replacing the word *longevity* with the word *life* in the previous sentence. Should the writer make the change or keep the sentence as it is?

A) Keep the sentence as is, because "longevity" provides a more formal way of saying the same thing.

B) Keep the sentence as is, because the sentence refers to the length of whale life, not only the life itself.

C) Make the change, because "life" provides a more general way of articulating the point.

D) Make the change, because readers may not know the meaning of the word "longevity."

42 From a gender perspective, these findings further break down the idea that gender roles are biologically determined. From an age perspective, the findings also show that societies that value youth and middle age to the detriment of old age may do so at **43** there own peril. Anyone with grandparents knows that these older relatives have experienced enough of life to know a thing or two. In whale pods as well as human communities, it seems, life may depend on the accrued knowledge **44** about the secrets of life that have been gathered by the old people who know about it.

42

Which of the following choices would introduce this paragraph most effectively?

A) Gender discrimination does not really exist in whale communities.

B) Whale grandmothers know things other than where to find the salmon.

C) There is a beautiful scene in Herman Melville's *Moby Dick* featuring whale families.

D) The findings are interesting to non-scientists as well.

43

A) NO CHANGE

B) their

C) it's

D) its

44

A) NO CHANGE

B) of some of the secret-knowing people whose long lives are long enough.

C) of those who have lived long enough to know the secrets of long life.

D) the longer-lived people who are more secret oriented.

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, 17 QUESTIONS

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

DIRECTIONS

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

NOTES

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

REFERENCE

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

$A = \ell w$

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

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

Special Right Triangles

$V = \ell w h$

$V = \pi r^2 h$

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

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

$V = \frac{1}{3}\ell w h$
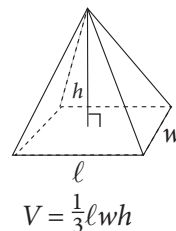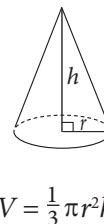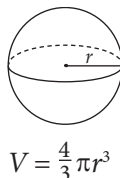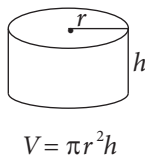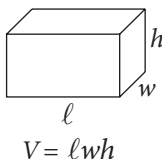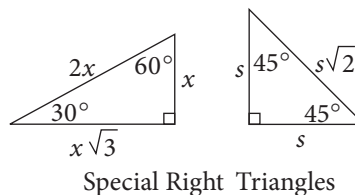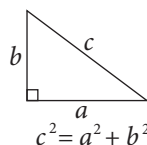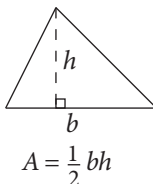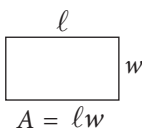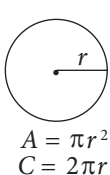
The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE ▶

1

Which of the following ordered pairs (x, y) satisfies both equations $x = \frac{1}{2}y + 3$ and $y = x^2 - 5x + 6$?

A) $(0, 3)$

B) $(2, -2)$

C) $(4, 2)$

D) $(6, 12)$

2

Which of the following is an equivalent form of the expression $30y - 12cy$?

A) $(5 - 2c)y$

B) $(30 - 12c)y$

C) $18(c - 2y)$

D) $18cy^2$

3

The formula $F = ma$ is used to calculate the force on an object with a mass, m, and an acceleration, a. Based on this formula, what is the acceleration, a, in terms of F and m ?

A) $a = Fm$

B) $a = F + m$

C) $a = \dfrac{F}{m}$

D) $a = \dfrac{m}{F}$

4

$$-4j - 10k = 50$$
$$j - 3k = 4$$

If (j, k) is the solution to the system of equations above, what is the value of j ?

A) 13

B) -5

C) -7

D) -10

CONTINUE

5

The equation $y = 3{,}100x + 105$ models the relationship between the weight, y, in grams, of an average giant panda and the number of months, x, after it was born. If the equation is graphed in the xy-plane, what is indicated by the slope of the graph?

A) The weight, in grams, of an average giant panda at birth

B) The number of months it takes an average giant panda to gain weight

C) The age, in months, of an average giant panda when it is fully matured

D) The weight, in grams, that an average giant panda gains each month

6

Which of the following is a solution to the equation $3b^2 - 6b = 5 + 4b^2$?

A) -5

B) 0

C) 1

D) 3

7

A line is graphed in the xy-plane. If the line has an x-intercept of 4 and contains the point $(-2, 6)$, which of the following cannot be true?

A) The point $(-10, -6)$ is on the line.

B) The slope of the line is negative.

C) The y-intercept is positive.

D) The point $(10, -6)$ is on the line.

8

A patterned quilt uses 16 different squares of fabric. Each square of fabric must have an area of at least 340 square inches and no more than 360 square inches. What inequality represents all possible values of the total area of fabric, f, in square inches needed for the quilt?

A) $5{,}740 \le f \le 5{,}760$

B) $5{,}440 \le f \le 5{,}760$

C) $5{,}440 \le f \le 5{,}460$

D) $340 \le f \le 360$

CONTINUE

9

Christen wants to buy dishes that cost $17.30 each and bowls that cost $14.90 each. A 15% discount will be applied to the entire purchase and no tax is charged. If Christen buys 3 dishes, which equation relates the number of bowls purchased, n, and the total cost in dollars, x?

A) $51.90 + 14.90n = 1.15x$

B) $51.90 + 14.90n = 0.85x$

C) $1.15(51.90 + 14.90n) = x$

D) $0.85(51.90 + 14.90n) = x$

10

$$\left(a^{\frac{1}{3}}b^{\frac{1}{4}}\right)^3 \left(a^{\frac{1}{3}}b^{\frac{1}{4}}\right)^4 = a^{\frac{k}{3}}b^{\frac{k}{4}}$$

If the equation above, where k is a constant, is true for all positive values of a and b, what is the value of k?

A)   3

B)   4

C)   7

D) 10

11

A baker has $75 with which to purchase ingredients. The baker needs to buy at least 2 containers of flour and at least 3 containers of cocoa powder. Flour costs $3.99 per container, and cocoa powder costs $5.99 per container. If f represents the number of containers of flour and c represents the number of containers of cocoa powder, which of the following systems of inequalities models this situation?

A) $\begin{cases} f \geq 2 \\ c \geq 3 \\ 3.99f + 5.99c \geq 75 \end{cases}$

B) $\begin{cases} f + c \geq 5 \\ 3.99f + 5.99c \geq 75 \end{cases}$

C) $\begin{cases} f \geq 2 \\ c \geq 3 \\ 3.99f + 5.99c \leq 75 \end{cases}$

D) $\begin{cases} f + c \geq 5 \\ 3.99f + 5.99c \leq 75 \end{cases}$

12

If the equation $x = (y + 5)(y - 15)$ is graphed in the xy-plane, what is the y-coordinate of the parabola's vertex?

A)   5

B)   10

C)   25

D) 100

CONTINUE

13

G

J

F   H
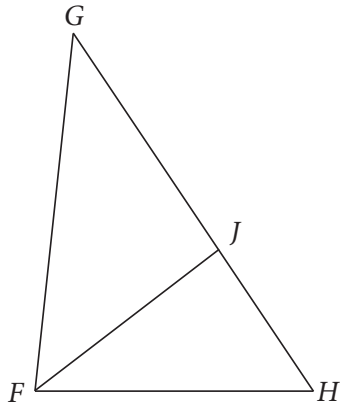
In the figure above, the ratio $\dfrac{FJ}{FH}$ has the same value as the ratio $\dfrac{FG}{GH}$. Which of the following angle measures must be congruent?

A) $\angle FGH$ and $\angle FHJ$

B) $\angle FJG$ and $\angle FJH$

C) $\angle GFJ$ and $\angle HFJ$

D) $\angle GFH$ and $\angle FJH$
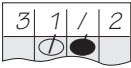
DIRECTIONS

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

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the 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 as $3\frac{1}{2}$.)

6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

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

Answer: 2.5

Write answer in boxes. → Fraction line

Grid in result. → Decimal point

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

14

Monica sells home-made jams and she made half as many ounces of jam on Wednesday as she did on Thursday. She made a total of 3 pounds and 6 ounces of jam on those two days. How many ounces of jam did Monica make on Thursday? (Note: 16 ounces = 1 pound)

15

$$6(2y + z) = 12y + 18$$

In the equation above, z is a constant. For what value of z does the equation have an infinite number of solutions?

16

$$(gx^2 - 4y^2)(6x^2 + hy^2)$$

In the expression above, g and h are non-zero constants with a difference of 5. If the value of the coefficient on the x^2y^2 term is zero when the expression is multiplied out and the like terms are collected, what is the value of gh ?

17

$$8y^2 - dy - 15$$

If $2y - 3$ is a factor of the expression above, in which d is an integer, what is the value of d ?

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

Math Test – Calculator

45 MINUTES, 31 QUESTIONS

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

DIRECTIONS

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

NOTES

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

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

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

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

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

REFERENCE

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

$A = \ell w$

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

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

Special Right Triangles

$V = \ell w h$

$V = \pi r^2 h$

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

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

$V = \frac{1}{3}\ell w h$
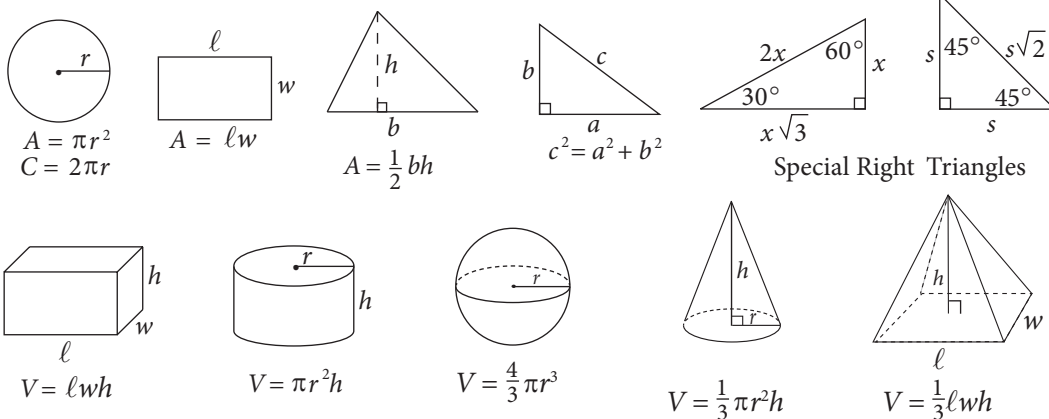
The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

A college bookstore makes a profit of $0.75 for every 12 pencils it sells. Which of the following is the profit that the store makes for selling 20 pencils?

A) $0.75

B) $0.95

C) $1.25

D) $2.22

2

A student planned to finish her summer reading assignment over the course of a 20-day portion of her summer vacation. Each day, she recorded the percent of her assignment she had left to read. The graph below shows the data for each day of the 20-day portion of her summer vacation.

Percent of Summer Reading Assignment Remaining
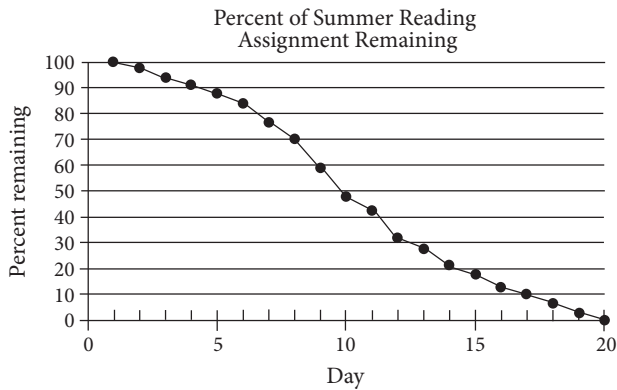
During which of the following periods is the decrease in the percent of her remaining summer reading the least?

A) Days 1 though 5

B) Days 3 through 8

C) Days 7 through 12

D) Days 13 through 17

3

Sydney borrowed money from a friend and is paying back the loan. The remaining amount she owes, A, can be calculated by the equation $A = 870 - 30w$, where w represents the number of weeks since she took the loan. What does the number 870 represent?

A) The total amount of money Sydney has repaid

B) The amount of money Sydney repays each week

C) The number of weeks Sydney has been paying back the loan

D) The original amount that Sydney borrowed

CONTINUE

Questions 4 and 5 refer to the following information.

Number of Years of Ownership
and Selling Price
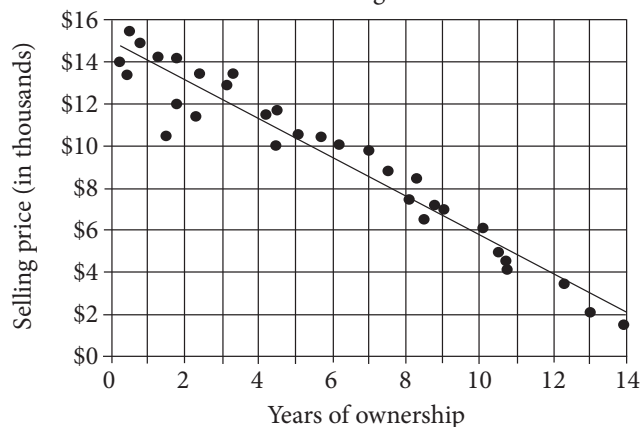
For 32 cars that were identical when new, the scatterplot above shows the number of years of ownership and the selling price when the first owner sold the car. The line of best fit is also shown.

4

Which of the following statements about the relationship between years of ownership and selling price is true?

A) As the number of years of ownership increases, the selling price decreases.

B) As the number of years of ownership decreases, the selling price decreases.

C) As the number of years of ownership increases, the selling price increases.

D) As the number of years of ownership decreases, the selling price remains constant.

5

For the car that was sold after exactly 7 years of ownership, the actual selling price of the car was approximately how much more than the selling price predicted by the line of best fit?

A) $650

B) $1,250

C) $2,150

D) $3,350

6

When the equation $y = 2x - b$, where b is a constant, is graphed in the xy-plane, the line passes through the point (3, –1). What is the value of b ?

A) –5

B) –3

C) 1

D) 7

CONTINUE

7

Month	Balance
0	$1,400
1	$1,344
2	$1,290
3	$1,239
4	$1,189
5	$1,142

The table above shows the balance, in dollars, of a bank account. Which of the following best describes the model that fits the data?

A) Exponential, decreasing by approximately 4% per month

B) Exponential, decreasing by approximately 8% per month

C) Linear, decreasing by approximately $47 per month

D) Linear, decreasing by approximately $56 per month

8

A team of scientists is tracking a snail moving at a rate of 700 millimeters per minute. If there are 10 millimeters in a centimeter, at what rate does that snail move in <u>centimeters per hour</u>?

A)　　4,200

B)　　7,000

C)　　42,000

D)　420,000

9

$$5\left(\frac{y}{2} + 5\right) = 2y + \frac{1}{2}y + 25$$

Which of the following describes the solution to the equation shown above?

A) The only solution is $y = 1\frac{1}{2}$.

B) The only solution is $y = 10$.

C) The equation has infinitely many solutions.

D) The equation has no solutions.

10

$$(2ab^2 + 5a^2 - 7a^2b) - (2ab^2 + 7a^2b - 3a^2)$$

Which of the following is equivalent to the expression above?

A) $4a^2b^4 - 21a^2b + 35a^2b$

B) $4ab^2 + 8a^2 - 14a^2b$

C) $2a^2 + 4ab^2$

D) $8a^2 - 14a^2b$

CONTINUE

11

Athletes in a School

	Left-Handed	Right-Handed
Varsity	11	98
Junior Varsity	17	144

The table above provides data about the 270 athletes in a particular high school. Approximately what percent of the athletes in the school are right-handed varsity athletes?

A)   6 percent

B)   36 percent

C)   53 percent

D)   98 percent

12

The table below shows the maximum weights that each of eight people at a gym can bench press.

Bench Press Weights

Person	Pounds
Aaron	40
Beth	30
Carey	110
Donna	230
Ethan	130
Fay	70
Gino	60
Helen	170

What is the difference between the maximum weight, in pounds, that Helen can bench press and the median weight, in pounds, of all eight people?

A)   10

B)   65

C)   70

D)   80

13

The table below shows the daily attendance of a Physics and a Biology class each day of a particular week.

Daily Attendance

Day	Physics	Biology
Monday	25	32
Tuesday	27	25
Wednesday	23	32
Thursday	31	21
Friday	25	28

Based on the information in the table, which of the following statements is true?

A)   Both the mode and the range for the Physics class are less than the mode and range for the Biology class.

B)   Both the mode and the range for the Physics class are greater than the mode and range for the Biology class.

C)   The mode for the Physics class is less than the mode for the Biology class, but the range for the Physics class is greater than the mode for the Biology class.

D)   The mode for the Physics class is greater than the mode for the Biology class, but the range for the Physics class is less than the mode for the Biology class.

14

A car company produces a particular model of car one at a time in its factories. If it takes one of the company's factories a total of 1,080 minutes to produce a single car, how many cars of that particular model can be produced by that particular factory in 540 <u>hours</u>?

A)   20

B)   25

C)   30

D)   35

CONTINUE

Questions 15–17 refer to the following information.

A major hospital conducted a study on a new experimental physical therapy method for some of its patients recovering from knee-replacement surgery. At the beginning of the study, 485 patients who had just had knee-replacement surgery were selected for the study; 194 of the patients were given the experimental physical therapy, and the remaining patients were put into conventional physical therapy. A summary of the recovery times for the patients who were in the study is shown in the table below.

Recovery Time for 485 Patients in the Study

Recovery Time	Experimental Therapy	Conventional Therapy
6 months or less	82	151
More than 6 months	112	140

15

What is the difference, to the nearest whole percent, between the percentage of patients in the experimental physical therapy with a recovery time of more than 6 months and the percentage of patients in the conventional physical therapy with a recovery time of more than 6 months?

A) 10%

B)   8%

C)   6%

D)   4%

16

Of the patients in the conventional physical therapy, the ratio of those who had one knee replaced to those who had both knees replaced is approximately 3:7. Which of the following is the best approximation for the number of patients in the conventional physical therapy who had both knees replaced?

A)   58

B)   87

C) 125

D) 204

17

If a patient in the study is selected at random, which of the following is closest to the probability that the patient will have a recovery time of more than 6 months?

A) 0.28

B) 0.40

C) 0.52

D) 0.81

CONTINUE

18

A circle is graphed in the *xy*-plane. If a circle has center (−3, 5) and a radius of 4, which of the following could be an equation of the circle?

A) $(x − 3)^2 − (y − 5)^2 = 4$

B) $(x − 3)^2 + (y − 5)^2 = 4$

C) $(x + 3)^2 − (y − 5)^2 = 16$

D) $(x + 3)^2 + (y − 5)^2 = 16$

19

A piano player charges a flat fee for an appearance plus an hourly rate based on the length of the performance. The equation $C = 100t + 50$ will relate the total charge *C*, in dollars, for a performance to the time *t*, in hours, of a performance. Based on this equation, how many additional hours will the length of the performance need to be for the piano player to charge an additional dollar?

A) $\dfrac{1}{100}$

B) $\dfrac{1}{50}$

C) 50

D) 100

20

Equal amounts of fencing are used to surround both an octagonal area and a square area. If each side of the octagon is 5 yards shorter than each side of the square, how many yards of fencing are needed to surround each area?

A) 20

B) 40

C) 60

D) 80

21

In the *xy*-plane, the graph of the function *f* is a parabola. If the graph of *f* intersects the *x*-axis at $(k, 0)$ and (3, 0), and the vertex of *f* is at (5, −3), what is the value of *k* ?

A) 9

B) 7

C) 5

D) 1

22

$$g(x) = \frac{3x + 9}{3x^2 - 3x - 18}$$

Which of the following is an equivalent form of rational function g that displays as constants or coefficients values that are not part of the domain?

A) $g(x) = \dfrac{1}{3x^2}$

B) $g(x) = \dfrac{1}{x - 2}$

C) $g(x) = \dfrac{x + 3}{x^2 - x - 6}$

D) $g(x) = \dfrac{3(x + 3)}{3(x - 3)(x + 2)}$

23

$$SA = 4\pi r^2$$

The formula for the surface area of a sphere with radius r is shown above. The radius of a volleyball is about 3 times the radius of a tennis ball. If a volleyball and a tennis ball are spherical, approximately how many times larger is the surface area of a volleyball than the surface area of a tennis ball?

A)   3

B)   9

C) 27

D) 36

24

A particle accelerates at a constant rate from a velocity of 20 meters per second to a velocity of 50 meters per second in 10 seconds. Which of the following expresses the velocity V, in meters per second, in terms of the time t, in seconds, after the acceleration began, for $0 \le t \le 10$?

A) $V = -50 + 3t$

B) $V = 20 + 3t$

C) $V = -20 - 3t$

D) $V = 50 - 3t$

25

If the function h is defined by $h(x) = 2x^2 - 7x - 3$, what is $h(x + 3)$?

A) $h(x + 3) = 2x^2 - 7x$

B) $h(x + 3) = 2x^2 - 7x - 6$

C) $h(x + 3) = 2x^2 + 5x - 6$

D) $h(x + 3) = 2x^2 - 23x + 15$

CONTINUE

26

$$10x - 62 = 9y$$
$$\frac{1}{4}x = y$$

The equations of two lines are shown above. If the lines are graphed on the *xy*-plane, which of the following ordered pairs represents the point of intersection of the two lines?

A) (8, 2)

B) (16, 4)

C) (24, 6)

D) (32, 8)

27

The amount of carbon-14 in a sample halves every 5,730 years. Which of the following best describes the type of decay that models the relationship between amount of carbon-14 and time?

A) Linear decay, because the amount of carbon-14 decreases by the same factor every 5,730-year period

B) Linear decay, because the amount of carbon-14 decreases by the same amount every 5,730-year period

C) Exponential decay, because the amount of carbon-14 decreases by the same factor every 5,730-year period

D) Exponential decay, because the amount of carbon-14 decreases by the same amount every 5,730-year period

CONTINUE

DIRECTIONS

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

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the 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 $3\ 1\ /\ 2$ is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

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

Write answer in boxes. ← Fraction line

Grid in result.

Answer: 2.5

← Decimal point

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

28

$$y = x + 8$$
$$y = x^2 - x - 7$$

If (x, y) is a solution to the equations above, what is one possible value for the sum of x and y ?

29

Type of Metal	Weight (ounces)	Price ($)
Gold	2	2,500
Platinum	5	7,500

A jewelry supply store sells boxes of sheet metal for gold and platinum at the weights and prices listed in the table above. A jeweler wants to purchase at least 90 ounces of metal and plans to spend at least $170,000. If she has already ordered 10 boxes of gold, what is the minimum number of boxes of platinum she can order to satisfy the requirements?

CONTINUE

Questions 30 and 31 refer to the following information.

Hours Spent Jogging
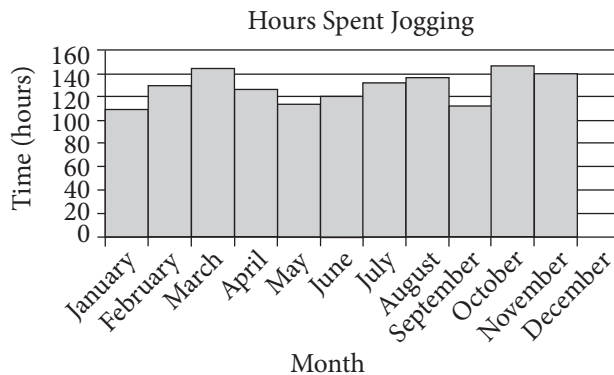
Month

The graph above shows the amount of time, in hours, that Robert spends jogging in each month through a particular year. The information for the month of December is not included in the graph.

30

In November, Robert jogged at an average pace of 8 miles per hour. In December, Robert ran for h hours at an average pace of 7 miles per hour. If the total distance that Robert jogged each of the two months was the same, what is the value of h ?

31

In June, Robert ran at a pace of 5 miles per hour at the beginning of the month before he increased in pace to 6 miles per hour toward the end of the month. If he spent 70% of this jogging time at the slower pace, and the rest at the faster pace, what is the total distance, in miles, that Robert jogged during the month of June?

STOP

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

PSAT/NMSQT PRACTICE TEST ANSWER SHEET

COMPLETE MARK ● **EXAMPLES OF INCOMPLETE MARKS** ⬤ ⊗ ⊖ ◉ ◐ ◑ ◍

It is recommended that you use a No. 2 pencil. It is very important that you fill in the entire circle darkly and completely. If you change your response, erase as completely as possible. Incomplete marks or erasures may affect your score.

■ TEST NUMBER

ENTER TEST NUMBER
For instance, for Practice Test #1, fill in the circle for 0 in the first column and for 1 in the second column.

0 ○○
1 ○○
2 ○○
3 ○○
4 ○○
5 ○○
6 ○○
7 ○○
8 ○○
9 ○○

■ SECTION 1

1 A B C D ○○○○
2 A B C D ○○○○
3 A B C D ○○○○
4 A B C D ○○○○
5 A B C D ○○○○
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30 A B C D ○○○○
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44 A B C D ○○○○
45 A B C D ○○○○
46 A B C D ○○○○
47 A B C D ○○○○

PSAT/NMSQT PRACTICE TEST ANSWER SHEET

	EXAMPLES OF	⚪ ⊗ ⊖ ◉	It is recommended that you use a No. 2 pencil. It is very important that you fill in the entire circle darkly and completely. If you change your response, erase as completely as possible. Incomplete marks or erasures may affect your score.
COMPLETE MARK ⚫	**INCOMPLETE MARKS**	◐ ⦸ ⦸ ⦸	

■ SECTION 2

	A B C D		A B C D		A B C D		A B C D		A B C D
1	○○○○	10	○○○○	19	○○○○	28	○○○○	37	○○○○
2	○○○○	11	○○○○	20	○○○○	29	○○○○	38	○○○○
3	○○○○	12	○○○○	21	○○○○	30	○○○○	39	○○○○
4	○○○○	13	○○○○	22	○○○○	31	○○○○	40	○○○○
5	○○○○	14	○○○○	23	○○○○	32	○○○○	41	○○○○
6	○○○○	15	○○○○	24	○○○○	33	○○○○	42	○○○○
7	○○○○	16	○○○○	25	○○○○	34	○○○○	43	○○○○
8	○○○○	17	○○○○	26	○○○○	35	○○○○	44	○○○○
9	○○○○	18	○○○○	27	○○○○	36	○○○○		

PSAT/NMSQT PRACTICE TEST ANSWER SHEET

| COMPLETE MARK ● | EXAMPLES OF INCOMPLETE MARKS ○ ⊗ ⊖ ◉ ● ⬤ | It is recommended that you use a No. 2 pencil. It is very important that you fill in the entire circle darkly and completely. If you change your response, erase as completely as possible. Incomplete marks or erasures may affect your score. |

■ SECTION 3

1 A B C D
2 A B C D
3 A B C D

4 A B C D
5 A B C D
6 A B C D

7 A B C D
8 A B C D
9 A B C D

10 A B C D
11 A B C D
12 A B C D

13 A B C D

Only answers that are gridded will be scored. You will not receive any credit for anything written in the boxes.

14

/ ○○
· ○○○○
0 ○○○○
1 ○○○○
2 ○○○○
3 ○○○○
4 ○○○○
5 ○○○○
6 ○○○○
7 ○○○○
8 ○○○○
9 ○○○○

15

/ ○○
· ○○○○
0 ○○○○
1 ○○○○
2 ○○○○
3 ○○○○
4 ○○○○
5 ○○○○
6 ○○○○
7 ○○○○
8 ○○○○
9 ○○○○

16

/ ○○
· ○○○○
0 ○○○○
1 ○○○○
2 ○○○○
3 ○○○○
4 ○○○○
5 ○○○○
6 ○○○○
7 ○○○○
8 ○○○○
9 ○○○○

17

/ ○○
· ○○○○
0 ○○○○
1 ○○○○
2 ○○○○
3 ○○○○
4 ○○○○
5 ○○○○
6 ○○○○
7 ○○○○
8 ○○○○
9 ○○○○

NO CALCULATOR ALLOWED

PSAT/NMSQT PRACTICE TEST ANSWER SHEET

	EXAMPLES OF	It is recommended that you use a No. 2 pencil. It is very important that you fill in the entire circle darkly and completely. If you change your response, erase as completely as possible. Incomplete marks or erasures may affect your score.
COMPLETE MARK ●	INCOMPLETE MARKS ⦸ ⊖ ◐	

■ **SECTION 4**

1 A B C D
2 A B C D
3 A B C D
4 A B C D
5 A B C D
6 A B C D

7 A B C D
8 A B C D
9 A B C D
10 A B C D
11 A B C D
12 A B C D

13 A B C D
14 A B C D
15 A B C D
16 A B C D
17 A B C D
18 A B C D

19 A B C D
20 A B C D
21 A B C D
22 A B C D
23 A B C D
24 A B C D

25 A B C D
26 A B C D
27 A B C D

Only answers that are gridded will be scored. You will not receive any credit for anything written in the boxes.

28
/ · 0 1 2 3 4 5 6 7 8 9

29
/ · 0 1 2 3 4 5 6 7 8 9

30
/ · 0 1 2 3 4 5 6 7 8 9

31
/ · 0 1 2 3 4 5 6 7 8 9

CALCULATOR ALLOWED