

# **The SAT Practice Test #6**

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**2021-22**

# The SAT®

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# Practice

# Test #6

**Make time to take the practice test.**  
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for the SAT.

After you've taken the practice test, score it right away with  
the scoring guide at [sat.org/scoring](https://sat.org/scoring).



**SAT®**

# Official SAT Practice Test

## About the Practice Test

Take the practice test, which starts on the next page, to reinforce your test-taking skills and to be more comfortable when you take the SAT. This practice test will give you a good idea of what to expect on the actual test.

In addition, once you take the test you can go to [sat.org/practicetests](https://sat.org/practicetests) for a scoring guide to check your answers and get answer explanations.

You'll need to set aside 3 hours and 15 minutes to take the test.

## Approaches to the Practice Test

The practice test will help you more if you take it under conditions as close as possible to those of the actual test.

- Plan to complete the entire test in one sitting.
  - ◆ The Reading Test takes 65 minutes, followed by a 10-minute break.
  - ◆ The Writing and Language Test is 35 minutes long, followed immediately (no break) by the Math Test – No Calculator, which takes 25 minutes.
  - ◆ Allow yourself a 5-minute break, and then take the Math Test – Calculator, which is 55 minutes long.
- Pace yourself by using a watch (without an audible alarm).
- Sit at a desk or table cleared of any other papers or books. Don't use any prohibited items such as a dictionary, notes, or scratch paper.
- Use an acceptable calculator that is familiar to you for the Math Test – Calculator. Check our calculator policies at [sat.org/calculator](https://sat.org/calculator).
- Read the test directions carefully.

## Marking the Answer Sheet

Getting credit for the right answer depends on marking the answer sheet correctly. When filling out your answer sheet, whether for the practice test or on test day, follow these important instructions:

- Make sure you use a No. 2 pencil.
- Fill in the entire bubble on the answer sheet darkly and completely.
- If you change your response, erase it as completely as possible.

## Calculating Your Scores

The scoring guide at [sat.org/practicetests](https://sat.org/practicetests) shows how your test should be scored: by counting the questions you answered correctly and converting this “raw” score to a score on the College Board scale of 200 to 800.

## Evaluate Your Test Performance

Once you've scored your practice test, review your performance and ask yourself these questions:

- **Did I run out of time before I finished a section?** Remember, all multiple-choice questions are scored the same way. Be prepared to keep moving on test day and don't spend too much time on any one question.
- **Did I make careless mistakes?** You may have misread a question, neglected to notice a word such as “except” or “best,” or solved for the wrong value. Recognizing these small but critical errors will help you avoid them on test day.
- **Did I spend too much time reading directions?** Review any directions that gave you trouble so you don't have to spend as much time reading them when you take the actual test.
- **Keep learning and practicing at [satpractice.org](https://satpractice.org).**

# Reading Test

## 65 MINUTES, 52 QUESTIONS

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

### DIRECTIONS

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

**Questions 1-10 are based on the following passage.**

This passage is adapted from Daniyal Mueenuddin, "Nawabdin Electrician." ©2009 by Daniyal Mueenuddin.

Another man might have thrown up his hands—but not Nawabdin. His twelve daughters acted as a spur to his genius, and he looked with satisfaction in the mirror each morning at the face of Line a warrior going out to do battle. Nawab of course knew that he must proliferate his sources of revenue—the salary he received from K. K. Harouni for tending the tube wells would not even begin to suffice. He set up a little one-room flour mill, run off 5 a condemned electric motor—condemned by him. He tried his hand at fish-farming in a little pond at the edge of his master's fields. He bought broken radios, fixed them, and resold them. He did not demur even when asked to fix watches, though that 10 enterprise did spectacularly badly, and in fact earned him more kicks than kudos, for no watch he took apart ever kept time again.

K. K. Harouni rarely went to his farms, but lived mostly in Lahore. Whenever the old man visited, 15 Nawab would place himself night and day at the door leading from the servants' sitting area into the walled grove of ancient banyan trees where the old farmhouse stood. Grizzled, his peculiar aviator

glasses bent and smudged, Nawab tended the 25 household machinery, the air conditioners, water heaters, refrigerators, and water pumps, like an engineer tending the boilers on a foundering steamer in an Atlantic gale. By his superhuman efforts he almost managed to maintain K. K. Harouni in the 30 same mechanical cocoon, cooled and bathed and lighted and fed, that the landowner enjoyed in Lahore.

Harouni of course became familiar with this ubiquitous man, who not only accompanied him on 35 his tours of inspection, but morning and night could be found standing on the master bed rewiring the light fixture or in the bathroom poking at the water heater. Finally, one evening at teatime, gauging the psychological moment, Nawab asked if he might say 40 a word. The landowner, who was cheerfully filing his nails in front of a crackling rosewood fire, told him to go ahead.

"Sir, as you know, your lands stretch from here to the Indus, and on these lands are fully seventeen tube 45 wells, and to tend these seventeen tube wells there is but one man, me, your servant. In your service I have earned these gray hairs"—here he bowed his head to show the gray—"and now I cannot fulfill my duties as I should. Enough, sir, enough. I beg you, forgive 50 me my weakness. Better a darkened house and proud hunger within than disgrace in the light of day. Release me, I ask you, I beg you."

The old man, well accustomed to these sorts of speeches, though not usually this florid, filed away at 55 his nails and waited for the breeze to stop.

"What's the matter, Nawabdin?"

"Matter, sir? O what could be the matter in your service. I've eaten your salt for all my years. But sir, on the bicycle now, with my old legs, and with the many injuries I've received when heavy machinery fell on me—I cannot any longer bicycle about like a bridegroom from farm to farm, as I could when I first had the good fortune to enter your employment. I beg you, sir, let me go."

"And what's the solution?" asked Harouni, seeing that they had come to the crux. He didn't particularly care one way or the other, except that it touched on his comfort—a matter of great interest to him.

"Well, sir, if I had a motorcycle, then I could somehow limp along, at least until I train up some younger man."

The crops that year had been good, Harouni felt expansive in front of the fire, and so, much to the disgust of the farm managers, Nawab received a brand-new motorcycle, a Honda 70. He even managed to extract an allowance for gasoline.

The motorcycle increased his status, gave him weight, so that people began calling him "Uncle," and asking his opinion on world affairs, about which he knew absolutely nothing. He could now range further, doing a much wider business. Best of all, now he could spend every night with his wife, who had begged to live not on the farm but near her family in Firoza, where also they could educate at least the two eldest daughters. A long straight road ran from the canal headworks near Firoza all the way to the Indus, through the heart of the K. K. Harouni lands. Nawab would fly down this road on his new machine, with bags and cloths hanging from every knob and brace, so that the bike, when he hit a bump, seemed to be flapping numerous small vestigial wings; and with his grinning face, as he rolled up to whichever tube well needed servicing, with his ears almost blown off, he shone with the speed of his arrival.

1

The main purpose of the first paragraph is to

- A) characterize Nawab as a loving father.
- B) outline the schedule of a typical day in Nawab's life.
- C) describe Nawab's various moneymaking ventures.
- D) contrast Nawab's and Harouni's lifestyles.

2

As used in line 16, "kicks" most nearly means

- A) thrills.
- B) complaints.
- C) jolts.
- D) interests.

3

The author uses the image of an engineer at sea (lines 23–28) most likely to

- A) suggest that Nawab often dreams of having a more exciting profession.
- B) highlight the fact that Nawab's primary job is to tend to Harouni's tube wells.
- C) reinforce the idea that Nawab has had many different occupations in his life.
- D) emphasize how demanding Nawab's work for Harouni is.

4

Which choice best supports the claim that Nawab performs his duties for Harouni well?

- A) Lines 28-32 (“By his . . . Lahore”)
- B) Lines 40-42 (“The landowner . . . ahead”)
- C) Lines 46-49 (“In your . . . should”)
- D) Line 58 (“I’ve . . . years”)

5

In the context of the conversation between Nawab and Harouni, Nawab’s comments in lines 43-52 (“Sir . . . beg you”) mainly serve to

- A) flatter Harouni by mentioning how vast his lands are.
- B) boast to Harouni about how competent and reliable Nawab is.
- C) emphasize Nawab’s diligence and loyalty to Harouni.
- D) notify Harouni that Nawab intends to quit his job tending the tube wells.

6

Nawab uses the word “bridegroom” (line 62) mainly to emphasize that he’s no longer

- A) in love.
- B) naive.
- C) busy.
- D) young.

7

It can reasonably be inferred from the passage that Harouni provides Nawab with a motorcycle mainly because

- A) Harouni appreciates that Nawab has to work hard to support his family.
- B) Harouni sees benefit to himself from giving Nawab a motorcycle.
- C) Nawab’s speech is the most eloquent that Harouni has ever heard.
- D) Nawab threatens to quit if Harouni doesn’t agree to give him a motorcycle.

8

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

- A) Lines 65-66 (“And . . . crux”)
- B) Lines 66-68 (“He didn’t . . . him”)
- C) Lines 75-76 (“He even . . . gasoline”)
- D) Lines 80-81 (“He could . . . business”)

9

The passage states that the farm managers react to Nawab receiving a motorcycle with

- A) disgust.
- B) happiness.
- C) envy.
- D) indifference.

10

According to the passage, what does Nawab consider to be the best result of getting the motorcycle?

- A) People start calling him “Uncle.”
- B) He’s able to expand his business.
- C) He’s able to educate his daughters.
- D) He can spend more time with his wife.

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

This passage is adapted from Stephen Coleman, Scott Anthony, and David E. Morrison, "Public Trust in the News." ©2009 by Stephen Coleman.

The news is a form of public knowledge. Unlike personal or private knowledge (such as the health of one's friends and family; the conduct of a Line private hobby; a secret liaison), public knowledge increases in value as it is shared by more people. The date of an election and the claims of rival candidates; the causes and consequences of an environmental disaster; a debate about how to frame a particular law; the latest reports from a war zone—these are all examples of public knowledge that people are generally expected to know in order to be considered informed citizens. Thus, in contrast to personal or private knowledge, which is generally left to individuals to pursue or ignore, public knowledge is promoted even to those who might not think it matters to them. In short, the circulation of public knowledge, including the news, is generally regarded as a public good which cannot be solely demand-driven.

20 The production, circulation, and reception of public knowledge is a complex process. It is generally accepted that public knowledge should be authoritative, but there is not always common agreement about what the public needs to know, who is best placed to relate and explain it, and how authoritative reputations should be determined and evaluated. Historically, newspapers such as *The Times* and broadcasters such as the BBC were widely regarded as the trusted shapers of authoritative agendas and conventional wisdom. They embodied the *Oxford English Dictionary's* definition of authority as the "power over, or title to influence, the opinions of others." As part of the general process of the transformation of authority whereby there has been a reluctance to uncritically accept traditional sources of public knowledge, the demand has been for all authority to make explicit the frames of value which determine their decisions. Centres of news production, as our focus groups show, have not been exempt from this process. Not surprisingly perhaps some news journalists feel uneasy about this renegotiation of their authority:

45 Editors are increasingly casting a glance at the "most read" lists on their own and other websites to work out which stories matter to readers and viewers. And now the audience—which used to know its place—is being asked to act as a kind of journalistic ombudsman, ruling on our credibility (broadcast journalist, 2008).

50 The result of democratising access to TV news could be political disengagement by the majority and a dumbing down through a popularity contest of stories (online news editor, 2007).

Despite the rhetorical bluster of these statements, 55 they amount to more than straightforward professional defensiveness. In their reference to an audience "which used to know its place" and conflation between democratisation and "dumbing down," they are seeking to argue for a particular mode of public knowledge: one which is shaped by experts, immune from populist pressures; and disseminated to attentive, but mainly passive recipients. It is a view of citizenship that closes down opportunities for popular involvement in the making 60 of public knowledge by reinforcing the professional claims of experts. The journalists quoted above are right to feel uneasy, for there is, at almost every institutional level in contemporary society, scepticism towards the epistemological authority of 65 expert elites. There is a growing feeling, as expressed by several of our focus group participants, that the news media should be "informative rather than authoritative"; the job of journalists should be to "give the news as raw as it is, without putting their 70 slant on it"; and people should be given "sufficient information" from which "we would be able to form opinions of our own."

At stake here are two distinct conceptions of authority. The journalists we have quoted are 75 resistant to the democratisation of news: the supremacy of the clickstream (according to which editors raise or lower the profile of stories according to the number of readers clicking on them online); the parity of popular culture with "serious" news; the demands of some audience members for 80 raw news rather than constructed narratives.

Percentage of Respondents Seeing News Stories  
as Inaccurate or Favoring One Side

	1985	1992	2003	2007	2011
<i>News organizations...</i>					
• Get the facts straight	55	49	36	39	25
• Often have inaccurate stories	34	44	56	53	66
• Don't know	11	7	8	8	9
• Are pretty independent	37	35	23	23	15
• Are often influenced by powerful people and organizations	53	58	70	69	80
• Don't know	10	7	7	8	5
 <i>On political and social issues, news organizations...</i>					
• Deal fairly with all sides	34	31	26	26	16
• Tend to favor one side	53	63	66	66	77
• Don't know	13	6	8	8	7

Adapted from "Pew Research Center for the People & the Press Report on Views of the News Media, 1985–2011." ©2011 by Pew Research Center.

**11**

The main purpose of the passage is to

- A) analyze the technological developments that have affected the production, circulation, and reception of news stories.
- B) discuss changes in the perception of the news media as a source of public knowledge.
- C) show how journalists' frames of value influence the production of news stories.
- D) challenge the conventional view that news is a form of public knowledge.

**12**

According to the passage, which expectation do traditional authorities now face?

- A) They should be uninfluenced by commercial considerations.
- B) They should be committed to bringing about positive social change.
- C) They should be respectful of the difference between public and private knowledge.
- D) They should be transparent about their beliefs and assumptions.

**13**

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

- A) Lines 2-5 ("Unlike . . . people")
- B) Lines 20-21 ("The production . . . process")
- C) Lines 33-38 ("As part . . . decisions")
- D) Lines 43-46 ("Editors . . . viewers")

**14**

As used in line 24, "common" most nearly means

- A) numerous.
- B) familiar.
- C) widespread.
- D) ordinary.

**15**

The authors most likely include the extended quotations in lines 43-53 to

- A) present contradictory examples.
- B) cite representative opinions.
- C) criticize typical viewpoints.
- D) suggest viable alternatives.

**16**

The authors indicate that the public is coming to believe that journalists' reports should avoid

- A) personal judgments about the events reported.
- B) more information than is absolutely necessary.
- C) quotations from authorities on the subject matter.
- D) details that the subjects of news reports wish to keep private.

17

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

- A) Lines 12-16 (“Thus . . . them”)
- B) Lines 30-33 (“They . . . others”)
- C) Lines 40-42 (“Not surprisingly . . . authority”)
- D) Lines 70-77 (“There . . . own”)

18

As used in line 74, “raw” most nearly means

- A) unfiltered.
- B) exposed.
- C) harsh.
- D) inexperienced.

19

Based on the table, in which year were people the most trusting of the news media?

- A) 1985
- B) 1992
- C) 2003
- D) 2011

20

Which statement is best supported by information presented in the table?

- A) Between 1985 and 2011, the proportion of inaccurate news stories rose dramatically.
- B) Between 1992 and 2003, the proportion of people who believed that news organizations were biased almost doubled.
- C) Between 2003 and 2007, people’s views of the accuracy, independence, and fairness of news organizations changed very little.
- D) Between 2007 and 2011, people’s perception that news organizations are accurate increased, but people’s perception that news organizations are fair diminished.

21

The 2011 data in the table best serve as evidence of

- A) “political disengagement by the majority” (line 51).
- B) “the professional claims of experts” (lines 65-66).
- C) “scepticism towards the epistemological authority of expert elites” (lines 69-70).
- D) “the supremacy of the clickstream” (line 81).

**Questions 22-32 are based on the following passage.**

This passage is adapted from Elsa Youngsteadt, "Decoding a Flower's Message." ©2012 by Sigma Xi, The Scientific Research Society.

Texas gourd vines unfurl their large, flared blossoms in the dim hours before sunrise. Until they close at noon, their yellow petals and mild, squashy *Line* aroma attract bees that gather nectar and shuttle pollen from flower to flower. But "when you advertise [to pollinators], you advertise in an open communication network," says chemical ecologist Ian Baldwin of the Max Planck Institute for Chemical Ecology in Germany. "You attract not just the good guys, but you also attract the bad guys." For a Texas gourd plant, striped cucumber beetles are among the very bad guys. They chew up pollen and petals, defecate in the flowers and transmit the dreaded bacterial wilt disease, an infection that can reduce an entire plant to a heap of collapsed tissue in mere days.

In one recent study, Nina Theis and Lynn Adler took on the specific problem of the Texas gourd—how to attract enough pollinators but not too many beetles. The Texas gourd vine's main pollinators are honey bees and specialized squash bees, which respond to its floral scent. The aroma includes 10 compounds, but the most abundant—and the only one that lures squash bees *25* into traps—is 1,4-dimethoxybenzene.

Intuition suggests that more of that aroma should be even more appealing to bees. "We have this assumption that a really fragrant flower is going to attract a lot of pollinators," says Theis, a chemical ecologist at Elms College in Chicopee, Massachusetts. But, she adds, that idea hasn't really been tested—and extra scent could well call in more beetles, too. To find out, she and Adler planted 168 Texas gourd vines in an Iowa field and, throughout the August flowering season, made half the plants more fragrant by tucking dimethoxybenzene-treated swabs deep inside their flowers. Each treated flower emitted about 45 times more fragrance than a normal one; the other half of *35* the plants got swabs without fragrance.

The researchers also wanted to know whether extra beetles would impose a double cost by both damaging flowers and deterring bees, which might not bother to visit (and pollinate) a flower laden with *45* other insects and their feces. So every half hour throughout the experiments, the team plucked all the beetles off of half the fragrance-enhanced flowers and half the control flowers, allowing bees to respond to the blossoms with and without interference by *50* beetles.

Finally, they pollinated by hand half of the female flowers in each of the four combinations of fragrance and beetles. Hand-pollinated flowers should develop into fruits with the maximum number of seeds, *55* providing a benchmark to see whether the fragrance-related activities of bees and beetles resulted in reduced pollination.

"It was very labor intensive," says Theis. "We would be out there at four in the morning, three *60* in the morning, to try and set up before these flowers open." As soon as they did, the team spent the next several hours walking from flower to flower, observing each for two-minute intervals "and writing down everything we saw."

*65* What they saw was double the normal number of beetles on fragrance-enhanced blossoms. Pollinators, to their surprise, did not prefer the highly scented flowers. Squash bees were indifferent, and honey bees visited enhanced flowers less often than normal ones. Theis thinks the bees were repelled not by the fragrance itself, but by the abundance of beetles: The data showed that the more beetles on a flower, the less likely a honey bee was to visit it.

*75* That added up to less reproduction for fragrance-enhanced flowers. Gourds that developed from those blossoms weighed 9 percent less and had, on average, 20 fewer seeds than those from normal flowers. Hand pollination didn't rescue the seed set, indicating that beetles damaged flowers directly—regardless of whether they also repelled pollinators. (Hand pollination did rescue fruit weight, a hard-to-interpret result that suggests that lost bee visits did somehow harm fruit development.)

85 The new results provide a reason that Texas gourd plants never evolved to produce a stronger scent: “If you really ramp up the odor, you don’t get more pollinators, but you can really get ripped apart by your enemies,” says Rob Raguso, a chemical ecologist  
90 at Cornell University who was not involved in the Texas gourd study.

22

The primary purpose of the passage is to

- A) discuss the assumptions and reasoning behind a theory.
- B) describe the aim, method, and results of an experiment.
- C) present and analyze conflicting data about a phenomenon.
- D) show the innovative nature of a procedure used in a study.

23

As presented in the passage, Theis and Adler’s research primarily relied on which type of evidence?

- A) Direct observation
- B) Historical data
- C) Expert testimony
- D) Random sampling

24

Which statement about striped cucumber beetles can most reasonably be inferred from the passage?

- A) They feed primarily on Texas gourd plants.
- B) They are less attracted to dimethoxybenzene than honey bees are.
- C) They experience only minor negative effects as a result of carrying bacterial wilt disease.
- D) They are attracted to the same compound in Texas gourd scent that squash bees are.

25

The author indicates that it seems initially plausible that Texas gourd plants could attract more pollinators if they

- A) did not have aromatic flowers.
- B) targeted insects other than bees.
- C) increased their floral scent.
- D) emitted more varied fragrant compounds.

26

- As used in line 38, “treated” most nearly means
- A) altered.
  - B) restored.
  - C) provided.
  - D) preserved.

27

What did Theis and Adler do as part of their study that most directly allowed Theis to reason that “bees were repelled not by the fragrance itself” (lines 70-71)?

- A) They observed the behavior of bees and beetles both before and after the flowers opened in the morning.
- B) They increased the presence of 1,4-dimethoxybenzene only during the August flowering season.
- C) They compared the gourds that developed from naturally pollinated flowers to the gourds that developed from hand-pollinated flowers.
- D) They gave bees a chance to choose between beetle-free enhanced flowers and beetle-free normal flowers.

28

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

- A) Lines 45-50 (“So every . . . beetles”)
- B) Lines 51-53 (“Finally . . . beetles”)
- C) Lines 59-61 (“We would . . . open”)
- D) Lines 76-79 (“Gourds . . . flowers”)

29

The primary function of the seventh and eighth paragraphs (lines 65-84) is to

- A) summarize Theis and Adler’s findings.
- B) describe Theis and Adler’s hypotheses.
- C) illustrate Theis and Adler’s methods.
- D) explain Theis and Adler’s reasoning.

30

- In describing squash bees as “indifferent” (line 68), the author most likely means that they
- A) could not distinguish enhanced flowers from normal flowers.
  - B) visited enhanced flowers and normal flowers at an equal rate.
  - C) largely preferred normal flowers to enhanced flowers.
  - D) were as likely to visit beetle-infested enhanced flowers as to visit beetle-free enhanced flowers.

31

- According to the passage, Theis and Adler’s research offers an answer to which of the following questions?
- A) How can Texas gourd plants increase the number of visits they receive from pollinators?
  - B) Why is there an upper limit on the intensity of the aroma emitted by Texas gourd plants?
  - C) Why does hand pollination rescue the fruit weight of beetle-infested Texas gourd plants?
  - D) Why do Texas gourd plants stop producing fragrance attractive to pollinators when beetles are present?

32

- Which choice provides the best evidence for the answer to the previous question?
- A) Lines 17-20 (“In one . . . beetles”)
  - B) Lines 22-25 (“The aroma . . . 1,4-dimethoxybenzene”)
  - C) Lines 79-84 (“Hand . . . development”)
  - D) Lines 85-86 (“The new . . . scent”)

**Questions 33-42 are based on the following passages.**

Passage 1 is adapted from Abraham Lincoln, "Address to the Young Men's Lyceum of Springfield, Illinois." Originally delivered in 1838. Passage 2 is from Henry David Thoreau, "Resistance to Civil Government." Originally published in 1849.

**Passage 1**

Let every American, every lover of liberty, every well-wisher to his posterity, swear by the blood of the Revolution, never to violate in the least particular, *Line* the laws of the country; and never to tolerate their violation by others. As the patriots of seventy-six did to the support of the Declaration of Independence, so to the support of the Constitution and Laws, let every American pledge his life, his property, and his sacred honor;—let every man remember that to violate the law, is to trample on the blood of his father, and to tear the character of his own, and his children's liberty. Let reverence for the laws, be breathed by every American mother, to the lisping babe, that prattles on her lap—let it be taught in schools, in seminaries, and in colleges;—let it be written in Primers, spelling books, and in Almanacs;—let it be preached from the pulpit, proclaimed in legislative halls, and enforced in courts of justice. And, in short, let it become the *political religion* of the nation; and let the old and the young, the rich and the poor, the grave and the gay, of all sexes and tongues, and colors and conditions, sacrifice unceasingly upon its altars. . . .

When I so pressingly urge a strict observance of all the laws, let me not be understood as saying there are no bad laws, nor that grievances may not arise, for the redress of which, no legal provisions have been made. I mean to say no such thing. But I do mean to say, that, although bad laws, if they exist, should be repealed as soon as possible, still while they continue in force, for the sake of example, they should be religiously observed. So also in unprovided cases. If such arise, let proper legal provisions be made for them with the least possible delay; but, till then, let them if not too intolerable, be borne with.

There is no grievance that is a fit object of redress by mob law. In any case that arises, as for instance, the promulgation of abolitionism, one of two positions is necessarily true; that is, the thing is right *40* within itself, and therefore deserves the protection of all law and all good citizens; or, it is wrong, and therefore proper to be prohibited by legal enactments; and in neither case, is the interposition of mob law, either necessary, justifiable, or excusable.

**Passage 2**

*45* Unjust laws exist; shall we be content to obey them, or shall we endeavor to amend them, and obey them until we have succeeded, or shall we transgress them at once? Men generally, under such a government as this, think that they ought to wait *50* until they have persuaded the majority to alter them. They think that, if they should resist, the remedy would be worse than the evil. But it is the fault of the government itself that the remedy is worse than the evil. It makes it worse. Why is it not more apt to *55* anticipate and provide for reform? Why does it not cherish its wise minority? Why does it cry and resist before it is hurt? . . .

If the injustice is part of the necessary friction of the machine of government, let it go, let it go; *60* perchance it will wear smooth—certainly the machine will wear out. If the injustice has a spring, or a pulley, or a rope, or a crank, exclusively for itself, then perhaps you may consider whether the remedy will not be worse than the evil; but if it is of such a *65* nature that it requires you to be the agent of injustice to another, then, I say, break the law. Let your life be a counter friction to stop the machine. What I have to do is to see, at any rate, that I do not lend myself to the wrong which I condemn.

*70* As for adopting the ways which the State has provided for remedying the evil, I know not of such ways. They take too much time, and a man's life will be gone. I have other affairs to attend to. I came into this world, not chiefly to make this a good place to *75* live in, but to live in it, be it good or bad. A man has not everything to do, but something; and because he cannot do everything, it is not necessary that he should do something wrong. . . .

I do not hesitate to say, that those who call  
80 themselves Abolitionists should at once effectually withdraw their support, both in person and property, from the government . . . and not wait till they constitute a majority of one, before they suffer the right to prevail through them. I think that it is enough if they have God on their side, without  
85 waiting for that other one. Moreover, any man more right than his neighbors constitutes a majority of one already.

33

In Passage 1, Lincoln contends that breaking the law has which consequence?

- A) It slows the repeal of bad laws.
- B) It undermines and repudiates the nation's values.
- C) It leads slowly but inexorably to rule by the mob.
- D) It creates divisions between social groups.

34

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

- A) Lines 9-12 ("let every man . . . liberty")
- B) Lines 20-23 ("and let . . . altars")
- C) Lines 33-35 ("If such . . . borne with")
- D) Lines 36-37 ("There . . . law")

35

As used in line 24, "urge" most nearly means

- A) hasten.
- B) stimulate.
- C) require.
- D) advocate.

36

The sentence in lines 24-28 ("When . . . made") primarily serves which function in Passage 1?

- A) It raises and refutes a potential counterargument to Lincoln's argument.
- B) It identifies and concedes a crucial shortcoming of Lincoln's argument.
- C) It acknowledges and substantiates a central assumption of Lincoln's argument.
- D) It anticipates and corrects a possible misinterpretation of Lincoln's argument.

**37**

- As used in line 32, “observed” most nearly means
- A) followed.
  - B) scrutinized.
  - C) contemplated.
  - D) noticed.

**38**

In Passage 2, Thoreau indicates that some unjust aspects of government are

- A) superficial and can be fixed easily.
- B) subtle and must be studied carefully.
- C) self-correcting and may be beneficial.
- D) inevitable and should be endured.

**39**

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

- A) Lines 45-48 (“Unjust . . . once”)
- B) Lines 51-52 (“They . . . evil”)
- C) Lines 58-59 (“If the injustice . . . go”)
- D) Lines 75-78 (“A man . . . wrong”)

40

- The primary purpose of each passage is to
- A) make an argument about the difference between legal duties and moral imperatives.
  - B) discuss how laws ought to be enacted and changed in a democracy.
  - C) advance a view regarding whether individuals should follow all of the country's laws.
  - D) articulate standards by which laws can be evaluated as just or unjust.

41

Based on the passages, Lincoln would most likely describe the behavior that Thoreau recommends in lines 64–66 (“if it . . . law”) as

- A) an excusable reaction to an intolerable situation.
- B) a rejection of the country's proper forms of remedy.
- C) an honorable response to an unjust law.
- D) a misapplication of a core principle of the Constitution.

42

Based on the passages, one commonality in the stances Lincoln and Thoreau take toward abolitionism is that

- A) both authors see the cause as warranting drastic action.
- B) both authors view the cause as central to their argument.
- C) neither author expects the cause to win widespread acceptance.
- D) neither author embraces the cause as his own.

**Questions 43–52 are based on the following passage and supplementary material.**

This passage is adapted from Kevin Bullis, “What Tech Is Next for the Solar Industry?” ©2013 by MIT Technology Review.

Solar panel installations continue to grow quickly, but the solar panel manufacturing industry is in the doldrums because supply far exceeds demand. The *Line* poor market may be slowing innovation, but 5 advances continue; judging by the mood this week at the IEEE Photovoltaics Specialists Conference in Tampa, Florida, people in the industry remain optimistic about its long-term prospects.

The technology that’s surprised almost everyone 10 is conventional crystalline silicon. A few years ago, silicon solar panels cost \$4 per watt, and Martin Green, professor at the University of New South Wales and one of the leading silicon solar panel researchers, declared that they’d never go 15 below \$1 a watt. “Now it’s down to something like 50 cents a watt, and there’s talk of hitting 36 cents per watt,” he says.

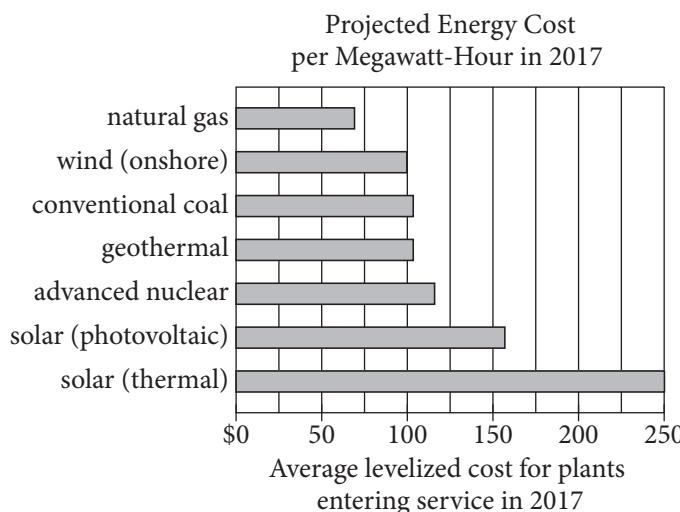
The U.S. Department of Energy has set a goal of reaching less than \$1 a watt—not just for the solar 20 panels, but for complete, installed systems—by 2020. Green thinks the solar industry will hit that target even sooner than that. If so, that would bring the direct cost of solar power to six cents per kilowatt-hour, which is cheaper than the average cost 25 expected for power from new natural gas power plants.

All parts of the silicon solar panel industry have been looking for ways to cut costs and improve the power output of solar panels, and that’s led to steady 30 cost reductions. Green points to something as mundane as the pastes used to screen-print some of the features on solar panels. Green’s lab built a solar cell in the 1990s that set a record efficiency for silicon solar cells—a record that stands to this day. To 35 achieve that record, he had to use expensive lithography techniques to make fine wires for collecting current from the solar cell. But gradual improvements have made it possible to use screen printing to produce ever-finer lines. Recent research 40 suggests that screen-printing techniques can produce lines as thin as 30 micrometers—about the width of the lines Green used for his record solar cells, but at costs far lower than his lithography techniques.

Meanwhile, researchers at the National Renewable Energy Laboratory have made flexible solar cells on a new type of glass from Corning called Willow Glass, which is thin and can be rolled up. The type of solar cell they made is the only current challenger to silicon in terms of large-scale production—thin-film 50 cadmium telluride. Flexible solar cells could lower the cost of installing solar cells, making solar power cheaper.

One of Green’s former students and colleagues, Jianhua Zhao, cofounder of solar panel manufacturer 55 China Sunergy, announced this week that he is building a pilot manufacturing line for a two-sided solar cell that can absorb light from both the front and back. The basic idea, which isn’t new, is that during some parts of the day, sunlight falls on the 60 land between rows of solar panels in a solar power plant. That light reflects onto the back of the panels and could be harvested to increase the power output. This works particularly well when the solar panels are built on sand, which is highly reflective. Where a 65 one-sided solar panel might generate 340 watts, a two-sided one might generate up to 400 watts. He expects the panels to generate 10 to 20 percent more electricity over the course of a year.

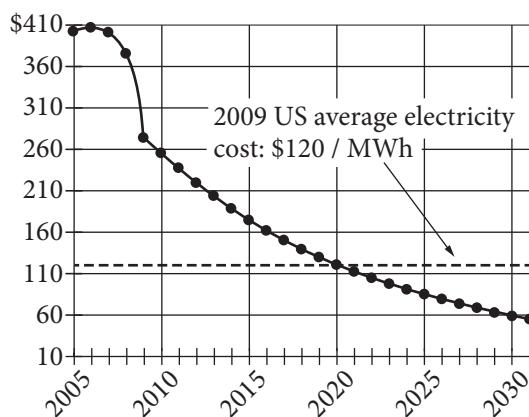
Even longer-term, Green is betting on silicon, 70 aiming to take advantage of the huge reductions in cost already seen with the technology. He hopes to greatly increase the efficiency of silicon solar panels by combining silicon with one or two other semiconductors, each selected to efficiently convert a 75 part of the solar spectrum that silicon doesn’t convert efficiently. Adding one semiconductor could boost efficiencies from the 20 to 25 percent range to around 40 percent. Adding another could make efficiencies as high as 50 percent feasible, which 80 would cut in half the number of solar panels needed for a given installation. The challenge is to produce good connections between these semiconductors, something made challenging by the arrangement of silicon atoms in crystalline silicon.

**Figure 1**

Adapted from Peter Schwartz, "Abundant Natural Gas and Oil Are Putting the Kibosh on Clean Energy." ©2012 by Condé Nast.

**Figure 2**

Solar Photovoltaic Cost per Megawatt-Hour (MWh)  
(Projected beyond 2009. All data in 2009 dollars.)



Adapted from Ramez Naam, "Smaller, Cheaper, Faster: Does Moore's Law Apply to Solar Cells?" ©2011 by Scientific American.

**43**

- The passage is written from the point of view of a
- A) consumer evaluating a variety of options.
  - B) scientist comparing competing research methods.
  - C) journalist enumerating changes in a field.
  - D) hobbyist explaining the capabilities of new technology.

**44**

- As used in line 4, “poor” most nearly means
- A) weak.
  - B) humble.
  - C) pitiable.
  - D) obsolete.

**45**

- It can most reasonably be inferred from the passage that many people in the solar panel industry believe that
- A) consumers don’t understand how solar panels work.
  - B) two-sided cells have weaknesses that have not yet been discovered.
  - C) the cost of solar panels is too high and their power output too low.
  - D) Willow Glass is too inefficient to be marketable.

**46**

- Which choice provides the best evidence for the answer to the previous question?
- A) Lines 1-3 (“Solar . . . demand”)
  - B) Lines 10-15 (“A few . . . a watt”)
  - C) Lines 22-26 (“If so . . . plants”)
  - D) Lines 27-30 (“All . . . reductions”)

**47**

- According to the passage, two-sided solar panels will likely raise efficiency by
- A) requiring little energy to operate.
  - B) absorbing reflected light.
  - C) being reasonably inexpensive to manufacture.
  - D) preventing light from reaching the ground.

**48**

- Which choice provides the best evidence for the answer to the previous question?
- A) Lines 58-61 (“The basic . . . plant”)
  - B) Lines 61-62 (“That . . . output”)
  - C) Lines 63-64 (“This . . . reflective”)
  - D) Lines 64-66 (“Where . . . 400 watts”)

49

- As used in line 69, “betting on” most nearly means
- A) dabbling in.
  - B) gambling with.
  - C) switching from.
  - D) optimistic about.

50

- The last sentence of the passage mainly serves to
- A) express concern about the limitations of a material.
  - B) identify a hurdle that must be overcome.
  - C) make a prediction about the effective use of certain devices.
  - D) introduce a potential new area of study.

51

According to figure 1, in 2017, the cost of which of the following fuels is projected to be closest to the 2009 US average electricity cost shown in figure 2?

- A) Natural gas
- B) Wind (onshore)
- C) Conventional coal
- D) Advanced nuclear

52

According to figure 2, in what year is the average cost of solar photovoltaic power projected to be equal to the 2009 US average electricity cost?

- A) 2018
- B) 2020
- C) 2025
- D) 2027

**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.

### A Necessary Resource for Science

In the winter of 1968, scientists David Schindler and Gregg Brunskill poured nitrates and phosphates into Lake 1 227, this is one of the 58 freshwater bodies that compose Canada’s remotely located Experimental Lakes Area. Schindler and Brunskill were contaminating the water not out of malice but in the name of research. While deliberately adding chemical compounds to a lake may seem 2 destructive and irresponsible, this method of experimenting is sometimes the most effective way to influence policy and save the environment from even more damaging pollution.

1

- A) NO CHANGE
- B) 227. Which is one
- C) 227. One
- D) 227, one

2

- A) NO CHANGE
- B) destructive, and irresponsible this method
- C) destructive and, irresponsible, this method
- D) destructive and irresponsible this method,

Schindler and Brunskill were investigating possible causes for the large blooms of blue-green algae, or cyanobacteria, that had been affecting bodies of water such as Lake Erie. **3** In addition to being unsightly and odorous, these algal blooms cause oxygen depletion. Oxygen depletion kills fish and other wildlife in the lakes. Just weeks after the scientists added the nitrates and phosphates, the water in Lake 227 turned bright **4** green. It was thick with: the same type of algal blooms that had plagued Lake Erie.

3

Which choice most effectively combines the underlined sentences?

- A) In addition to being unsightly and odorous, these algal blooms cause oxygen depletion: the result being that it kills fish and other wildlife in the lakes.
- B) In addition to being unsightly and odorous, these algal blooms cause oxygen depletion; the algal blooms cause oxygen depletion that kills fish and other wildlife in the lakes.
- C) In addition to being unsightly and odorous, these algal blooms cause oxygen depletion, and oxygen depletion caused by the algal blooms kills fish and other wildlife in the lakes.
- D) In addition to being unsightly and odorous, these algal blooms cause oxygen depletion, which kills fish and other wildlife in the lakes.

4

- A) NO CHANGE
- B) green: it was thick with
- C) green. It was thick with—
- D) green, it was thick with

5 One mission of the Experimental Lakes Area is to conduct research that helps people better understand threats to the environment. The scientists divided the lake in half by placing a nylon barrier through the narrowest part of its figure-eight shape. In one half of Lake 226, they added phosphates, nitrates, and a source of carbon; in the other, they added just nitrates 6 and a source of carbon was added. Schindler and Brunskill hypothesized that phosphates were responsible for the growth of cyanobacteria. The experiment confirmed their suspicions when the half of the lake containing the phosphates 7 was teeming with blue-green algae.

5

Which choice provides the best transition from the previous paragraph to this one?

- A) NO CHANGE
- B) The Experimental Lakes Area is located in a sparsely inhabited region that experiences few effects of human and industrial activity.
- C) To isolate the cause of the algae, Schindler and Brunskill performed another experiment, this time using Lake 226.
- D) The process by which water becomes enriched by dissolved nutrients, such as phosphates, is called eutrophication.

6

- A) NO CHANGE
- B) and a source of carbon.
- C) plus also a source of carbon.
- D) but also adding a source of carbon.

7

- A) NO CHANGE
- B) were teeming
- C) are teeming
- D) teems

Schindler and Brunskill's findings were **8** shown off by the journal *Science*. The research demonstrated a clear correlation between introducing phosphates and the growth of blue-green algae. **9** For example, legislators in Canada passed laws banning phosphates in laundry detergents, which had been entering the water supply. **10**

**8**

- A) NO CHANGE
- B) put in the spotlight of
- C) published in
- D) put into

**9**

- A) NO CHANGE
- B) Similarly,
- C) However,
- D) Subsequently,

**10**

At this point, the writer wants to add a second policy outcome of the research described. Which choice best accomplishes this goal?

- A) Lake 226 continued to develop blooms of blue-green algae for eight consecutive years after the experiment took place.
- B) In the United States, many individual states have also adopted legislation to eliminate, or at least reduce, phosphorous content in laundry detergents.
- C) In 1974, Schindler initiated a study of the effects of acid rain, using Lake 223 to examine how sulfuric acid altered aquatic ecosystems.
- D) Aerial photos of the lakes taken before and during algal blooms helped convey the effects of phosphates in water to the public.

Experiments like these can help people understand the unintended consequences of using certain household products. **11** Of course, regulating the use of certain chemical compounds can be a controversial issue.

Selectively establishing remote study locations, such as the Experimental Lakes Area, can provide scientists with opportunities to safely conduct controlled research. This research can generate evidence solid enough to persuade policy makers to take action in favor of protecting the larger environment.

11

Which choice most effectively anticipates and addresses a relevant counterargument to the argument in favor of the types of experiments described in the passage?

- A) NO CHANGE
- B) Many companies now offer phosphate-free alternatives for household cleaning products.
- C) Obviously, scientists should not be allowed to randomly perform experiments on just any body of water.
- D) Phosphates are sometimes used in agricultural fertilizers, in addition to being used in cleaning products.

Questions 12–22 are based on the following passage.

**A Little to the Left, but Not Too Much!**

Italy's Tower of Pisa has been leaning southward since the initial 12 stages of its construction over 800 years ago. 13 Indeed, if the tower's construction had not taken two centuries and involved significant breaks due to war and civil unrest, which allowed the ground beneath the tower to settle, the tower would likely have collapsed before it was completed.

12

- A) NO CHANGE
- B) stage's of its'
- C) stage's of it's
- D) stages of its

13

- A) NO CHANGE
- B) Therefore,
- C) Nevertheless,
- D) However,

Luckily, the tower survived, and its tilt has made it an Italian **14** icon, it attracts visitors from all over who flock to Pisa to see one of the greatest architectural **15** weirdnesses in the world. **16** By the late twentieth century, the angle of the tower's tilt had reached an astonishing 5.5 degrees; in **17** 1990, Italy's government closed the tower to visitors and appointed a committee to find a way to save it.

**14**

- A) NO CHANGE
- B) icon, attracting
- C) icon, its attracting
- D) icon; attracting

**15**

- A) NO CHANGE
- B) deviations
- C) oddities
- D) abnormalities

**16**

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

Unfortunately, the tower's tilt has steadily increased over the centuries, placing the structure in danger of collapse.

Should the writer make this addition here?

- A) Yes, because it provides an important restatement of the main claim in the previous sentence.
- B) Yes, because it establishes an important shift in emphasis in the paragraph's discussion about the tower's tilt.
- C) No, because it interrupts the paragraph's discussion with irrelevant information.
- D) No, because it repeats information that is already presented in the first paragraph.

**17**

- A) NO CHANGE
- B) 1990, Italy's government, closed
- C) 1990 Italy's government, closed,
- D) 1990: Italy's government closed

The committee was charged with saving the tower without ruining its aesthetic, **18** which no one had yet managed to achieve. The committee's first attempt to reduce the angle of the tower's tilt—placing 600 tons of iron ingots (molded pieces of metal) on the tower's north side to create a counterweight—was derided because the bulky weights ruined the tower's appearance. The attempt at a less visible solution—sinking anchors into the ground below the tower—almost caused the tower to fall.

18

Which choice best supports the main point of the paragraph?

- A) NO CHANGE
- B) although not everyone on the committee agreed completely about what that aesthetic was.
- C) which meant somehow preserving the tower's tilt while preventing that tilt from increasing and toppling the tower.
- D) which included the pristine white marble finish that has come to be widely associated with the tower's beauty.

[1] Enter committee member John Burland, [19] he is a geotechnical engineer from England who saved London's clock tower Big Ben from collapse. [2] Burland began a years-long process of drilling out small amounts of soil from under the tower [20] that took several years to complete and then monitoring the tower's resulting movement. [3] Twice daily, Burland evaluated these movements and made recommendations as to how much soil should be removed in the next drilling. [4] By 2001, almost 77 tons of soil had been removed, and the tower's tilt had decreased by over 1.5 degrees; the ugly iron weights were removed, and the tower was reopened to visitors. [5] Burland [21] advocated using soil extraction: removing small amounts of soil from under the tower's north side, opposite its tilt, to enable gravity to straighten the tower. [22]

The tower's tilt has not increased since, and the committee is confident that the tower will be safe for another 200 years. Burland is now working on a more permanent solution for keeping the tower upright, but he is adamant that the tower never be completely straightened. In an interview with PBS's *Nova*, Burland explained that it is very important "that we don't really change the character of the monument. That would be quite wrong and quite inappropriate."

19

- A) NO CHANGE
- B) Burland is
- C) his being
- D) DELETE the underlined portion.

20

- A) NO CHANGE
- B) —taking several years to complete—
- C) that took him several years to complete
- D) DELETE the underlined portion.

21

- A) NO CHANGE
- B) advocated to use
- C) advocated the using of
- D) advocating to use

22

To make this paragraph most logical, sentence 5 should be

- A) placed after sentence 1.
- B) placed after sentence 2.
- C) placed after sentence 3.
- D) DELETED from the paragraph.

Questions 23–33 are based on the following passage and supplementary material.

### The Physician Assistant Will See You Now

23 The term “paramedics” refers to health care workers who provide routine and clinical services. While the pressures of an aging population, insurance reforms, and health epidemics have increased demand for care, the supply of physicians is not expected to 24 keep pace. The Association of American Medical Colleges predicts a shortage of over 90,000 physicians by 2020; by 2025, that number could climb to more than 130,000. In some parts of the country, shortages are already a sad fact of life. A 2009 report by the Bureau of Health Professions notes that although a fifth of the US population lives in rural areas, less than a tenth of US physicians serves that population. Because a traditionalist response to the crisis—25 amping up medical-college enrollments and expanding physician training programs—is too slow and costly to address the near-term problem, alternatives are being explored. One promising avenue has been greater reliance on physician assistants (PAs).

23

Which choice is the best introduction to the paragraph?

- A) NO CHANGE
- B) For many Americans, finding a physician is likely to become a growing challenge.
- C) Getting treatment for an illness usually requires seeing either a general practitioner or a specialist.
- D) Worldwide the costs of health care are increasing at an alarming rate.

24

- A) NO CHANGE
- B) maintain the tempo.
- C) get in line.
- D) move along.

25

- A) NO CHANGE
- B) bolstering
- C) arousing
- D) revving up

26 By virtue of 27 there medical training, PAs can perform many of the jobs traditionally done by doctors, including treating chronic and acute conditions, performing minor 28 surgeries: and prescribing some medications. However, although well 29 compensated earning in 2012 a median annual salary of \$90,930, PAs cost health care providers less than do the physicians who

26

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

Several factors argue in favor of such an expanded role.

Should the writer make this addition here?

- A) Yes, because it introduces a counterargument for balance.
- B) Yes, because it frames the points that the paragraph will examine.
- C) No, because it does not specify the education required to be a PA.
- D) No, because it presents information that is only tangential to the main argument.

27

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

28

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

29

- A) NO CHANGE
- B) compensated (earning in 2012 a median annual salary of \$90,930),
- C) compensated, earning in 2012 a median annual salary of \$90,930
- D) compensated: earning in 2012 a median annual salary of \$90,930,

might otherwise undertake these tasks. Moreover, the training period for PAs is markedly shorter than **30** those for physicians—two to three years versus the seven to eleven required for physicians.

Physician assistants already offer vital primary care in many locations. Some 90,000 PAs were employed nationwide in 2012. Over and above their value in partially compensating for the general physician shortage has been their extraordinary contribution to rural health care. A recent review of the scholarly literature by Texas researchers found that PAs lend cost-efficient, widely appreciated services in underserved areas.

**31** In addition, rural-based PAs often provide a broader spectrum of such services than do their urban and suburban counterparts, possibly as a consequence of the limited pool of rural-based physicians.

30

- A) NO CHANGE
- B) that compared with
- C) that for
- D) DELETE the underlined portion.

31

- A) NO CHANGE
- B) Thus,
- C) Despite this,
- D) On the other hand,

Increasingly, PAs and other such medical practitioners have become a critical complement to physicians. A 2013 RAND Corporation report estimates that while the number of primary care physicians will increase slowly from 2010 to 2025, the number of physician assistants and nurse-practitioners in primary care will grow at much faster rates. **32** Both by merit and from necessity, PAs are likely to greet more **33** patience than ever before.

**Supply of Physicians, Physician Assistants, and Nurse-Practitioners in Primary Care Clinical Practice in 2010 and 2025**

Provider type	2010		2025 (predicted)	
	Number	Percent of total	Number	Percent of total
Physicians	210,000	71	216,000	60
Physician assistants	30,000	10	42,000	12
Nurse-practitioners	56,000	19	103,000	28
Total	296,000	100	361,000	100

Adapted from David I. Auerbach et al., "Nurse-Managed Health Centers and Patient-Centered Medical Homes Could Mitigate Expected Primary Care Physician Shortage." ©2013 by Project HOPE: The People-to-People Health Foundation, Inc.

32

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

In fact, according to the data presented in the table, physician assistants will likely outnumber physicians by 2025.

Should the writer make this addition here?

- A) Yes, because it provides additional support for the main point of the paragraph.
- B) Yes, because it addresses a possible counterargument to the writer's main claim.
- C) No, because it is not an accurate interpretation of the data.
- D) No, because it introduces irrelevant information that interrupts the flow of the passage.

33

- A) NO CHANGE
- B) patience, than
- C) patients then
- D) patients than

**Questions 34–44 are based on the following passage.**

### Gold into Silver: The “Reverse Alchemy” of Superhero Comics History

**34** Popular film franchises are often “rebooted” in an effort to make their characters and stories fresh and relevant for new audiences. Superhero comic books are periodically reworked to try to increase their appeal to contemporary readers. This practice is almost as **35** elderly as the medium itself and has in large part established the “ages” that compose comic book history. The shift from the Golden to the Silver Age is probably the most successful **36** example: of publishers responding to changing times and tastes.

34

Which choice most effectively combines the underlined sentences?

- A) In an effort to make their characters and stories fresh and relevant for new audiences, popular film franchises, which are often “rebooted,” are similar to superhero comic books, which are periodically reworked to try to increase their appeal to contemporary readers.
- B) Just as popular film franchises are often “rebooted” in an effort to make their characters and stories fresh and relevant for new audiences, superhero comic books are periodically reworked to try to increase their appeal to contemporary readers.
- C) Superhero comic books are periodically reworked to try to increase their appeal to contemporary readers, while popular film franchises are often “rebooted” in an effort to make their characters and stories fresh and relevant for new audiences.
- D) Superhero comic books are much like popular film franchises in being often “rebooted” in an effort to make their characters and stories fresh and relevant for new audiences and periodically reworked to try to increase their appeal to contemporary readers.

35

- A) NO CHANGE
- B) old
- C) mature
- D) geriatric

36

- A) NO CHANGE
- B) example, of publishers
- C) example of publishers,
- D) example of publishers

The start of the first (“Golden”) age of comic books is often dated to 1938 with the debut of Superman in *Action Comics* #1. Besides beginning the age, Superman in many respects defined it, becoming the model on which many later superheroes were based. His characterization, as established in *Superman* #1 (1939), was relatively simple. He could “hurdle skyscrapers” and “leap an eighth of a mile”; “run faster than a streamline train”; withstand anything less than a “bursting shell”; and 37 lift a car over his head. Sent to Earth from the “doomed planet” Krypton, he was raised by human foster parents, whose love helped infuse him with an unapologetic desire to “benefit mankind.” Admirable but aloof, the Golden Age Superman was arguably more paragon than character, a problem only partially solved by giving him a human alter ego. Other Golden Age superheroes were similarly archetypal: Batman was a crime-fighting millionaire, Wonder Woman a warrior princess from a mythical island.

37

Which choice is most consistent with the previous examples in the sentence?

- A) NO CHANGE
- B) hold down a regular job as a newspaper reporter.
- C) wear a bright blue costume with a flowing red cape.
- D) live in the big city of Metropolis instead of the small town where he grew up.

By contrast, the second (“Silver”) age of comics was marked by characters that, though somewhat simplistic by today’s standards, **38** were provided with origin stories often involving scientific experiments gone wrong. In addition to super villains, the new, soon-to-be-iconic characters of the **39** age: Spider-Man, the Fantastic Four, and the Hulk among them—had to cope with mundane, real-life problems, including paying the rent, dealing with family squabbles, and facing anger, loneliness, and ostracism. Their interior lives were richer and their motivations more complex. Although sales remained strong for Golden Age stalwarts Superman and, to a lesser extent, Batman, **40** subsequent decades would show the enduring appeal of these characters.

38

Which choice most effectively sets up the main idea of the following two sentences?

- A) NO CHANGE
- B) reflected the increasing conservatism of the United States in the 1950s.
- C) engaged in bizarre adventures frequently inspired by science fiction.
- D) were more “realistic” than their Golden Age counterparts.

39

- A) NO CHANGE
- B) age;
- C) age,
- D) age—

40

The writer wants a conclusion to the sentence and paragraph that logically completes the discussion of the Silver Age and provides an effective transition into the next paragraph. Which choice best accomplishes these goals?

- A) NO CHANGE
- B) the distinctions between later stages of comic book history are less well defined than the one between the Golden and Silver Ages.
- C) readers increasingly gravitated to the upstarts as the 1960s and the Silver Age drew to a close.
- D) these characters themselves underwent significant changes over the course of the Silver Age.

More transformations would take place in the medium as the Silver Age gave way to the Bronze and Modern (and possibly Postmodern) Ages. Such efforts **41** have yielded diminishing returns, as even the complete relaunch of DC **42** Comics' superhero's, line in 2011 has failed to arrest the steep two-decade decline of comic book sales. For both commercial and, arguably, creative reasons, **43** then, no transition was more successful than **44** those from the Golden to Silver Age.

41

- A) NO CHANGE
- B) would have yielded
- C) were yielding
- D) will yield

42

- A) NO CHANGE
- B) Comic's superhero's
- C) Comics superhero's
- D) Comics' superhero

43

- A) NO CHANGE
- B) however,
- C) nevertheless,
- D) yet,

44

- A) NO CHANGE
- B) these
- C) that
- D) DELETE the underlined portion.

**STOP**

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



# Math Test – No Calculator

**25 MINUTES, 20 QUESTIONS**

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

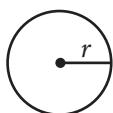
## DIRECTIONS

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

## NOTES

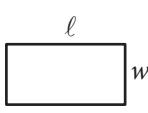
1. The use of a calculator is not permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

## REFERENCE

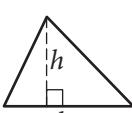


$$A = \pi r^2$$

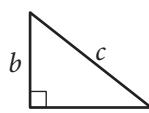
$$C = 2\pi r$$



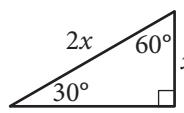
$$A = \ell w$$



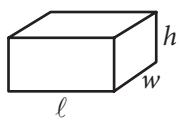
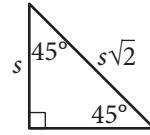
$$A = \frac{1}{2} bh$$



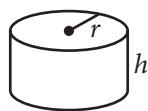
$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = \ell wh$$



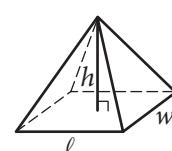
$$V = \pi r^2 h$$



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



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



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

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

The number of radians of arc in a circle is  $2\pi$ .

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

**3****3****1**

Salim wants to purchase tickets from a vendor to watch a tennis match. The vendor charges a one-time service fee for processing the purchase of the tickets. The equation  $T = 15n + 12$  represents the total amount  $T$ , in dollars, Salim will pay for  $n$  tickets. What does 12 represent in the equation?

- A) The price of one ticket, in dollars
- B) The amount of the service fee, in dollars
- C) The total amount, in dollars, Salim will pay for one ticket
- D) The total amount, in dollars, Salim will pay for any number of tickets

**2**

A gardener buys two kinds of fertilizer. Fertilizer A contains 60% filler materials by weight and Fertilizer B contains 40% filler materials by weight. Together, the fertilizers bought by the gardener contain a total of 240 pounds of filler materials. Which equation models this relationship, where  $x$  is the number of pounds of Fertilizer A and  $y$  is the number of pounds of Fertilizer B?

- A)  $0.4x + 0.6y = 240$
- B)  $0.6x + 0.4y = 240$
- C)  $40x + 60y = 240$
- D)  $60x + 40y = 240$

**3**

What is the sum of the complex numbers  $2 + 3i$  and  $4 + 8i$ , where  $i = \sqrt{-1}$  ?

- A) 17
- B)  $17i$
- C)  $6 + 11i$
- D)  $8 + 24i$

**4**

$$4x^2 - 9 = (px + t)(px - t)$$

In the equation above,  $p$  and  $t$  are constants. Which of the following could be the value of  $p$  ?

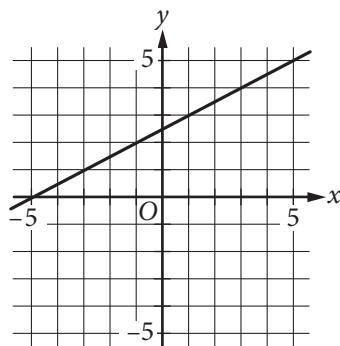
- A) 2
- B) 3
- C) 4
- D) 9



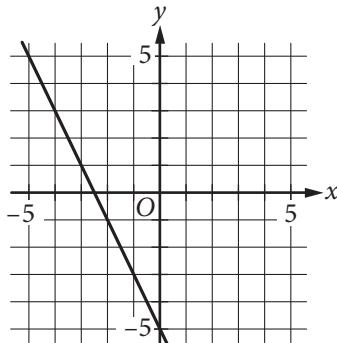
5

Which of the following is the graph of the equation  $y = 2x - 5$  in the  $xy$ -plane?

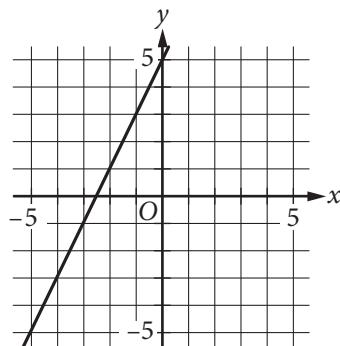
A)



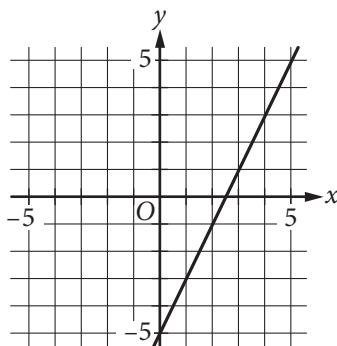
B)



C)



D)





6

If  $x = \frac{2}{3}y$  and  $y = 18$ , what is the value of  $2x - 3$ ?

- A) 21
- B) 15
- C) 12
- D) 10

7

A bricklayer uses the formula  $n = 7\ell h$  to estimate the number of bricks,  $n$ , needed to build a wall that is  $\ell$  feet long and  $h$  feet high. Which of the following correctly expresses  $\ell$  in terms of  $n$  and  $h$ ?

- A)  $\ell = \frac{7}{nh}$
- B)  $\ell = \frac{h}{7n}$
- C)  $\ell = \frac{n}{7h}$
- D)  $\ell = \frac{n}{7+h}$

8

$x$	$w(x)$	$t(x)$
1	-1	-3
2	3	-1
3	4	1
4	3	3
5	-1	5

The table above shows some values of the functions  $w$  and  $t$ . For which value of  $x$  is  $w(x) + t(x) = x$ ?

- A) 1
- B) 2
- C) 3
- D) 4

9

If  $\sqrt{x} + \sqrt{9} = \sqrt{64}$ , what is the value of  $x$ ?

- A)  $\sqrt{5}$
- B) 5
- C) 25
- D) 55

## 3



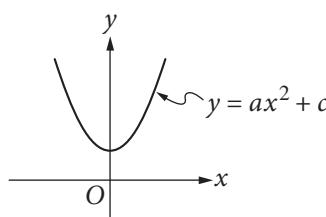
## 3

10

Jaime is preparing for a bicycle race. His goal is to bicycle an average of at least 280 miles per week for 4 weeks. He bicycled 240 miles the first week, 310 miles the second week, and 320 miles the third week. Which inequality can be used to represent the number of miles,  $x$ , Jaime could bicycle on the 4th week to meet his goal?

- A)  $\frac{240 + 310 + 320}{3} + x \geq 280$
- B)  $240 + 310 + 320 \geq x(280)$
- C)  $\frac{240}{4} + \frac{310}{4} + \frac{320}{4} + x \geq 280$
- D)  $240 + 310 + 320 + x \geq 4(280)$

11



The vertex of the parabola in the  $xy$ -plane above is  $(0, c)$ . Which of the following is true about the parabola with the equation  $y = -a(x - b)^2 + c$ ?

- A) The vertex is  $(b, c)$  and the graph opens upward.
- B) The vertex is  $(b, c)$  and the graph opens downward.
- C) The vertex is  $(-b, c)$  and the graph opens upward.
- D) The vertex is  $(-b, c)$  and the graph opens downward.

12

Which of the following is equivalent to  $\frac{4x^2 + 6x}{4x + 2}$ ?

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

13

$$2x^2 - 4x = t$$

In the equation above,  $t$  is a constant. If the equation has no real solutions, which of the following could be the value of  $t$ ?

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



14

A laundry service is buying detergent and fabric softener from its supplier. The supplier will deliver no more than 300 pounds in a shipment. Each container of detergent weighs 7.35 pounds, and each container of fabric softener weighs 6.2 pounds. The service wants to buy at least twice as many containers of detergent as containers of fabric softener. Let  $d$  represent the number of containers of detergent, and let  $s$  represent the number of containers of fabric softener, where  $d$  and  $s$  are nonnegative integers. Which of the following systems of inequalities best represents this situation?

- A)  $7.35d + 6.2s \leq 300$   
 $d \geq 2s$
- B)  $7.35d + 6.2s \leq 300$   
 $2d \geq s$
- C)  $14.7d + 6.2s \leq 300$   
 $d \geq 2s$
- D)  $14.7d + 6.2s \leq 300$   
 $2d \geq s$

15

Which of the following is equivalent to  $\left(a + \frac{b}{2}\right)^2$ ?

- A)  $a^2 + \frac{b^2}{2}$
- B)  $a^2 + \frac{b^2}{4}$
- C)  $a^2 + \frac{ab}{2} + \frac{b^2}{2}$
- D)  $a^2 + ab + \frac{b^2}{4}$

**DIRECTIONS**

**For questions 16–20,** 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  $\frac{7}{2}$ . (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.

Answer: $\frac{7}{12}$	Answer: 2.5																																																																																																																																												
<p>Write → answer in boxes.</p> <p>Grid in result.</p> <table border="1" style="margin-left: 20px;"> <tr><td>7</td><td>/</td><td>1</td><td>2</td></tr> <tr><td>0</td><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>8</td><td>9</td><td>0</td><td>1</td></tr> <tr><td>2</td><td>3</td><td>4</td><td>5</td></tr> <tr><td>6</td><td>7</td><td>8</td><td>9</td></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>9</td><td>0</td><td>1</td><td>2</td></tr> <tr><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td><td>0</td></tr> <tr><td>2</td><td>1</td><td>0</td><td>9</td></tr> <tr><td>6</td><td>5</td><td>4</td><td>3</td></tr> <tr><td>8</td><td>7</td><td>6</td><td>5</td></tr> <tr><td>0</td><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>9</td><td>8</td><td>7</td><td>6</td></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>9</td><td>0</td><td>1</td><td>2</td></tr> </table>	7	/	1	2	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	2	1	0	9	6	5	4	3	8	7	6	5	0	1	2	3	4	5	6	7	9	8	7	6	1	2	3	4	5	6	7	8	9	0	1	2	<p>← Fraction line</p> <p>← Decimal point</p> <table border="1" style="margin-left: 20px;"> <tr><td>2</td><td>.</td><td>5</td></tr> <tr><td>0</td><td>1</td><td>2</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>8</td><td>9</td><td>0</td></tr> <tr><td>2</td><td>3</td><td>4</td></tr> <tr><td>6</td><td>7</td><td>8</td></tr> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>9</td><td>8</td><td>7</td></tr> <tr><td>3</td><td>4</td><td>5</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td>0</td><td>1</td><td>2</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>8</td><td>9</td><td>0</td></tr> <tr><td>2</td><td>1</td><td>0</td></tr> <tr><td>6</td><td>5</td><td>4</td></tr> <tr><td>9</td><td>8</td><td>7</td></tr> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>9</td><td>8</td><td>7</td></tr> </table>	2	.	5	0	1	2	4	5	6	8	9	0	2	3	4	6	7	8	1	2	3	5	6	7	9	8	7	3	4	5	7	8	9	0	1	2	4	5	6	8	9	0	2	1	0	6	5	4	9	8	7	1	2	3	5	6	7	9	8	7
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Answer: 201—either position is correct

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



16

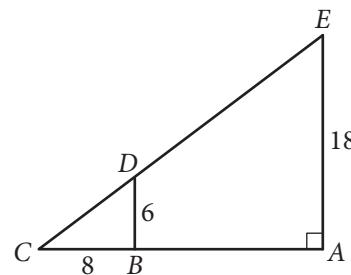
If  $a^{\frac{b}{4}} = 16$  for positive integers  $a$  and  $b$ , what is one possible value of  $b$ ?

17

$$\frac{2}{3}t = \frac{5}{2}$$

What value of  $t$  is the solution of the equation above?

18



In the figure above,  $\overline{BD}$  is parallel to  $\overline{AE}$ . What is the length of  $\overline{CE}$ ?

**3****3****19**

How many liters of a 25% saline solution must be added to 3 liters of a 10% saline solution to obtain a 15% saline solution?

**20**

Points  $A$  and  $B$  lie on a circle with radius 1, and arc  $\widehat{AB}$  has length  $\frac{\pi}{3}$ . What fraction of the circumference of the circle is the length of arc  $\widehat{AB}$ ?

**STOP**

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



# Math Test – Calculator

**55 MINUTES, 38 QUESTIONS**

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

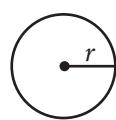
## DIRECTIONS

For questions 1–30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 31–38, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

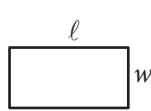
## NOTES

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

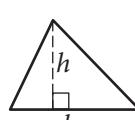
## REFERENCE



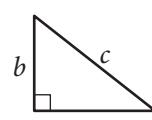
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



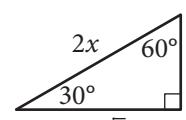
$$A = lw$$



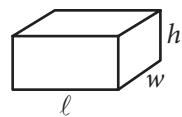
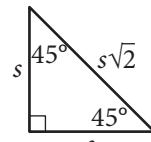
$$A = \frac{1}{2}bh$$



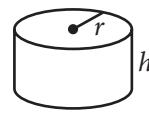
$$c^2 = a^2 + b^2$$



Special Right Triangles



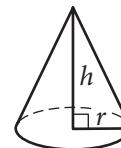
$$V = lwh$$



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



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



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



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

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

The number of radians of arc in a circle is  $2\pi$ .

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

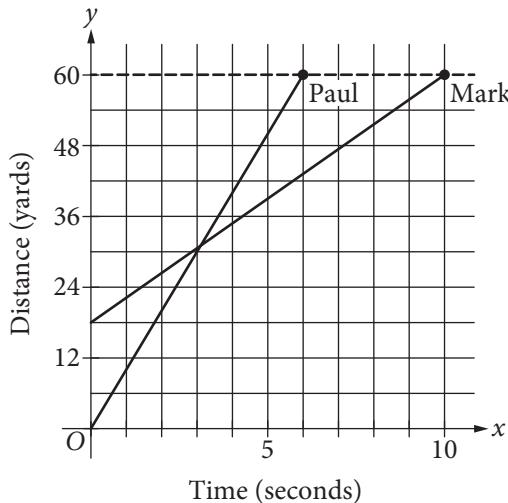


1

Which expression is equivalent to  
 $(2x^2 - 4) - (-3x^2 + 2x - 7)$ ?

- A)  $5x^2 - 2x + 3$
- B)  $5x^2 + 2x - 3$
- C)  $-x^2 - 2x - 11$
- D)  $-x^2 + 2x - 11$

2



The graph above shows the positions of Paul and Mark during a race. Paul and Mark each ran at a constant rate, and Mark was given a head start to shorten the distance he needed to run. Paul finished the race in 6 seconds, and Mark finished the race in 10 seconds. According to the graph, Mark was given a head start of how many yards?

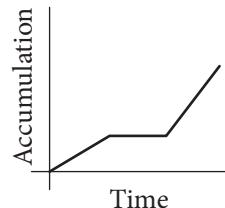
- A) 3
- B) 12
- C) 18
- D) 24



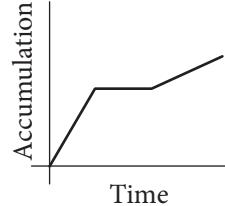
3

Snow fell and then stopped for a time. When the snow began to fall again, it fell at a faster rate than it had initially. Assuming that none of the snow melted during the time indicated, which of the following graphs could model the total accumulation of snow versus time?

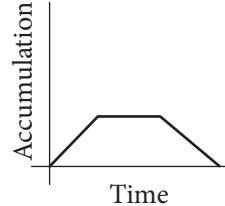
A)



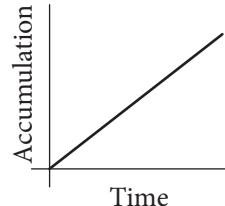
B)



C)



D)



4

A website-hosting service charges businesses a onetime setup fee of \$350 plus  $d$  dollars for each month. If a business owner paid \$1,010 for the first 12 months, including the setup fee, what is the value of  $d$ ?

- A) 25
- B) 35
- C) 45
- D) 55

5

$$6x - 9y > 12$$

Which of the following inequalities is equivalent to the inequality above?

- A)  $x - y > 2$
- B)  $2x - 3y > 4$
- C)  $3x - 2y > 4$
- D)  $3y - 2x > 2$



6

Where Do People Get Most of Their Medical Information?

Source	Percent of those surveyed
Doctor	63%
Internet	13%
Magazines/brochures	9%
Pharmacy	6%
Television	2%
Other/none of the above	7%

The table above shows a summary of 1,200 responses to a survey question. Based on the table, how many of those surveyed get most of their medical information from either a doctor or the Internet?

- A) 865
- B) 887
- C) 912
- D) 926

7

The members of a city council wanted to assess the opinions of all city residents about converting an open field into a dog park. The council surveyed a sample of 500 city residents who own dogs. The survey showed that the majority of those sampled were in favor of the dog park. Which of the following is true about the city council's survey?

- A) It shows that the majority of city residents are in favor of the dog park.
- B) The survey sample should have included more residents who are dog owners.
- C) The survey sample should have consisted entirely of residents who do not own dogs.
- D) The survey sample is biased because it is not representative of all city residents.



8

## Ice Cream and Topping Selections

		Flavor	
		Vanilla	Chocolate
Topping	Hot fudge	8	6
	Caramel	5	6

The table above shows the flavors of ice cream and the toppings chosen by the people at a party. Each person chose one flavor of ice cream and one topping. Of the people who chose vanilla ice cream, what fraction chose hot fudge as a topping?

- A)  $\frac{8}{25}$
- B)  $\frac{5}{13}$
- C)  $\frac{13}{25}$
- D)  $\frac{8}{13}$

9

The total area of a coastal city is 92.1 square miles, of which 11.3 square miles is water. If the city had a population of 621,000 people in the year 2010, which of the following is closest to the population density, in people per square mile of land area, of the city at that time?

- A) 6,740
- B) 7,690
- C) 55,000
- D) 76,000



10

Between 1497 and 1500, Amerigo Vespucci embarked on two voyages to the New World. According to Vespucci's letters, the first voyage lasted 43 days longer than the second voyage, and the two voyages combined lasted a total of 1,003 days. How many days did the second voyage last?

- A) 460
- B) 480
- C) 520
- D) 540

11

$$\begin{aligned}7x + 3y &= 8 \\6x - 3y &= 5\end{aligned}$$

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

- A)  $-\frac{4}{3}$
- B)  $\frac{2}{3}$
- C)  $\frac{4}{3}$
- D)  $\frac{22}{3}$

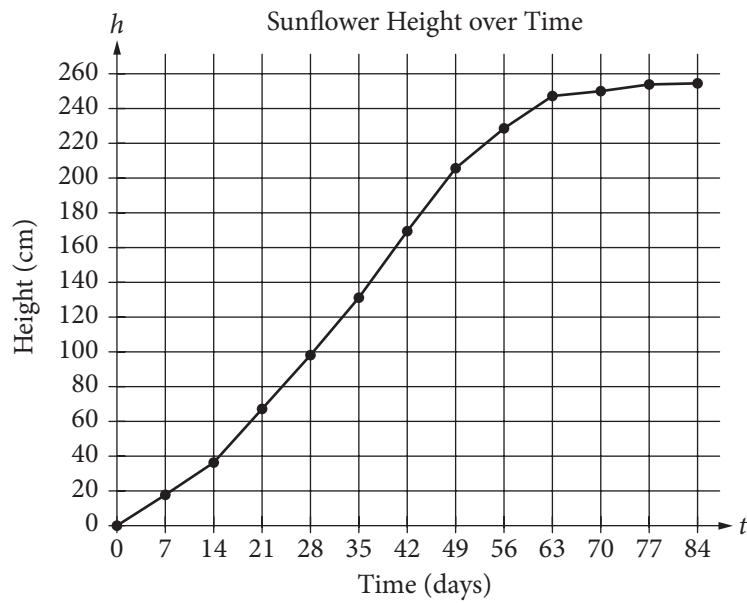


Questions 12–14 refer to the following information.

Sunflower Growth

Day	Height (cm)
0	0.00
7	17.93
14	36.36
21	67.76
28	98.10
35	131.00
42	169.50
49	205.50
56	228.30
63	247.10
70	250.50
77	253.80
84	254.50

Sunflower Height over Time



In 1919, H. S. Reed and R. H. Holland published a paper on the growth of sunflowers. Included in the paper were the table and graph above, which show the height  $h$ , in centimeters, of a sunflower  $t$  days after the sunflower begins to grow.

12

Over which of the following time periods is the average growth rate of the sunflower least?

- A) Day 0 to Day 21
- B) Day 21 to Day 42
- C) Day 42 to Day 63
- D) Day 63 to Day 84

13

The function  $h$ , defined by  $h(t) = at + b$ , where  $a$  and  $b$  are constants, models the height, in centimeters, of the sunflower after  $t$  days of growth during a time period in which the growth is approximately linear. What does  $a$  represent?

- A) The predicted number of centimeters the sunflower grows each day during the period
- B) The predicted height, in centimeters, of the sunflower at the beginning of the period
- C) The predicted height, in centimeters, of the sunflower at the end of the period
- D) The predicted total increase in the height of the sunflower, in centimeters, during the period



14

The growth rate of the sunflower from day 14 to day 35 is nearly constant. On this interval, which of the following equations best models the height  $h$ , in centimeters, of the sunflower  $t$  days after it begins to grow?

- A)  $h = 2.1t - 15$
- B)  $h = 4.5t - 27$
- C)  $h = 6.8t - 12$
- D)  $h = 13.2t - 18$

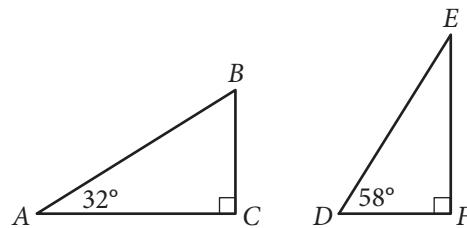
15

$x$	1	2	3	4	5
$y$	$\frac{11}{4}$	$\frac{25}{4}$	$\frac{39}{4}$	$\frac{53}{4}$	$\frac{67}{4}$

Which of the following equations relates  $y$  to  $x$  for the values in the table above?

- A)  $y = \frac{1}{2} \cdot \left(\frac{5}{2}\right)^x$
- B)  $y = 2 \cdot \left(\frac{3}{4}\right)^x$
- C)  $y = \frac{3}{4}x + 2$
- D)  $y = \frac{7}{2}x - \frac{3}{4}$

16

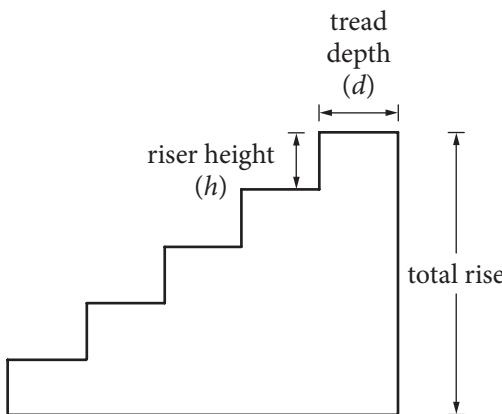


Triangles  $ABC$  and  $DEF$  are shown above. Which of the following is equal to the ratio  $\frac{BC}{AB}$ ?

- A)  $\frac{DE}{DF}$
- B)  $\frac{DF}{DE}$
- C)  $\frac{DF}{EF}$
- D)  $\frac{EF}{DE}$



**Questions 17–19 refer to the following information.**



Note: Figure not drawn to scale.

When designing a stairway, an architect can use the riser-tread formula  $2h + d = 25$ , where  $h$  is the riser height, in inches, and  $d$  is the tread depth, in inches. For any given stairway, the riser heights are the same and the tread depths are the same for all steps in that stairway.

The number of steps in a stairway is the number of its risers. For example, there are 5 steps in the stairway in the figure above. The total rise of a stairway is the sum of the riser heights as shown in the figure.

17

Which of the following expresses the riser height in terms of the tread depth?

A)  $h = \frac{1}{2}(25 + d)$

B)  $h = \frac{1}{2}(25 - d)$

C)  $h = -\frac{1}{2}(25 + d)$

D)  $h = -\frac{1}{2}(25 - d)$

18

Some building codes require that, for indoor stairways, the tread depth must be at least 9 inches and the riser height must be at least 5 inches. According to the riser-tread formula, which of the following inequalities represents the set of all possible values for the riser height that meets this code requirement?

A)  $0 \leq h \leq 5$

B)  $h \geq 5$

C)  $5 \leq h \leq 8$

D)  $8 \leq h \leq 16$

19

An architect wants to use the riser-tread formula to design a stairway with a total rise of 9 feet, a riser height between 7 and 8 inches, and an odd number of steps. With the architect's constraints, which of the following must be the tread depth, in inches, of the stairway? (1 foot = 12 inches)

A) 7.2

B) 9.5

C) 10.6

D) 15



20

What is the sum of the solutions to  $(x - 6)(x + 0.7) = 0$ ?

- A) -6.7
- B) -5.3
- C) 5.3
- D) 6.7

21

A study was done on the weights of different types of fish in a pond. A random sample of fish were caught and marked in order to ensure that none were weighed more than once. The sample contained 150 largemouth bass, of which 30% weighed more than 2 pounds. Which of the following conclusions is best supported by the sample data?

- A) The majority of all fish in the pond weigh less than 2 pounds.
- B) The average weight of all fish in the pond is approximately 2 pounds.
- C) Approximately 30% of all fish in the pond weigh more than 2 pounds.
- D) Approximately 30% of all largemouth bass in the pond weigh more than 2 pounds.

22

Number of States with 10 or More Electoral Votes in 2008

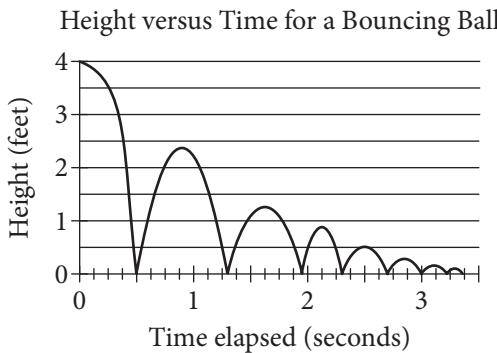
Electoral votes	Frequency
10	4
11	4
12	1
13	1
15	3
17	1
20	1
21	2
27	1
31	1
34	1
55	1

In 2008, there were 21 states with 10 or more electoral votes, as shown in the table above. Based on the table, what was the median number of electoral votes for the 21 states?

- A) 13
- B) 15
- C) 17
- D) 20



23



As part of an experiment, a ball was dropped and allowed to bounce repeatedly off the ground until it came to rest. The graph above represents the relationship between the time elapsed after the ball was dropped and the height of the ball above the ground. After it was dropped, how many times was the ball at a height of 2 feet?

- A) One
- B) Two
- C) Three
- D) Four

24

A customer's monthly water bill was \$75.74. Due to a rate increase, her monthly bill is now \$79.86. To the nearest tenth of a percent, by what percent did the amount of the customer's water bill increase?

- A) 4.1%
- B) 5.1%
- C) 5.2%
- D) 5.4%

25

$x$	$f(x)$
0	-2
2	4
6	16

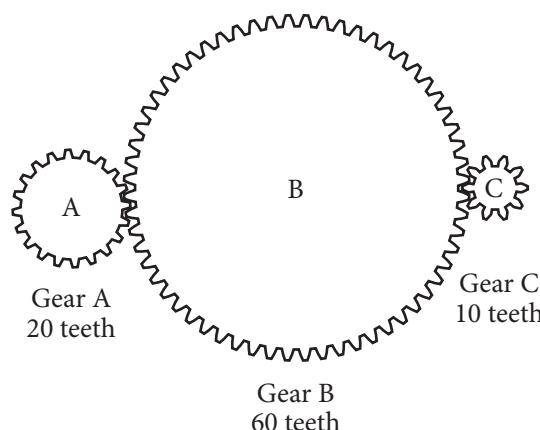
Some values of the linear function  $f$  are shown in the table above. What is the value of  $f(3)$ ?

- A) 6
- B) 7
- C) 8
- D) 9



26

A gear ratio  $r:s$  is the ratio of the number of teeth of two connected gears. The ratio of the number of revolutions per minute (rpm) of two gear wheels is  $s:r$ . In the diagram below, Gear A is turned by a motor. The turning of Gear A causes Gears B and C to turn as well.



If Gear A is rotated by the motor at a rate of 100 rpm, what is the number of revolutions per minute for Gear C?

- A) 50
- B) 110
- C) 200
- D) 1,000

27

In the  $xy$ -plane, the graph of  $2x^2 - 6x + 2y^2 + 2y = 45$  is a circle. What is the radius of the circle?

- A) 5
- B) 6.5
- C)  $\sqrt{40}$
- D)  $\sqrt{50}$

28

Two different points on a number line are both 3 units from the point with coordinate  $-4$ . The solution to which of the following equations gives the coordinates of both points?

- A)  $|x + 4| = 3$
- B)  $|x - 4| = 3$
- C)  $|x + 3| = 4$
- D)  $|x - 3| = 4$



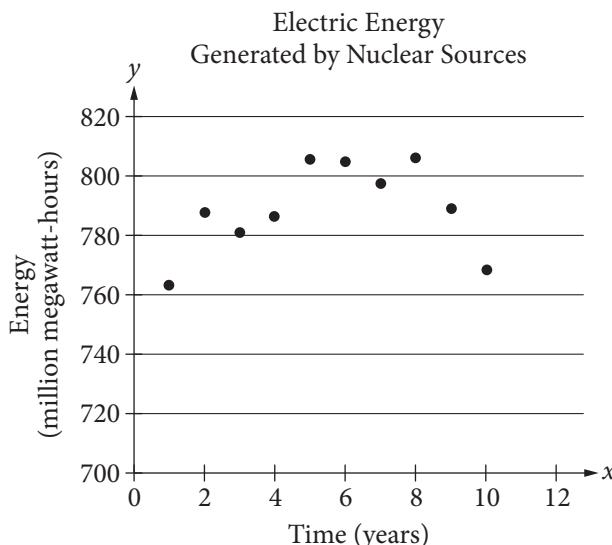
29

A motor powers a model car so that after starting from rest, the car travels  $s$  inches in  $t$  seconds, where  $s = 16t\sqrt{t}$ . Which of the following gives the average speed of the car, in inches per second, over the first  $t$  seconds after it starts?

- A)  $4\sqrt{t}$
- B)  $16\sqrt{t}$
- C)  $\frac{16}{\sqrt{t}}$
- D)  $16t$

30

The scatterplot below shows the amount of electric energy generated, in millions of megawatt-hours, by nuclear sources over a 10-year period.



Of the following equations, which best models the data in the scatterplot?

- A)  $y = 1.674x^2 + 19.76x - 745.73$
- B)  $y = -1.674x^2 - 19.76x - 745.73$
- C)  $y = 1.674x^2 + 19.76x + 745.73$
- D)  $y = -1.674x^2 + 19.76x + 745.73$

**DIRECTIONS**

**For questions 31–38,** 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.

Write answer →  
in boxes.

Grid in result.

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

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

Fraction line

Answer: 2.5

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

Decimal point

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

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

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

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

Answer: 201—either position is correct

2	0	1
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4

2	0	1
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4

2	0	1
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4

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



31

A group of friends decided to divide the \$800 cost of a trip equally among themselves. When two of the friends decided not to go on the trip, those remaining still divided the \$800 cost equally, but each friend's share of the cost increased by \$20. How many friends were in the group originally?

32

$$2(5x - 20) - (15 + 8x) = 7$$

What value of  $x$  satisfies the equation above?



33

A laboratory supply company produces graduated cylinders, each with an internal radius of 2 inches and an internal height between 7.75 inches and 8 inches. What is one possible volume, rounded to the nearest cubic inch, of a graduated cylinder produced by this company?

34

In the  $xy$ -plane, the graph of  $y = 3x^2 - 14x$  intersects the graph of  $y = x$  at the points  $(0, 0)$  and  $(a, a)$ . What is the value of  $a$ ?



35

The line with the equation  $\frac{4}{5}x + \frac{1}{3}y = 1$  is graphed in the  $xy$ -plane. What is the  $x$ -coordinate of the  $x$ -intercept of the line?

36

	Masses (kilograms)					
Andrew	2.4	2.5	3.6	3.1	2.5	2.7
Maria	$x$	3.1	2.7	2.9	3.3	2.8

Andrew and Maria each collected six rocks, and the masses of the rocks are shown in the table above. The mean of the masses of the rocks Maria collected is 0.1 kilogram greater than the mean of the masses of the rocks Andrew collected. What is the value of  $x$ ?

37

Jeremy deposited  $x$  dollars in his investment account on January 1, 2001. The amount of money in the account doubled each year until Jeremy had 480 dollars in his investment account on January 1, 2005. What is the value of  $x$ ?

38

A school district is forming a committee to discuss plans for the construction of a new high school. Of those invited to join the committee, 15% are parents of students, 45% are teachers from the current high school, 25% are school and district administrators, and the remaining 6 individuals are students. How many more teachers were invited to join the committee than school and district administrators?

# STOP

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

## Answer Explanations

# SAT Practice Test #6

## Section 1: Reading Test

### QUESTION 1

**Choice C is the best answer.** In the first paragraph the reader is introduced to Nawab, a father of twelve daughters who feels compelled to make more money to care for his family: “he must proliferate his sources of revenue” (lines 6-7). The remainder of the paragraph focuses on the way Nawab attempts to “proliferate” those income sources by identifying some of the moneymaking schemes Nawab undertakes, including setting up a flour mill and a fish farm and attempting to fix both radios and watches.

Choice A is incorrect because even if the first paragraph does indicate that Nawab is willing to work hard to take care of his family, it does not specifically address how he interacts with his daughters emotionally. Choice B is incorrect because the first paragraph describes some of Nawab’s activities but not the specifics of his schedule. Choice D is incorrect because the first paragraph introduces Harouni as Nawab’s employer but does not describe his lifestyle.

### QUESTION 2

**Choice B is the best answer.** The passage states that Nawab earned “more kicks than kudos” (line 16) for his failed attempts at fixing watches. In the context of not doing a job well, this means Nawab was not given compliments (“kudos”) for his efforts but complaints (“kicks”) about them.

Choices A and D are incorrect because the passage clearly states that Nawab was not successful fixing watches, which earned him a negative response (“kicks,” or complaints). In this context it would be illogical to suggest that Nawab’s unsuccessful efforts at fixing watches would result in the sort of positive response implied by choice A (“thrills”) or choice D (“interests”). Choice C is incorrect because even though “jolts” might be unpleasant, they’re not the kind of negative response one would get instead of compliments.

### QUESTION 3

**Choice D is the best answer.** The passage states that Nawab works “like an engineer tending the boilers on a foundering steamer in an Atlantic gale” (lines 26-28) in his attempts to keep his employer comfortable. The author likely uses this image because it highlights the challenging nature of Nawab’s work—work that is described in the next sentence as requiring “superhuman efforts” (line 28).

Choices A, B, and C are incorrect because the author's use of the image of an engineer working hard on a "foundering steamer" describes the effort Nawab is making in keeping his employer comfortable, not what Nawab might be dreaming about, anything to do with tube wells (which are not mentioned in the second paragraph), or that Nawab has had many different jobs in his life.

## QUESTION 4

**Choice A is the best answer** because lines 28-32 show that Nawab is an efficient employee, stating that due to his "superhuman efforts," Nawab is able to keep his employer comfortable, or in almost "the same mechanical cocoon . . . that the landowner enjoyed in Lahore."

Choice B is incorrect because lines 40-42 describe the actions of Nawab's employer only and do not address the employer's feelings about Nawab's work. Choice C is incorrect because lines 46-49 show Nawab characterizing himself as an old and ineffective employee, not one who performs his job well. Choice D is incorrect because line 58 addresses the fact Nawab had always lived in his employer's household but not his effectiveness as an employee.

## QUESTION 5

**Choice C is the best answer.** The main purpose of Nawab's comments in lines 43-52 is to highlight the labor and service he has provided for Harouni over the years. Nawab says "there is but one man, me, your servant" to take care of the tube wells on all Harouni's vast lands and that the extensive work has resulted in Nawab earning gray hairs on his employer's behalf.

Choice A is incorrect because even though lines 43-52 initially highlight the vastness of Harouni's lands, those lines primarily focus on Nawab's dedication and service to Harouni. Choice B is incorrect because lines 43-52 emphasize not that Nawab is competent and reliable but that Nawab feels he is no longer able to adequately fulfill his duties. Choice D is incorrect because in lines 43-52, Nawab doesn't say he intends to quit his job, asking instead only for help doing it.

## QUESTION 6

**Choice D is the best answer.** In lines 61-62, Nawab says to his employer that he "cannot any longer bicycle about like a bridegroom from farm to farm." In this context, Nawab uses the word "bridegroom" to imply he is no longer a young man who can easily travel such great distances on his bike.

Choices A, B, and C are incorrect because in the context of Nawab not being able to bike so far, he uses the word "bridegroom" to imply that he is no longer young, not that he is no longer in love (choice A), naive (choice B), or busy (choice C).

## QUESTION 7

**Choice B is the best answer.** Harouni's reaction to Nawab's request for a new motorcycle can be found in lines 66-68, where the employer is said not to "particularly care one way or the other, except that it touched on his comfort—a matter of great interest to him." For Harouni, in other words, the issue of Nawab getting a new motorcycle came down to what was best for Harouni, not what was best for Nawab.

Choice A is incorrect because in the passage Harouni is said not to be particularly impressed with how hard Nawab works; he cares about the issue of the motorcycle only in regard to its effect on his own comfort. Choice C is incorrect because Harouni is said to find Nawab's speech not eloquent but "florid" (line 54), meaning flamboyant or ostentatious. Choice D is incorrect because Nawab does not threaten to quit his job but politely asks his employer to "let me go" (line 64).

## QUESTION 8

**Choice B is the best answer.** The previous question asks why Harouni purchases his employee Nawab a new motorcycle, with the correct answer (that Harouni did so because it was in his own best interest) supported in lines 66-68: "He didn't particularly care one way or the other, except that it touched on his comfort—a matter of great interest to him."

Choices A, C, and D are incorrect because the lines cited do not support the answer to the previous question about why Harouni buys Nawab a new motorcycle. Instead, they simply identify the issue (choice A), note that Harouni also gave Nawab money for gas (choice C), and show how the motorcycle affects Nawab's side businesses (choice D).

## QUESTION 9

**Choice A is the best answer.** The passage states that Nawab's new motorcycle leads to the "disgust of the farm managers" (line 74).

Choices B, C, and D are incorrect because the passage specifically says Nawab's new motorcycle leads to the "disgust of the farm managers," not their happiness (choice B), envy (choice C), or indifference (choice D).

## QUESTION 10

**Choice D is the best answer.** The passage specifically states what Nawab considers the greatest part of his getting a new motorcycle: "Best of all, now he could spend every night with his wife" (lines 81-82).

Choices A, B, and C are incorrect because the passage explicitly states that Nawab believes the best thing about his new motorcycle is that he can "spend every night with his wife," not that people start calling him "Uncle" (choice A), that he is able to expand his business (choice B), or that he is able to educate his daughters (choice C).

## QUESTION 11

**Choice B is the best answer.** The passage states that historically, “newspapers such as *The Times* and broadcasters such as the BBC were widely regarded as the trusted shapers of authoritative agendas and conventional wisdom” (lines 27-30). But it goes on to say that “there is a growing feeling . . . that the news media should be ‘informative rather than authoritative’” (lines 70-73). Together these lines indicate the main purpose of the passage, which is to discuss how people’s perception of the news media is changing from its being an authoritative voice to simply an informative one.

Choice A is incorrect because the passage deals with changes in the way news is perceived but does not primarily focus on the technological changes that may have resulted in those or other changes. Choice C is incorrect because even if the passage implies that viewers might increasingly believe a journalist’s values can affect the news stories being produced, it does not provide specific examples of that happening. Choice D is incorrect because the passage begins with the simple sentence “The news is a form of public knowledge” (line 1) and makes no attempt to refute that claim.

## QUESTION 12

**Choice D is the best answer.** Although the passage initially states that traditional news authorities were once implicitly “trusted” (line 29) regarding the content they produced, it goes on to note that “as part of the general process of the transformation of authority . . . the demand has been for all authority to make explicit the frames of value which determine their decisions” (lines 33-38). The modern audience, in other words, wants to hear not only the stories a news organization produces but also the values that form the foundation of that organization’s beliefs.

Choices A, B, and C are incorrect because lines 33-38 make clear that the expectation traditional authorities now face is the need to “make explicit the frames of value which determine their decisions,” not that they shouldn’t be affected by commercial interests (choice A), that they should work for the common good (choice B), or that they should consider the context of public versus private knowledge (choice C).

## QUESTION 13

**Choice C is the best answer.** The previous question asks what expectation traditional authorities now face, with the answer being that they must make their perspectives or beliefs clear to the audience. This is supported in lines 33-38: “As part of the general process of the transformation of authority . . . the demand has been for all authority to make explicit the frames of value which determine their decisions.”

Choices A, B, and D are incorrect because the lines cited do not support the answer to the previous question about what expectation traditional authorities now face, instead contrasting private and public knowledge (choice A), explaining the complexity of news dissemination (choice B), and providing one way news has changed in modern times (choice D).

## QUESTION 14

**Choice C is the best answer.** In lines 23-25, the passage states that “there is not always common agreement about what the public needs to know.” In this context, a “common” agreement is a widespread one shared by many people.

Choices A, B, and D are incorrect because in the context of something shared by many people, the word “common” implies that it is widespread, not that it is plentiful or abundant (choice A), recognizable to others (choice B), or normal (choice D).

## QUESTION 15

**Choice B is the best answer.** Two quotes are provided in lines 43-53, one highlighting the way editors work differently in modern times due to the demands of the audience and one offering an opinion about the perceived negative effects of that new reality of news. Those extended quotations were added by the authors most likely because they provide concrete examples of how some journalists feel about modern news dissemination.

Choice A is incorrect because the two quotations provided in lines 43-53 are not contradictory: the first offers a description of how news editors work differently in modern times, and the second describes how certain changes might affect news stories or the audience. Choices C and D are incorrect because the two quotations illustrate how some feel about the way the dissemination of news might be changing and are not used to either criticize or make suggestions.

## QUESTION 16

**Choice A is the best answer.** The passage explains that although the major news organizations were once considered “trusted shapers” (line 29) of public knowledge, that perception is changing due to the “growing feeling . . . that the news media should be ‘informative rather than authoritative’; the job of journalists should be to ‘give the news as raw as it is, without putting their slant on it’; and people should be given ‘sufficient information’ from which ‘we would be able to form opinions of our own’” (lines 70-77). In other words, the audience now wants raw facts about the world, not facts constructed in support of a certain opinion.

Choice B is incorrect because the passage presents the public as wanting information without any slant on it, not as wanting only a limited amount of information. Choices C and D are incorrect because the passage does not specifically identify the public’s feelings about including quotations from authorities in news stories or how they would want journalists to handle private details that the subjects of news stories do not want revealed.

## QUESTION 17

**Choice D is the best answer.** The previous question asks what the public is beginning to believe should be avoided in news stories, with the answer being the personal opinions or feelings of journalists. This is supported in lines 70-77: “There is a growing feeling . . . that the news media should be ‘informative rather than authoritative’; the job of journalists should be to ‘give the news as raw as it is, without

putting their slant on it'; and people should be given 'sufficient information' from which 'we would be able to form opinions of our own.'"

Choices A, B, and C are incorrect because the lines cited do not support the answer that the modern public wants journalists to avoid personal judgments when telling news stories, instead contrasting personal or private knowledge with public knowledge (choice A), characterizing how trusted broadcasters were once viewed (choice B), and explaining how some professional journalists feel about the new reality of the news (choice C).

## QUESTION 18

**Choice A is the best answer.** In lines 73-75, the passage states the modern belief that "the job of journalists should be to 'give the news as raw as it is, without putting their slant on it.'" In this context, the word "raw" means unfiltered or in its most basic state.

Choices B, C, and D are incorrect because in the context of news without any "slant on it," the word "raw" implies something unfiltered, not something unprotected or uncovered (choice B), severe (choice C), or untried or unproven (choice D).

## QUESTION 19

**Choice A is the best answer.** The table shows that in 1985, 55% of respondents believed news organizations "get the facts straight," which was the highest percentage for that choice for any of the years provided.

Choices B, C, and D are incorrect because the table shows that the percentage of respondents who believed news organizations "get the facts straight" was smaller in 1992 (49%), 2003 (36%), and 2011 (25%) than in 1985 (55%).

## QUESTION 20

**Choice C is the best answer.** The table shows that from 2003 to 2007, the percentage of people who believed news organizations "get the facts straight" rose only minimally, from 36 to 39%, while their perception of the independence and fairness of those organizations changed not at all, remaining at 23% and 26%, respectively.

Choice A is incorrect because the table indicates viewers' perceptions of the accuracy of news organizations but does not identify how many inaccurate news stories there were in any of the years listed. Choice B is incorrect because the number of people who believe news organizations "tend to favor one side" did not double between 1992 and 2003, rising only from 63% to 66%. Choice D is incorrect because the table shows that between 2007 and 2011, people's perception of the accuracy of news organizations decreased rather than increased, dropping from 39% to 25%.

## QUESTION 21

**Choice C is the best answer.** The 2011 data in the table indicate that only 25% of respondents believed news organizations were accurate, 15% believed they were independent, and 16% believed they were fair. Combined, these data support the idea put forth in lines 69-70 that modern audiences are becoming skeptical of the authority of experts.

Choices A, B, and D are incorrect because the 2011 data in the table show the public's lack of faith in the accuracy, independence, and fairness of news organizations but do not indicate how politically involved that public was (choice A), demonstrate the claims of experts (choice B), or reveal the importance of viewer mouse clicks in modern news (choice D).

## QUESTION 22

**Choice B is the best answer.** The first paragraph of the passage identifies and describes "Texas gourd vines" (line 1), but the primary focus of the passage is introduced in the first sentence of the second paragraph: "In one recent study, Nina Theis and Lynn Adler took on the specific problem of the Texas gourd—how to attract enough pollinators but not too many beetles" (lines 17-20). The remainder of the passage focuses on describing the purpose, process, and results of the recent research done on those Texas gourd vines.

Choice A is incorrect because the passage doesn't focus on the assumptions behind a theory but rather on the way in which that theory was tested. Choice C is incorrect because the passage does not present much conflicting data; most of it supports the idea there can be too much fragrance for the Texas gourd vine. Choice D is incorrect because the passage explains the procedures used in a study were "very labor intensive" (line 58) but does not present them as particularly innovative.

## QUESTION 23

**Choice A is the best answer.** The passage says that to test their hypothesis, the scientists "planted 168 Texas gourd vines in an Iowa field" (lines 33-34) and then ultimately walked "from flower to flower, observing each for two-minute intervals" (lines 62-63). Because they gathered data by looking at and studying the plants in question, the scientists' research is best characterized as relying on direct observation.

Choices B, C, and D are incorrect because lines 62-63 make clear that the research emphasized direct observation, not historical data (choice B), expert testimony (choice C), or random sampling (choice D).

## QUESTION 24

**Choice D is the best answer.** The passage states that by using the smell of their nectar to lure pollinators like bees, Texas gourd vines are employing an "open communication network" that attracts "not just the good guys, but . . . also . . . the bad guys" (lines 7-10). Because cucumber beetles are then identified as some of "the very bad guys" (line 12) as far as the Texas gourd plant is concerned, it can be inferred that both the beetles and the bees are attracted to the same scent.

Choices A and C are incorrect because they are not supported by the text; the passage states that cucumber beetles “chew up pollen and petals” (lines 12-13) from the Texas gourd vines but not that those vines are their “primary” food source, and the passage does not address any effects, positive or negative, that cucumber beetles experience as a result of carrying bacterial wilt disease. Choice B is incorrect because the passage states that treating the Texas gourd vines with dimethoxybenzene led to “double the normal number of beetles” (lines 65-66) but that pollinators like bees “did not prefer” (line 67) the treated flowers, which implies that cucumber beetles are not less attracted but more attracted to dimethoxybenzene than honey bees are.

### QUESTION 25

**Choice C is the best answer.** The author indicates that it is reasonable to think that the Texas gourd plants might lure more pollinators if their smell was stronger. This is clear from lines 26-27, which state that “intuition suggests that more of that aroma should be even more appealing to bees.”

Choices A and D are incorrect because lines 26-27 support the idea that it was initially thought that Texas gourd vines could lure more pollinators through “more of that aroma,” not by lacking an aroma (choice A) or giving off a more varied aroma (choice D). Choice B is incorrect because bees are the only pollinators specifically discussed in the passage, and there is no suggestion that targeting other insects would attract more bees.

### QUESTION 26

**Choice A is the best answer.** The passage explains that as part of their research the scientists “made half the plants more fragrant by tucking dimethoxybenzene-treated swabs deep inside their flowers. Each treated flower emitted about 45 times more fragrance than a normal one” (lines 35-39). In this context, a flower that was “treated” would be one that was changed or altered.

Choices B, C, and D are incorrect because in the context of a flower having a compound like dimethoxybenzene added to it, the word “treated” means changed or altered, not returned to normal (choice B), given (choice C), or kept for future use (choice D).

### QUESTION 27

**Choice D is the best answer.** In the passage Theis surmises that honey bees were likely repelled not by the enhanced fragrance of the dimethoxybenzene-treated flowers but “by the abundance of beetles” (lines 71-72) found on them. She was able to make that assumption because the honey bees were able to choose between both normal flowers and fragrance-enhanced flowers without any beetles on them, because one of the parameters of the research was that “every half hour throughout the experiments, the team plucked all the beetles off of half the fragrance-enhanced flowers and half the control flowers, allowing bees to respond to the blossoms with and without interference by beetles” (lines 45-50).

Choice A is incorrect because the passage states only that the scientists observed the bees and beetles on the flowers as soon as they opened (lines 59-61), not both before and after they opened. Choice B is

incorrect because although the passage does state that the experiment only took place during the “August flowering season” (line 35), it doesn’t state that this was a variable in the experiment or had any effect on it. Choice C is incorrect because comparing gourds based on the type of pollination is not related to the issue of what repelled bees from the fragrance-enhanced plants.

## QUESTION 28

**Choice A is the best answer.** The previous question asks what Theis and Adler did to allow Theis to theorize that the bees were repelled not by the enhanced fragrance of certain flowers but by the excessive number of beetles on them, with the answer (they give the bees the chance to visit both normal and fragrance-enhanced flowers that did not have beetles on them) being supported in lines 45-50: “So every half hour throughout the experiments, the team plucked all the beetles off of half the fragrance-enhanced flowers and half the control flowers, allowing bees to respond to the blossoms with and without interference by beetles.”

Choices B, C, and D are incorrect because the lines cited do not support the answer to the previous question about what allowed Theis and Adler to theorize that the bees were repelled not by fragrance but by insects, instead highlighting a variable that didn’t directly address the effect of fragrance on bees (choice B), describing the timing of one of the steps undertaken in the experiment (choice C), and discussing an aspect of gourd growth that was not related to the question of why bees may or may not have wanted to visit fragrance-enhanced flowers (choice D).

## QUESTION 29

**Choice A is the best answer.** The first six paragraphs (lines 1-64) of the passage introduce a plant (the Texas gourd vine) and its problem (luring enough insects to pollinate it but not too many of those that will harm it) and then describe a study undertaken to deal with “the specific problem of the Texas gourd—how to attract enough pollinators but not too many beetles” (lines 18-20). After the specifics of that experiment are described in detail, the results are explained and summarized in the seventh and eighth paragraphs (lines 65-84): “What they saw was double the normal number of beetles. . . . Squash bees were indifferent, and honey bees visited enhanced flowers less often. . . . That added up to less reproduction for fragrance-enhanced flowers” (lines 65-76).

Choice B is incorrect because Theis and Adler’s hypothesis (that more fragrance would make the flowers “even more appealing to bees,” line 27) is found in the third paragraph (lines 26-40). Choice C is incorrect because Theis and Adler’s methods are described in the third through sixth paragraphs (lines 26-64), not the seventh and eighth (lines 65-84). Choice D is incorrect because the seventh and eighth paragraphs detail the results in an experiment but do not focus on the researchers’ reasoning.

## QUESTION 30

**Choice B is the best answer.** To be “indifferent” is to be apathetic, or without care or concern. In the context of an experiment that tested whether or not insects preferred normally scented flowers or ones

with enhanced fragrance, describing the squash bees as “indifferent” implies they did not care about the scents and were equally drawn to both types of flowers.

Choice A is incorrect because “indifference” suggests the amount of concern one has about something but not anything to do with physical capabilities (such as being able to distinguish between the flowers). Choice C is incorrect because “indifference” suggests that one has no preference. Choice D is incorrect because the squash bees are said to be “indifferent” to certain flowers based on their fragrance, not on the number of beetles that may or may not be on them.

### QUESTION 31

**Choice B is the best answer.** Theis and Adler’s research clearly provided an answer to the question of why there is an upper limit on the intensity of the aroma emitted by Texas gourd plants, as their experiment was described as being able to “provide a reason that Texas gourd plants never evolved to produce a stronger scent” (lines 85-86).

Choice A is incorrect because Theis and Adler’s research was not able to show how to increase pollinator visits to the Texas gourd vine, as the results of their experiment showed that “pollinators, to their surprise, did not prefer the highly scented flowers” (lines 67-68). Choice C is incorrect because Theis and Adler’s research was not able to explain how hand pollination rescued fruit weight, a finding the passage describes as “a hard-to-interpret result” (line 83). Choice D is incorrect because the passage never indicates that the flowers stop producing fragrance when beetles are present.

### QUESTION 32

**Choice D is the best answer.** The previous question asks what question from among the answer choices Theis and Adler’s research was able to answer regarding Texas gourd vines. The answer (they determined why there was an upper limit to the amount of fragrance produced) is supported in lines 85-86: “The new results provide a reason that Texas gourd plants never evolved to produce a stronger scent.”

Choices A, B, and C are incorrect because the lines cited do not support the answer to the previous question about what Theis and Adler’s research revealed about Texas gourd vines, instead explaining the goal of the experiment undertaken (choice A), identifying some of the fragrance compounds found in the plant’s aroma (choice B), and describing results related to hand pollination rather than fragrance (choice C).

### QUESTION 33

**Choice B is the best answer.** In Passage 1, Lincoln asserts that citizens of the United States should never break the laws of their land, for any reason, because to do so undermines the nation’s values. This is clearly demonstrated when he says, “let every man remember that to violate the law, is to trample on the blood of his father, and to tear the character of his own, and his children’s liberty” (lines 9-12).

Choice A is incorrect because Lincoln says that bad laws “should be repealed as soon as possible” (line 30), not that breaking the law would slow their repeals. Choice C is incorrect because Lincoln says that “there is no grievance that is a fit object of redress by mob law” (lines 36-37) but doesn’t argue that breaking the law will lead to mob rule. Choice D is incorrect because in his speech Lincoln doesn’t discuss divisions between social groups.

### QUESTION 34

**Choice A is the best answer.** The previous question asks what Lincoln believes is the result of breaking the laws, with the answer being that such actions undermine a nation’s values. This is supported in lines 9-12: “let every man remember that to violate the law, is to trample on the blood of his father, and to tear the character of his own, and his children’s liberty.”

Choices B, C, and D are incorrect because the lines cited do not support the answer to the previous question regarding what Lincoln contends happens when citizens break the law, instead explaining exactly which groups Lincoln believes should vow to follow the laws (choice B), illustrating how Lincoln believes unjust laws should be dealt with (choice C), and stating Lincoln’s belief that no law is ever improved through mob rule (choice D).

### QUESTION 35

**Choice D is the best answer.** In lines 24-25, Lincoln says, “I so pressingly urge a strict observance of all the laws.” In this context, the word “urge” most nearly means advocate, because when Lincoln urges people to obey the laws, he is pleading in favor of them doing so.

Choices A and C are incorrect because in the context of lines 24-25 (“I so pressingly urge a strict observance of all the laws”), to urge that laws be followed is to advocate for them to be obeyed, not to speed up such adherence (choice A) or make such adherence necessary (choice C). Choice B is incorrect because Lincoln is asking people to follow the laws but not directly causing people to obey them.

### QUESTION 36

**Choice D is the best answer.** After advocating for citizens “never to violate in the least particular, the laws of the country” (lines 3-4), Lincoln begins the second paragraph by making another point: “When I so pressingly urge a strict observance of all the laws, let me not be understood as saying there are no bad laws, nor that grievances may not arise, for the redress of which, no legal provisions have been made” (lines 24-28). This sentence is an attempt on Lincoln’s part to make clear what could be a misunderstanding of his position (“let me not be understood”) and to correct that possible misunderstanding. Lincoln doesn’t want people to believe he is saying all laws are always good, but rather that those laws need to be followed as long as they are on the books.

Choices A and B are incorrect because the sentence in lines 24-28 does not raise and refute a possible counterargument to Lincoln's argument or identify a shortcoming of his argument, but rather it is an attempt on Lincoln's part to make sure he is not misunderstood. Choice C is incorrect because that sentence does not acknowledge and provide support for a central assumption of Lincoln's argument but looks at a different aspect of the issue.

### QUESTION 37

**Choice A is the best answer.** In the passage Lincoln states his belief that any laws that "continue in force, for the sake of example, they should be religiously observed" (lines 31-32). In this context, "observed" most nearly means followed, as Lincoln is urging citizens to heed or follow the country's laws.

Choices B, C, and D are incorrect because in the context of Lincoln advocating that laws be religiously "observed," he means those laws should be followed, not that they should be studied closely (choice B), considered at length (choice C), or merely recognized (choice D).

### QUESTION 38

**Choice D is the best answer.** Passage 2 begins with Thoreau's statement that "unjust laws exist" (line 45). His philosophy regarding how to deal with those unjust laws is evident in lines 58-59: "If the injustice is part of the necessary friction of the machine of government, let it go, let it go." Thoreau believes, in other words, that some injustices are an unfortunate part of normal governance and just need to be endured ("let it go, let it go").

Choice A is incorrect because Thoreau does not say some unjust aspects of government can be fixed easily or that they are merely superficial. Choice B is incorrect because Thoreau does not argue that such injustices are subtle and should be studied, but rather that in certain cases it is best to "let it go, let it go" (line 59), while in other cases one should act or "break the law" (line 66). Choice C is incorrect because Thoreau does not say that any such unjust aspects of government are beneficial or helpful.

### QUESTION 39

**Choice C is the best answer.** The previous question asks what Thoreau feels about some unjust aspects of government, with the answer being that he finds them inevitable and something that needs to be endured. This is supported in lines 58-59: "If the injustice is part of the necessary friction of the machine of government, let it go, let it go."

Choices A, B, and D are incorrect because the lines cited do not support the answer to the previous question about Thoreau's thoughts regarding certain injustices in government, instead asking a theoretical question about how one should respond to unjust laws (choice A), providing an observation about how some view acting out against unjust laws (choice B), and acknowledging that in some questions of conscience, one may or may not choose to act (choice D).

## QUESTION 40

**Choice C is the best answer.** In Passage 1, Lincoln makes clear his belief that individuals should always heed the laws: “Let every American . . . swear . . . never to violate in the least particular, the laws of the country” (lines 1-4). Even bad laws, he states, “while they continue in force, for the sake of example, they should be religiously observed” (lines 30-32). In Passage 2, Thoreau is less rigid in his beliefs regarding the need for individuals to heed the laws of the country, arguing at times that some laws should be broken: “but if it is of such a nature that it requires you to be the agent of injustice to another, then, I say, break the law” (lines 64-66). While Lincoln and Thoreau can therefore be said to disagree about the moral imperative to follow existing laws, both passages advance an opinion regarding the need to follow or not follow all of the country’s laws.

Choice A is incorrect because the passages are not making arguments about differences between legal duties and moral imperatives but rather are addressing the need to follow (or not) the laws of a land. Choice B is incorrect. Both passages address the question of changing existing laws in the United States, but that is only a minor part of what is a greater debate about the need to follow or not follow existing laws. Choice D is incorrect because neither passage addresses the standards for determining whether or not laws are just, only whether laws should be heeded or not.

## QUESTION 41

**Choice B is the best answer.** In Passage 2, Thoreau says that if a law “is of such a nature that it requires you to be the agent of injustice to another, then, I say, break the law” (lines 64-66). It is clear from Passage 1 that Lincoln would reject this stance, as he says individuals should never break the law (“Let every American . . . swear . . . never to violate in the least particular, the laws of the country,” lines 1-4) and should wait for a bad law to be repealed (“bad laws, if they exist, should be repealed . . . still while they continue . . . they should be religiously observed,” lines 29-32).

Choices A and C are incorrect because in Passage 1, Lincoln is absolutely clear that all laws “should be religiously observed” (line 32); he does not describe anyone’s suggestion to break the law as either excusable (choice A) or honorable (choice C). Choice D is incorrect because it is not supported by the passage, as Lincoln does not discuss the core principles of the Constitution in Passage 1.

## QUESTION 42

**Choice D is the best answer.** In Passage 1, Lincoln uses abolitionism solely as an example to illustrate the argument he is making about heeding the law: “In any case that arises, as for instance, the promulgation of abolitionism, one of two positions is necessarily true” (lines 37-39). In Passage 2, Thoreau does the same thing by noting that “those who call themselves Abolitionists should at once effectually withdraw their support . . . from the government” (lines 79-82). Although Lincoln and Thoreau use the cause of abolitionism to argue different points, a commonality they share is that neither embraces the cause personally in the passage; Lincoln simply uses it as an example (“as for instance”) while Thoreau specifically talks of *other people* “who call themselves Abolitionists.”

Choice A is incorrect because in Passage 1, Lincoln argues against drastic action, saying that even in the case of abolitionism, such a response is not “necessary, justifiable, or excusable” (line 44). Choice B is incorrect because it’s not accurate to say abolitionism was central to the arguments, only that each used that subject as an example. Choice C is incorrect because neither Lincoln nor Thoreau offers an opinion about whether or not abolitionism will gain widespread acceptance, instead they incorporate it only as an example in their discussions of just and unjust laws.

### QUESTION 43

**Choice C is the best answer.** In lines 10-17, the passage illustrates how the cost of solar energy has dropped in recent years: “A few years ago, silicon solar panels cost \$4 per watt. . . . ‘Now it’s down to something like 50 cents a watt, and there’s talk of hitting 36 cents per watt.’” In lines 44-47, the passage describes some of the new technology that exists in the field: “Meanwhile, researchers at the National Renewable Energy Laboratory have made flexible solar cells on a new type of glass from Corning called Willow Glass, which is thin and can be rolled up.” Overall, the passage can be regarded as an objective overview of the solar panel industry delivered by a journalist covering the field.

Choices A and D are incorrect because the author does not present himself as either a consumer who plans to buy solar panels or a hobbyist with a personal interest in solar panel technology. Rather, the author focuses on developments in solar technology. Choice B is incorrect because the passage does not discuss research methods used in the solar panel field but rather the technologies that exist in the field.

### QUESTION 44

**Choice A is the best answer.** In the context of describing the solar panel manufacturing industry as being “in the doldrums because supply far exceeds demand” (lines 2-3), saying it is currently a “poor” market implies it is a weak, or slow, market.

Choices B, C, and D are incorrect because in the context of describing the solar panel manufacturing industry as being “in the doldrums,” saying it is a poor market implies it is a weak market, not a modest one (choice B), a pathetic one (choice C), or an outdated one (choice D).

### QUESTION 45

**Choice C is the best answer.** It can reasonably be inferred that much of the solar panel industry believes current solar technology is too expensive and inefficient because the passage states that the industry has been working to improve those two things: “All parts of the silicon solar panel industry have been looking for ways to cut costs and improve the power output of solar panels, and that’s led to steady cost reductions” (lines 27-30).

Choice A is incorrect because the passage explains how solar panels work but never states or implies that consumers do not understand the technology. Choice B is incorrect because while the passage explains how two-sided solar cells can increase solar electric output, it does not suggest that they have

any existing or possible weaknesses. Choice D is incorrect because the passage characterizes Willow Glass as entirely promising and doesn't imply that it is not efficient enough to be marketed.

## QUESTION 46

**Choice D is the best answer.** The previous question asks what can be inferred from the passage about beliefs in the solar panel industry, with the answer being that many in the industry believe current solar technology is too expensive and too inefficient. This is supported in lines 27-30: "All parts of the silicon solar panel industry have been looking for ways to cut costs and improve the power output of solar panels, and that's led to steady cost reductions."

Choices A, B, and C are incorrect because the lines cited do not support the answer to the previous question, which is that much of the solar panel industry believes current solar technology is too expensive and inefficient. Choice A highlights the industry's current limited sales. Choice B addresses the high cost of solar panels but not their inefficiency. Choice C addresses a potential decrease in the cost of solar panels and does not mention efficiency.

## QUESTION 47

**Choice B is the best answer.** The passage clearly states how two-sided solar panels will increase the efficiency of solar electricity units, explaining that they will be able to absorb excess reflected light, especially if those panels are built on sand: "That light reflects onto the back of the panels and could be harvested to increase the power output" (lines 61-62).

Choices A, C, and D are incorrect because the passage explains only that two-sided solar panels can raise efficiency by harvesting reflected light, not that they can raise efficiency because they take little energy to operate (choice A), are cost-effective (choice C), or keep sunlight from reaching the ground (choice D).

## QUESTION 48

**Choice B is the best answer.** The previous question asks how two-sided solar panels can raise the efficiency of solar electricity units, with the answer being they can increase solar power input by catching excess reflected light. This is supported in lines 61-62: "That light reflects onto the back of the panels and could be harvested to increase the power output."

Choices A, C, and D are incorrect because the lines cited do not support the answer to the previous question about how two-sided solar panels can raise the efficiency of solar electricity units, instead highlighting that some sunlight is missed by current units (choice A), explaining why two-sided solar panels work well in sand (choice C), and projecting how much more effective those two-sided solar panels could be (choice D).

## QUESTION 49

**Choice D is the best answer.** In lines 69-71, the passage states that “even longer-term, Green is betting on silicon, aiming to take advantage of the huge reductions in cost already seen with the technology.” In this context, the phrase “betting on” most nearly means “optimistic about,” as the sentence implies that Green has positive expectations for silicon use now and in the future.

Choice A is incorrect because “dabbling in” a subject implies being only minimally involved with it, but in lines 69-71, Green is shown to be committed to silicon use. Choice B is incorrect because in this context the phrase “betting on” is figurative and implies believing in something, not actually being involved with games of chance. Choice C is incorrect because Green is said to want to “take advantage” of silicon use, meaning he does not intend to switch from it.

## QUESTION 50

**Choice B is the best answer.** The passage concludes by stating that “the challenge is to produce good connections between these semiconductors, something made challenging by the arrangement of silicon atoms in crystalline silicon” (lines 81-84). As this last sentence identifies an issue the solar panel industry still faces, and describes it as a “challenging” one at that, it mainly serves to identify a problem or hurdle that must be dealt with by the industry.

Choices A, C, and D are incorrect because the main point of the passage’s last sentence is that there is a “challenge” or hurdle that the solar panel industry has to deal with; it doesn’t express concerns about what a material won’t be able to do (choice A), make predictions (choice C), or introduce a new idea for study (choice D).

## QUESTION 51

**Choice D is the best answer.** Figure 2 shows that in 2009, the US average electricity cost per megawatt-hour (MWh) was \$120. Of the projected 2017 energy costs for fuels listed in figure 1, the one closest to the 2009 US average electricity cost 120 dollars per megawatt-hour is the projected cost of advanced nuclear energy, estimated at just below 125 dollars per megawatt-hour.

Choices A, B, and C are incorrect because figure 1 shows the projected energy costs of natural gas, wind (onshore), and conventional coal as just below 75 dollars per megawatt-hour, 100 dollars per megawatt-hour, and approximately 105 dollars per megawatt-hour, respectively. None of these costs is as close to the 2009 US average electricity cost of 120 dollars per megawatt-hour as the projected 2017 cost of advanced nuclear energy, which is just below 125 dollars per megawatt-hour.

## QUESTION 52

**Choice B is the best answer.** Figure 2 shows that the dropping cost of solar photovoltaic power per megawatt-hour is projected to intersect with the 2009 US average electricity cost of 120 dollars per megawatt-hour in the year 2020.

Choice A is incorrect because figure 2 projects that the solar photovoltaic cost per megawatt-hour in 2018 will be approximately \$140, which is more than the 2009 US average electricity cost of 120 dollars per megawatt-hour. Choices C and D are incorrect because figure 2 projects that the solar photovoltaic cost per megawatt-hour will be around \$90 in 2025 and \$70 in 2027, both of which are less than the 2009 US average electricity cost of 120 dollars per megawatt-hour.

## Section 2: Writing Test

### QUESTION 1

**Choice D is the best answer** because a comma is needed to separate the main independent clause (“In the winter . . . Lake 227”) from the dependent clause that describes the lake. The pronoun “one” is used correctly to refer to its antecedent “Lake 227.”

Choice A is incorrect because it creates a comma splice (two independent clauses joined by only a comma). Choices B and C are incorrect because in both choices the information that follows the period is not in the form of a complete sentence.

### QUESTION 2

**Choice A is the best answer** because the comma is used correctly to separate the introductory dependent clause (“While . . . irresponsible”) from the independent clause that follows it.

Choices B, C, and D are incorrect because the comma in each is misplaced. Choices B and D lack a comma where one is needed after the dependent clause (“While . . . irresponsible”). In choice C, while a comma is provided after “irresponsible,” there is an unnecessary comma after “and.”

### QUESTION 3

**Choice D is the best answer** because it most clearly and concisely combines the sentences using the correct punctuation. This choice eliminates unnecessary words, and the commas are placed correctly between the clauses.

Choice A is incorrect because the phrase “the result being that it” is wordy and could be replaced with the single word “which.” Choice B is incorrect because the words “algal blooms cause oxygen depletion” need not be repeated. Choice C is incorrect because there is unnecessary repetition of the words “oxygen depletion” and “algal blooms.”

### QUESTION 4

**Choice B is the best answer** because the colon is used properly to introduce an independent clause (“it was . . . Erie”) that explains or elaborates on the information that came before in the sentence.

Choice A is incorrect because the colon is misplaced. It should be placed after the word “green,” not after “with.” Choice C is incorrect because the dash is not placed correctly. If it were placed after the word “green,” it could be used. Choice D is incorrect because the comma creates a comma splice. A comma cannot be used without a conjunction to join two independent clauses.

## QUESTION 5

**Choice C is the best answer** because it contains the best transition between the two paragraphs. The previous paragraphs describe an experiment that Schindler and Brunskill conducted in Lake 227. This paragraph is about an experiment they performed in Lake 226. Only choice C provides a transition that introduces the new experiment performed in Lake 226.

Choice A is incorrect because it contains no specific reference to the previous paragraph and is too general to be tied to this paragraph. Choices B and D are incorrect because they contain unnecessary details that do not connect the ideas in the paragraphs.

## QUESTION 6

**Choice B is the best answer** because it is concise. It does not repeat the idea of addition.

Choices A, C, and D are incorrect because they are repetitive. The conjunction “and” is sufficient after “they added just nitrates” to indicate that “a source of carbon” was also added. Choice A needlessly contains “was added.” In choice C “plus also” and in choice D “also adding” are similarly repetitive.

## QUESTION 7

**Choice A is the best answer** because the singular past tense verb “was teeming” agrees in number with the singular subject “half” and is consistent with the other past tense verbs in the paragraph.

Choices B and C are incorrect because they contain plural verbs instead of the singular one that is needed to agree with the singular subject “half.” Choice D is incorrect because it contains a present tense verb that is inconsistent with the past tense verbs in the paragraph.

## QUESTION 8

**Choice C is the best answer** because the verb “published” most effectively indicates the relationship between research findings and a journal, *Science*. Scientific research is published in scientific journals.

Choices A, B, and D are incorrect because they don’t feature the specific vocabulary required, and the tone of the answer choices is too informal for the content of the passage.

### QUESTION 9

**Choice D is the best answer** because “subsequently” logically indicates that after the research demonstrated a clear correlation between the growth of blue-green algae and the introduction of phosphates into the water, Canadian legislators passed laws banning phosphates in laundry detergent.

Choices A, B, and C are incorrect because the transitional phrase “for example” and the conjunctive adverbs “similarly” and “however” do not indicate a logical relationship between what the research demonstrated and what the Canadian legislators did with that knowledge.

### QUESTION 10

**Choice B is the best answer** because it deals with a “policy outcome” related to the research. The adoption of legislation to reduce or eliminate phosphates in detergents is a policy outcome (a change in official policy concerning detergents) that was clearly informed by Schindler and Brunskill’s research.

Choices A, C, and D are incorrect because they do not mention legislation or policies that were adopted as a result of Schindler and Brunskill’s research on the effects of phosphates in laundry detergents.

### QUESTION 11

**Choice C is the best answer** because it offers a counterargument to the previous sentence’s claim in favor of “experiments like these.” Acknowledging that “scientists should not be allowed to randomly perform experiments on just any body of water” shows that the writer is aware of the potential problems with these experiments.

Choices A, B, and D are incorrect because none of them offers a counterargument. They all make factual statements.

### QUESTION 12

**Choice D is the best answer** because it correctly provides the plural noun “stages” and the singular possessive pronoun “its” (no apostrophe).

Choices A and C are incorrect because a possessive pronoun is needed to replace the proper noun “Tower of Pisa,” not the contraction “it’s.” Choices B and C are incorrect because there is no reason to make “stage” possessive; nothing belongs to it.

### QUESTION 13

**Choice A is the best answer** because the conjunctive adverb “indeed” appropriately points back to and elaborates on the fact provided in the previous sentence (that the Tower has been leaning from the very beginning).

Choices B, C, and D are incorrect because they do not accurately present the relationship between the first and second sentences. Choice B, “therefore,” indicates that what follows is a consequence of what came before. Choice C, “nevertheless,” and choice D, “however,” suggest that what follows contrasts with what was stated previously.

### QUESTION 14

**Choice B is the best answer** because the participle “attracting” introduces a dependent clause (“attracting . . . world”) that appropriately modifies the noun “icon.”

Choice A is incorrect because it creates a comma splice. A comma cannot be used without a conjunction to separate two independent clauses. Choice C is incorrect because the possessive pronoun “its” makes no sense in the context of the sentence. Choice D is incorrect because a semicolon is used to join two independent clauses, not an independent and a dependent clause.

### QUESTION 15

**Choice C is the best answer** because it would be appropriate to characterize a famous and unusual building like the Tower of Pisa as “one of the greatest architectural oddities in the world.”

Choices A, B, and D are incorrect. The words “weirdnesses,” “deviations,” and “abnormalities” would all result in inappropriate characterizations. The Tower is a beloved icon and tourist magnet; as such, it is more fitting to describe it as an architectural oddity than as an architectural weirdness, architectural deviation, or architectural abnormality.

### QUESTION 16

**Choice B is the best answer** because it confirms that the sentence should be added and provides the appropriate reason: it establishes a key shift in the passage between the introduction of the tower and the discussion of recent attempts to save it.

Choice A is incorrect because the suggested sentence does not repeat a previous idea. Choices C and D are incorrect because the sentence should be added. The suggested sentence does not contain irrelevant information that interrupts the flow of the paragraph, nor does it repeat information.

### QUESTION 17

**Choice A is the best answer** because the comma is used correctly after the prepositional phrase “in 1990” to introduce the independent clause “Italy’s government closed the tower. . . .”

Choices B and C are incorrect because each places a comma between the subject “government” and the verb “closed.” Choice D is incorrect because a comma can be used, but not a colon, after an introductory prepositional phrase.

### QUESTION 18

**Choice C is the best answer** because it supports the main point of the paragraph. The paragraph suggests that the committee’s goal was to maintain the tower’s “aesthetic” by reducing (but not eliminating) the tilt without ruining the tower’s appearance or causing it to fall.

Choices A, B, and D are incorrect because none of the choices supports the main point of the paragraph—the need to both keep the tower from falling and maintain its charming appearance. Choice A repeats an idea from earlier in the passage. Choices B and D provide information that is only loosely related to the paragraph’s discussion of efforts to save the tower.

### QUESTION 19

**Choice D is the best answer** because deleting “he is” eliminates the comma splice that exists in the original sentence. Two independent clauses cannot be joined by only a comma.

Choice A is incorrect because two independent clauses cannot be joined by only a comma. Choice B is incorrect because it creates a comma splice and also needlessly repeats Burland’s name. Choice C is incorrect because “his being” is unnecessary and unidiomatic in this context.

### QUESTION 20

**Choice D is the best answer** because the earlier phrase “a years-long process” is sufficient to indicate that Burland’s work spanned several years.

Choices A, B, and C are incorrect because they all repeat information provided in the earlier phrase “a years-long process.”

## QUESTION 21

**Choice A is the best answer** because the verb “advocated” and the participle “using” are appropriate in this context: “advocated” functions as the main verb and “using” introduces the clause that tells what Burland advocated.

Choices B and C are incorrect because they are unidiomatic. Choice D doesn’t provide a main verb necessary to create an independent clause before the semicolon.

## QUESTION 22

**Choice A is the best answer** because sentence 5 introduces Burland’s plan for using gravity to straighten the tower—a plan that is presented in detail in the subsequent sentences 2, 3, and 4.

Choices B and C are incorrect because if sentence 5 were to be placed after either sentence 2 or sentence 3, the sequencing and logic of the paragraph would be impaired. Choice D is incorrect because if sentence 5 were to be deleted, a key aspect of the plan—its use of gravity to straighten the tower—would never be mentioned. The reader would then have to infer what Burland was doing by “drilling out small amounts of soil from under the tower.”

## QUESTION 23

**Choice B is the best answer** because the main point of the paragraph is that the supply of physicians in the United States is not expected to keep up with the demand or need for them in the future. Choice B introduces the idea that it may become increasingly difficult for Americans to find a physician.

Choice A is not correct because it discusses “paramedics,” health care workers who are not mentioned elsewhere in the paragraph. Choice C is incorrect because it does not introduce the doctor shortage problem that is the main topic of the paragraph. Choice D is incorrect because the paragraph is not focused on the costs of health care.

## QUESTION 24

**Choice A is the best answer** because “keep pace” is an appropriate idiomatic expression that clearly indicates the writer’s concern that the supply of doctors won’t be able to match the growing demand for them.

Choices B, C, and D are incorrect because they are unidiomatic in the context of the sentence. The sentence discusses the mismatch between the “increased demand for care” and the limited “supply of physicians.” The writer is concerned with the extent to which supply can grow to meet the growth in demand—or, in other words, “keep pace” with increased demand. The phrases “maintain the tempo,” “get in line,” and “move along” are inappropriate to convey this idea.

## QUESTION 25

**Choice B is the best answer** because “bolstering” means supporting, which is appropriate in the context of “medical-college enrollments.” It makes sense in a discussion of a doctor shortage to mention the idea of providing support for enrollments—that is, maintaining and perhaps increasing the numbers of students enrolled in medical colleges.

Choices A and D are incorrect because they are excessively casual and unclear in context: it is not clear what it would mean for “medical-college enrollments” (the numbers of students enrolled in medical colleges) to be amped or revved up. Choice C is incorrect because it would be inappropriate to describe enrollments as being aroused.

## QUESTION 26

**Choice B is the best answer** because it provides an appropriate reason for adding the sentence. In context, the sentence sets up the “several factors” that follow in the paragraph: the services that a PA can provide, the monetary advantages associated with employing a PA, and the short training period required for becoming a PA.

Choice A is incorrect because the sentence does not introduce a counterargument; rather, it supports the claim made in the previous sentence. Choices C and D are incorrect because the sentence should be added.

## QUESTION 27

**Choice C is the best answer** because the plural possessive pronoun “their” correctly refers to its plural antecedent “PAs.”

Choice A is incorrect because the word “there” does not show possession and does not make sense in the context of the sentence. Choice B is incorrect because the contraction “they’re” does not show possession and does not make sense in the context of the sentence. Choice D is incorrect because the singular pronoun phrase “his or her” does not agree in number with the plural antecedent “PAs.”

## QUESTION 28

**Choice D is the best answer** because the comma is used correctly to separate the items in the list of jobs that PAs can perform.

Choice A is incorrect because a colon should not be used to separate items in a list. Choice B is incorrect because, while semicolons may be used to separate items in a list, they must be used consistently (that is, after “conditions” as well as after “surgeries”). Choice C is incorrect because a comma should not be used after the conjunction “and” in a list of items.

### QUESTION 29

**Choice B is the best answer** because the parentheses are used correctly to enclose information that is interesting but not essential to the sentence. If the parenthetical information were to be deleted, the sentence would still make sense.

Choice A is incorrect because a comma or other punctuation is necessary to separate “well compensated” from the nonessential clause “earning in 2012 a median annual salary of \$90,930.” Choice C is incorrect because a comma is necessary after “\$90,930” to set off the clause from the rest of the sentence. Choice D is incorrect because a colon is typically preceded by an independent clause and because a nonessential clause should be set off from the sentence by matching punctuation, such as two commas or parentheses.

### QUESTION 30

**Choice C is the best answer** because “that for” agrees with the singular antecedent “period” and compares two similar things: the training period for PAs and that (the training period) for physicians.

Choice A is incorrect because the plural pronoun “those” doesn’t agree with the singular antecedent “period.” Choice B is incorrect because “compared with” repeats the idea of comparison already provided in the word “shorter.” Choice D is incorrect because the underlined portion cannot be deleted without eliminating a necessary element in the comparison. A “training period” can’t be compared to “physicians.”

### QUESTION 31

**Choice A is the best answer** because the transitional phrase “in addition” correctly introduces another example of PAs’ “extraordinary contribution to rural health care.”

Choices B, C, and D are incorrect because they do not convey the appropriate relationship between ideas. In choice B, “Thus” does not make sense because the claim that PAs “provide a broader spectrum of such services” is not a result or consequence of the claim that they provide “cost-efficient, widely appreciated services.” Choices C and D, “despite this” and “on the other

hand,” incorrectly indicate that the claim about the “broader spectrum of such services” is in contrast to the previous claim rather than in addition to it.

### QUESTION 32

**Choice C is the best answer** because it gives an appropriate explanation for why the sentence should not be added. While relevant, the sentence does not accurately interpret the data in the table, which indicates that the number of physicians in 2025 will be 216,000 and the number of physician assistants will be 42,000.

Choices A and B are incorrect because the sentence incorrectly interprets the data in the table and should not be added. Choice D is incorrect because the sentence contains false information, not irrelevant information.

### QUESTION 33

**Choice D is the best answer** because the word “patients” correctly identifies the people served by PAs. Additionally, the comparative conjunction “than” is used correctly in the comparison introduced by the adverb “more.”

Choices A and B are incorrect because the noun “patience” refers to a human quality of tolerance or perseverance. It cannot be used to refer to people served by PAs. Choice C is incorrect because the word “then” refers to a time sequence or tells when something happened.

### QUESTION 34

**Choice B is the best answer** because it most effectively combines the underlined sentences. The introductory dependent clause clearly and concisely sets up the comparison between the “rebooting” of films and the reworking of comic books. It also provides a clear and logical referent for the phrase “This practice” in the second sentence.

Choices A, C, and D are incorrect because the combinations do not connect the two sentences logically and concisely to demonstrate the comparison between the “rebooting” of films and the reworking of comic books. In addition, none provides a clear and logical referent for the phrase “This practice” in the second sentence.

### QUESTION 35

**Choice B is the best answer** because the adjective “old” is used appropriately to describe a longstanding practice.

Choices A and D, “elderly” and “geriatric,” are incorrect in this context because they are generally used to refer to people, not to a practice. Choice C, “mature,” is incorrect because it does not fit the context of the sentence, which is about a longstanding practice, not a fully developed one.

### QUESTION 36

**Choice D is the best answer** because no punctuation is needed to set off the prepositional phrase “of publishers.”

Choices A and B are incorrect because neither a colon nor a comma is needed to separate the noun “example” from the prepositional phrase that describes it. Choice C is incorrect because no comma is needed to separate the noun “publishers” from the participle “responding” that describes it.

### QUESTION 37

**Choice A is the best answer** because the phrase “lift a car over his head” is consistent with the other examples of Superman’s superhuman physical abilities: “hurdle skyscrapers,” “leap an eighth of a mile,” etc.

Choices B, C, and D are incorrect because they are inconsistent with the other examples in the sentence of Superman’s superhuman physical abilities. Holding a job, wearing a costume, and living in a city describe the original Superman but do not characterize his physical abilities.

### QUESTION 38

**Choice D is the best answer** because it most effectively sets up the following sentences, which describe the “realistic” nature of superheroes in the Silver Age. According to these sentences, Silver Age superheroes dealt with everyday problems and had richer interior lives and more complex motivations than their Golden Age counterparts.

Choices A, B, and C are incorrect because neither “scientific experiments gone wrong,” conservatism in the United States in the 1950s, nor the influence of science fiction on comics is addressed in the following two sentences.

### QUESTION 39

**Choice D is the best answer** because it uses punctuation correctly. Because there is a dash between “them” and the verb “had,” another dash is required before “Spider-Man” to set off the nonessential clause “Spider-Man, the Fantastic Four, and the Hulk among them.” A

nonessential clause should be set off from the sentence by matching punctuation, such as two dashes or commas.

Choice A is incorrect because a colon needs to be preceded by an independent clause. Choice B is incorrect because, when used in this way, a semicolon needs to be preceded and followed by independent clauses. Choice C is incorrect because a comma and a dash cannot be used to enclose a nonessential clause. Two dashes or two commas should be used instead.

## QUESTION 40

**Choice C is the best answer** because, as the only choice that focuses on Silver Age characters (“the upstarts”), it most logically completes the discussion of the Silver Age. It also provides an effective transition to the next paragraph: by indicating that “the Silver Age drew to a close,” it sets up the next paragraph’s discussion of the Bronze and other ages.

Choices A and D are incorrect because each focuses on Golden Age characters and thus fails to logically complete the discussion of the Silver Age. Choice B is incorrect because it prematurely discusses a topic that would be better addressed in the next paragraph.

## QUESTION 41

**Choice A is the best answer** because the present perfect verb “have yielded” is used correctly to indicate that the action of the sentence began in the past and is ongoing in the present. In this case, the transformation of comics from the Silver Age to subsequent ages began in the past and continues today.

Choice B is incorrect because the verb “would have yielded” indicates that an action was possible but never happened. Choice C is incorrect because the past tense verb “were yielding” indicates that the action happened and ended in the past. Choice D is incorrect because the verb “will yield” means that the action will happen in the future, which is not necessarily true.

## QUESTION 42

**Choice D is the best answer** because the possessive plural noun “Comics” and adjective “superhero” appropriately indicate that the “superhero line” is a feature of the comics.

Choices A, B, and C are incorrect because the possessive singular noun “superhero’s” is not correctly used in the sentence. Nothing belongs to a singular “superhero” in the sentence. Furthermore, in choice B, the singular possessive noun “Comic’s” is used incorrectly since more than one comic is being referred to. In choice C, “Comics” is plural, but it needs to be possessive, too.

### **QUESTION 43**

**Choice A is the best answer** because the conjunctive adverb “then” correctly shows that given previously stated information, the conclusion that can be drawn is that the transition between the Golden and Silver Ages of comic books was more successful than others.

Choices B, C, and D are incorrect because they do not indicate the correct relationship between the information presented earlier and conclusions that can be drawn from the information. “However,” “nevertheless,” and “yet” are ordinarily used to indicate that in spite of some action, a different or unexpected result occurs.

### **QUESTION 44**

**Choice C is the best answer** because the singular pronoun “that” agrees in number with its singular antecedent “transition.”

Choices A and B are incorrect because the plural pronouns “those” and “these” do not agree with the singular antecedent “transition.” Additionally, choice B is incorrect because “these” implies that whatever is being referred to is at hand, not in the past. Choice D is incorrect because a pronoun is needed to complete the comparison of transitions between comic book ages.

## **Section 3: Math Test - No Calculator**

### **QUESTION 1**

**Choice B is correct.** The total amount  $T$ , in dollars, Salim will pay for  $n$  tickets is given by  $T = 15n + 12$ , which consists of both a per-ticket charge and a one-time service fee. Since  $n$  represents the number of tickets that Salim purchases, it follows that  $15n$  represents the price, in dollars, of  $n$  tickets. Therefore, 15 must represent the per-ticket charge. At the same time, no matter how many tickets Salim purchases, he will be charged the \$12 fee only once. Therefore, 12 must represent the amount of the service fee, in dollars.

Choice A is incorrect. Since  $n$  represents the total number of tickets that Salim purchases, it follows that  $15n$  represents the price, in dollars, of  $n$  tickets, excluding the service fee. Therefore, 15, not 12, must represent the price of 1 ticket. Choice C is incorrect. If Salim purchases only 1 ticket, the total amount, in dollars, Salim will pay can be found by substituting  $n = 1$  into the equation for  $T$ . If  $n = 1$ ,  $T = 15(1) + 12 = 27$ . Therefore, the total amount Salim will pay for one ticket is \$27, not \$12. Choice D is incorrect. The total amount, in dollars, Salim will

pay for  $n$  tickets is given by  $15n + 12$ . The value 12 represents only a portion of this total amount. Therefore, the value 12 does not represent the total amount, in dollars, for any number of tickets.

## QUESTION 2

**Choice B is correct.** Since Fertilizer A contains 60% filler materials by weight, it follows that  $x$  pounds of Fertilizer A consists of  $0.6x$  pounds of filler materials. Similarly,  $y$  pounds of Fertilizer B consists of  $0.4y$  pounds of filler materials. When  $x$  pounds of Fertilizer A and  $y$  pounds of Fertilizer B are combined, the result is 240 pounds of filler materials. Therefore, the total amount, in pounds, of filler materials in a mixture of  $x$  pounds of Fertilizer A and  $y$  pounds of Fertilizer B can be expressed as  $0.6x + 0.4y = 240$ .

Choice A is incorrect. This choice transposes the percentages of filler materials for Fertilizer A and Fertilizer B. Fertilizer A consists of  $0.6x$  pounds of filler materials and Fertilizer B consists of  $0.4y$  pounds of filler materials. Therefore,  $0.6x + 0.4y$  is equal to 240, not  $0.4x + 0.6y$ . Choice C is incorrect. This choice incorrectly represents how to take the percentage of a value mathematically. Fertilizer A consists of  $0.6x$  pounds of filler materials, not  $60x$  pounds of filler materials, and Fertilizer B consists of  $0.4y$  pounds of filler materials, not  $40y$  pounds of filler materials. Choice D is incorrect. This choice transposes the percentages of filler materials for Fertilizer A and Fertilizer B and incorrectly represents how to take the percentage of a value mathematically.

## QUESTION 3

**Choice C is correct.** For a complex number written in the form  $a + bi$ ,  $a$  is called the real part of the complex number and  $b$  is called the imaginary part. The sum of two complex numbers,  $a + bi$  and  $c + di$ , is found by adding real parts and imaginary parts, respectively; that is,  $(a + bi) + (c + di) = (a + c) + (b + d)i$ . Therefore, the sum of  $2 + 3i$  and  $4 + 8i$  is  $(2 + 4) + (3 + 8)i = 6 + 11i$ .

Choice A is incorrect and is the result of disregarding  $i$  and adding all parts of the two complex numbers together,  $2 + 3 + 4 + 8 = 17$ . Choice B is incorrect and is the result of adding all parts of the two complex numbers together and multiplying the sum by  $i$ . Choice D is incorrect and is the result of multiplying the real parts and imaginary parts of the two complex numbers,  $(2)(4) = 8$  and  $(3)(8) = 24$ , instead of adding those parts together.

## QUESTION 4

**Choice A is correct.** The right side of the equation can be multiplied using the distributive property:  $(px + t)(px - t) = p^2x^2 - ptx + ptx - t^2$ . Combining like terms gives  $p^2x^2 - t^2$ . Substituting this expression for the right side of the equation gives  $4x^2 - 9 = p^2x^2 - t^2$ , where  $p$  and  $t$  are

constants. This equation is true for all values of  $x$  only when  $4 = p^2$  and  $9 = t^2$ . If  $4 = p^2$ , then  $p = 2$  or  $p = -2$ . Therefore, of the given answer choices, only 2 could be the value of  $p$ .

Choices B, C, and D are incorrect. For the equation to be true for all values of  $x$ , the coefficients of  $x^2$  on both sides of the equation must be equal; that is,  $4 = p^2$ . Therefore, the value of  $p$  cannot be 3, 4, or 9.

## QUESTION 5

**Choice D is correct.** In the  $xy$ -plane, the graph of the equation  $y = mx + b$ , where  $m$  and  $b$  are constants, is a line with slope  $m$  and  $y$ -intercept  $(0, b)$ . Therefore, the graph of  $y = 2x - 5$  in the  $xy$ -plane is a line with slope 2 and a  $y$ -intercept  $(0, -5)$ . Having a slope of 2 means that for each increase in  $x$  by 1, the value of  $y$  increases by 2. Only the graph in choice D has a slope of 2 and crosses the  $y$ -axis at  $(0, -5)$ . Therefore, the graph shown in choice D must be the correct answer.

Choices A, B, and C are incorrect. The graph of  $y = 2x - 5$  in the  $xy$ -plane is a line with slope 2 and a  $y$ -intercept at  $(0, -5)$ . The graph in choice A crosses the  $y$ -axis at the point  $(0, 2.5)$ , not  $(0, -5)$ , and it has a slope of  $\frac{1}{2}$ , not 2. The graph in choice B crosses the  $y$ -axis at  $(0, -5)$ ; however, the slope of this line is -2, not 2. The graph in choice C has a slope of 2; however, the graph crosses the  $y$ -axis at  $(0, 5)$ , not  $(0, -5)$ .

## QUESTION 6

**Choice A is correct.** Substituting the given value of  $y = 18$  into the equation  $x = \frac{2}{3}y$  yields  $x = \left(\frac{2}{3}\right)(18)$ , or  $x = 12$ . The value of the expression  $2x - 3$  when  $x = 12$  is  $2(12) - 3 = 21$ .

Choice B is incorrect. If  $2x - 3 = 15$ , then adding 3 to both sides of the equation and then dividing both sides of the equation by 2 yields  $x = 9$ . Substituting 9 for  $x$  and 18 for  $y$  into the equation  $x = \frac{2}{3}y$  yields  $9 = \frac{2}{3}18 = 12$ , which is false. Therefore, the value of  $2x - 3$  cannot be 15. Choices C and D are also incorrect. As with choice B, assuming the value of  $2x - 3$  is 12 or 10 will lead to a false statement.

## QUESTION 7

**Choice C is correct.** By properties of multiplication, the formula  $n = 7\ell h$  can be rewritten as  $n = (7h)\ell$ . To solve for  $\ell$  in terms of  $n$  and  $h$ , divide both sides of the equation by the factor  $7h$ .

Solving this equation for  $\ell$  gives  $\ell = \frac{n}{7h}$ .

Choices A, B, and D are incorrect and may result from algebraic errors when rewriting the given equation.

## QUESTION 8

**Choice B is correct.** This question can be answered by making a connection between the table and the algebraic equation. Each row of the table gives a value of  $x$  and its corresponding values in both  $w(x)$  and  $t(x)$ . For instance, the first row gives  $x = 1$  and the corresponding values  $w(1) = -1$  and  $t(1) = -3$ . The row in the table where  $x = 2$  is the only row that has the property  $x = w(x) + t(x)$ :  $2 = 3 + (-1)$ . Therefore, choice B is the correct answer.

Choice A is incorrect because when  $x = 1$ , the equation  $w(x) + t(x) = x$  is not true. According to the table,  $w(1) = -1$  and  $t(1) = -3$ . Substituting the values of each term when  $x = 1$  gives  $-1 + (-3) = 1$ , an equation that is not true. Choice C is incorrect because when  $x = 3$ , the equation  $w(x) + t(x) = x$  is not true. According to the table,  $w(3) = 4$  and  $t(3) = 1$ . Substituting the values of each term when  $x = 3$  gives  $4 + 1 = 3$ , an equation that is not true. Choice D is incorrect because when  $x = 4$ , the equation  $w(x) + t(x) = x$  is not true. According to the table,  $w(4) = 3$  and  $t(4) = 3$ . Substituting the values of each term when  $x = 4$  gives  $3 + 3 = 4$ , an equation that is not true.

## QUESTION 9

**Choice C is correct.** The two numerical expressions in the given equation can be simplified as  $\sqrt{9} = 3$  and  $\sqrt{64} = 8$ , so the equation can be rewritten as  $\sqrt{x} + 3 = 8$ , or  $\sqrt{x} = 5$ . Squaring both sides of the equation gives  $x = 25$ .

Choice A is incorrect and may result from a misconception about how to square both sides of  $\sqrt{x} = 5$  to determine the value of  $x$ . Choice B is incorrect. The value of  $\sqrt{x}$ , not  $x$ , is 5. Choice D is incorrect and represents a misconception about the properties of radicals. While it is true that  $55 + 9 = 64$ , it is not true that  $\sqrt{55} + \sqrt{9} = \sqrt{64}$ .

## QUESTION 10

**Choice D is correct.** Jaime's goal is to average at least 280 miles per week for 4 weeks. If  $T$  is the total number of miles Jamie will bicycle for 4 weeks, then his goal can be represented

symbolically by the inequality:  $\frac{T}{4} \geq 280$ , or equivalently  $T \geq 4(280)$ . The total number of miles

Jamie will bicycle during this time is the sum of the distances he has completed and has yet to complete. Thus  $T = 240 + 310 + 320 + x$ . Substituting this expression into the inequality  $T \geq 4(280)$  gives  $240 + 310 + 320 + x \geq 4(280)$ . Therefore, choice D is the correct answer.

Choices A, B, and C are incorrect because they do not correctly capture the relationships between the total number of miles Jaime will ride his bicycle ( $240 + 310 + 320 + x$ ) and the minimum number of miles he is attempting to bicycle for the four weeks ( $280 + 280 + 280 + 280$ ).

### QUESTION 11

**Choice B is correct.** Since the shown parabola opens upward, the coefficient of  $x^2$  in the equation  $y = ax^2 + c$  must be positive. Given that  $a$  is positive,  $-a$  is negative, and therefore the graph of the equation  $y = -a(x - b)^2 + c$  will be a parabola that opens downward. The vertex of this parabola is  $(b, c)$ , because the maximum value of  $y$ ,  $c$ , is reached when  $x = b$ . Therefore, the answer must be choice B.

Choices A and C are incorrect. The coefficient of  $x^2$  in the equation  $y = -a(x - b)^2 + c$  is negative. Therefore, the parabola with this equation opens downward, not upward. Choice D is incorrect because the vertex of this parabola is  $(b, c)$ , not  $(-b, c)$ , because the maximum value of  $y$ ,  $c$ , is reached when  $x = b$ .

### QUESTION 12

**Choice D is correct. Dividing  $4x^2 + 6x$  by  $4x + 2$  gives:**

$$\begin{array}{r} x + 1 \\ 4x + 2 \overline{)4x^2 + 6x} \\ - (4x + 2x) \\ \hline 4x \\ - (4x + 2) \\ \hline - 2 \end{array}$$

Therefore, the expression  $\frac{4x^2 + 6x}{4x + 2}$  is equivalent to  $x + 1 - \frac{2}{4x + 2}$ .

Alternate approach: The numerator of the given expression,  $4x^2 + 6x$ , can be rewritten in terms of the denominator,  $4x + 2$ , as follows:  $4x^2 + 2x + 4x + 2 - 2$ , or  $x(4x + 2) + (4x + 2) - 2$ . So the given expression can be rewritten as

$$\frac{x(4x + 2) + (4x + 2) - 2}{4x + 2} = x + 1 - \frac{2}{4x + 2}.$$

Choices A and B are incorrect and may result from incorrectly factoring the numerator and denominator of the expression  $\frac{4x^2 + 6x}{4x + 2}$  and then incorrectly identifying common factors in the two factored expressions. Choice C is incorrect and may result from a variety of mistakes made when performing long division.

### QUESTION 13

**Choice A is correct.** The number of solutions to any quadratic equation in the form  $ax^2 + bx + c = 0$ , where  $a$ ,  $b$ , and  $c$  are constants, can be found by evaluating the expression  $b^2 - 4ac$ , which is called the discriminant. If the value of  $b^2 - 4ac$  is a positive number, then there will be exactly two real solutions to the equation. If the value of  $b^2 - 4ac$  is zero, then there will be exactly one real solution to the equation. Finally, if the value of  $b^2 - 4ac$  is negative, then there will be no real solutions to the equation.

The given equation  $2x^2 - 4x = t$  is a quadratic equation in one variable, where  $t$  is a constant. Subtracting  $t$  from both sides of the equation gives  $2x^2 - 4x - t = 0$ . In this form,  $a = 2$ ,  $b = -4$ , and  $c = -t$ . The values of  $t$  for which the equation has no real solutions are the same values of  $t$  for which the discriminant of this equation is a negative value. The discriminant is equal to  $(-4)^2 - 4(2)(-t)$ ; therefore,  $(-4)^2 - 4(2)(-t) < 0$ . Simplifying the left side of the inequality gives  $16 + 8t < 0$ . Subtracting 16 from both sides of the inequality and then dividing both sides by 8 gives  $t < -2$ . Of the values given in the options,  $-3$  is the only value that is less than  $-2$ . Therefore, choice A must be the correct answer.

Choices B, C, and D are incorrect and may result from a misconception about how to use the discriminant to determine the number of solutions of a quadratic equation in one variable.

### QUESTION 14

**Choice A is correct.** The number of containers in a shipment must have a weight less than 300 pounds. The total weight, in pounds, of detergent and fabric softener that the supplier delivers can be expressed as the weight of each container multiplied by the number of each type of container, which is  $7.35d$  for detergent and  $6.2s$  for fabric softener. Since this total cannot exceed 300 pounds, it follows that  $7.35d + 6.2s \leq 300$ . Also, since the laundry service wants to buy at least twice as many containers of detergent as containers of fabric softener, the number of containers of detergent should be greater than or equal to two times the number of containers of fabric softener. This can be expressed by the inequality  $d \geq 2s$ .

Choice B is incorrect because it misrepresents the relationship between the numbers of each container that the laundry service wants to buy. Choice C is incorrect because the first inequality of the system incorrectly doubles the weight per container of detergent. The weight

of each container of detergent is 7.35, not 14.7 pounds. Choice D is incorrect because it doubles the weight per container of detergent and transposes the relationship between the numbers of containers.

### QUESTION 15

**Choice D is correct.** The expression can be rewritten as  $\left(a + \frac{b}{2}\right)\left(a + \frac{b}{2}\right)$ . Using the distributive property, the expression yields  $\left(a + \frac{b}{2}\right)\left(a + \frac{b}{2}\right) = a^2 + \frac{ab}{2} + \frac{ab}{2} + \frac{b^2}{4}$ . Combining like terms gives  $a^2 + ab + \frac{b^2}{4}$ .

Choices A, B, and C are incorrect and may result from errors using the distributive property on the given expression or combining like terms.

### QUESTION 16

**The correct answers are 1, 2, 4, 8, or 16.** Number 16 can be written in exponential form  $a^{\frac{b}{4}}$ , where  $a$  and  $b$  are positive integers as follows:  $2^4$ ,  $4^2$ ,  $16^1$ ,  $(16^2)^{\frac{1}{2}}$ ,  $(16^4)^{\frac{1}{4}}$ . Hence, if  $a^{\frac{b}{4}} = 16$ , where  $a$  and  $b$  are positive integers, then  $\frac{b}{4}$  can be 4, 2, 1,  $\frac{1}{2}$ , or  $\frac{1}{4}$ . So the value of  $b$  can be 16, 8, 4, 2, or 1. Any of these values may be gridded as the correct answer.

### QUESTION 17

**The correct answer is  $\frac{15}{4}$  or 3.75.** Multiplying both sides of the equation  $\frac{2}{3}t = \frac{5}{2}$  by  $\frac{3}{2}$  results in  $t = \frac{15}{4}$ , or  $t = 3.75$ .

### QUESTION 18

**The correct answer is 30.** In the figure given, since  $\overline{BD}$  is parallel to  $\overline{AE}$  and both segments are intersected by  $\overline{CE}$ , then angle  $BDC$  and angle  $AEC$  are corresponding angles and therefore congruent. Angle  $BCD$  and angle  $ACE$  are also congruent because they are the same angle. Triangle  $BCD$  and triangle  $ACE$  are similar because if two angles of one triangle are congruent to two angles of another triangle, the triangles are similar. Since triangle  $BCD$  and triangle  $ACE$  are similar, their corresponding sides are proportional. So in triangle  $BCD$  and triangle  $ACE$ ,  $\overline{BD}$  corresponds to  $\overline{AE}$  and  $\overline{CD}$  corresponds to  $\overline{CE}$ . Therefore,  $\frac{BD}{CD} = \frac{AE}{CE}$ . Since triangle  $BCD$  is a right triangle, the Pythagorean theorem can be used to give the value of  $CD$ :  $6^2 + 8^2 = CD^2$ . Taking the square root of each side gives  $CD = 10$ . Substituting the values in the proportion  $\frac{BD}{CD} = \frac{AE}{CE}$  yields

$\frac{6}{10} = \frac{18}{CE}$ . Multiplying each side by  $CE$ , and then multiplying by  $\frac{10}{6}$  yields  $CE = 30$ . Therefore, the length of  $\overline{CE}$  is 30.

### QUESTION 19

**The correct answer is 1.5 or  $\frac{3}{2}$ .** The total amount, in liters, of a saline solution can be expressed as the liters of each type of saline solution multiplied by the percent of the saline solution. This gives  $3(0.10)$ ,  $x(0.25)$ , and  $(x + 3)(0.15)$ , where  $x$  is the amount, in liters, of a 25% saline solution and 10%, 15%, and 25% are represented as 0.10, 0.15, and 0.25, respectively. Thus, the equation  $3(0.10) + 0.25x = 0.15(x + 3)$  must be true. Multiplying 3 by 0.10 and distributing 0.15 to  $(x + 3)$  yields  $0.30 + 0.25x = 0.15x + 0.45$ . Subtracting  $0.15x$  and 0.30 from each side of the equation gives  $0.10x = 0.15$ . Dividing each side of the equation by 0.10 yields  $x = 1.5$ , or  $x = \frac{3}{2}$ .

### QUESTION 20

**The correct answer is  $\frac{1}{6}$ , .166, or .167.** The circumference,  $C$ , of a circle is  $C = 2\pi r$ , where  $r$  is the radius of the circle. For the given circle with a radius of 1, the circumference is  $C = 2(\pi)(1)$ , or  $C = 2\pi$ . To find what fraction of the circumference the length of arc  $AB$  is, divide the length of the arc by the circumference, which gives  $\frac{\pi}{3} \div 2\pi$ . This division can be represented by  $\frac{\pi}{3} \cdot \frac{1}{2\pi} = \frac{1}{6}$ . The fraction  $\frac{1}{6}$  can also be rewritten as .166 or .167.

## Section 4: Math Test - Calculator

### QUESTION 1

**Choice A is correct.** The given expression  $(2x^2 - 4) - (-3x^2 + 2x - 7)$  can be rewritten as  $2x^2 - 4 + 3x^2 - 2x + 7$ . Combining like terms yields  $5x^2 - 2x + 3$ .

Choices B, C, and D are incorrect because they are the result of errors when applying the distributive property.

### QUESTION 2

**Choice C is correct.** The lines shown on the graph give the positions of Paul and Mark during the race. At the start of the race, 0 seconds have elapsed, so the  $y$ -intercept of the line that represents Mark's position during the race represents the number of yards Mark was from Paul's position (at 0 yards) at the start of the race. Because the  $y$ -intercept of the line that

represents Mark's position is at the grid line that is halfway between 12 and 24, Mark had a head start of 18 yards.

Choices A, B, and D are incorrect. The  $y$ -intercept of the line that represents Mark's position shows that he was 18 yards from Paul's position at the start of the race, so he did not have a head start of 3, 12, or 24 yards.

### QUESTION 3

**Choice A is correct.** The leftmost segment in choice A, which represents the first time period, shows that the snow accumulated at a certain rate; the middle segment, which represents the second time period, is horizontal, showing that the snow stopped accumulating; and the rightmost segment, which represents the third time period, is steeper than the first segment, indicating that the snow accumulated at a faster rate than it did during the first time period.

Choice B is incorrect. This graph shows snow accumulating faster during the first time period than during the third time period; however, the question says that the rate of snow accumulation in the third time period is higher than in the first time period. Choice C is incorrect. This graph shows snow accumulation increasing during the first time period, not accumulating during the second time period, and then decreasing during the third time period; however, the question says that no snow melted (accumulation did not decrease) during this time. Choice D is incorrect. This graph shows snow accumulating at a constant rate, not stopping for a period of time or accumulating at a faster rate during a third time period.

### QUESTION 4

**Choice D is correct.** The equation  $12d + 350 = 1,010$  can be used to determine  $d$ , the number of dollars charged per month. Subtracting 350 from both sides of this equation yields  $12d = 660$ , and then dividing both sides of the equation by 12 yields  $d = 55$ .

Choice A is incorrect. If  $d$  were equal to 25, the first 12 months would cost  $350 + (12)(25) = 650$  dollars, not \$1,010. Choice B is incorrect. If  $d$  were equal to 35, the first 12 months would cost  $350 + (12)(35) = 770$  dollars, not \$1,010. Choice C is incorrect. If  $d$  were equal to 45, the first 12 months would cost  $350 + (12)(45) = 890$  dollars, not \$1,010.

### QUESTION 5

**Choice B is correct.** Both sides of the given inequality can be divided by 3 to yield  $2x - 3y > 4$ .

Choices A, C, and D are incorrect because they are not equivalent to (do not have the same solution set as) the given inequality. For example, the ordered pair  $(0, -1.5)$  is a solution to the given inequality, but it is not a solution to any of the inequalities in choices A, C, or D.

## QUESTION 6

**Choice C is correct.** According to the table, 63% of survey respondents get most of their medical information from a doctor and 13% get most of their medical information from the Internet. Therefore, 76% of the 1,200 survey respondents get their information from either a doctor or the Internet, and 76% of 1,200 is 912.

Choices A, B, and D are incorrect. According to the table, 76% of survey respondents get their information from either a doctor or the Internet. Choice A is incorrect because 865 is about 72% (the percent of survey respondents who get most of their medical information from a doctor or from magazines/brochures), not 76%, of 1,200. Choice B is incorrect because 887 is about 74%, not 76%, of 1,200. Choice D is incorrect because 926 is about 77%, not 76%, of 1,200.

## QUESTION 7

**Choice D is correct.** The members of the city council wanted to assess opinions of all city residents. To gather an unbiased sample, the council should have used a random sampling design to select subjects from all city residents. The given survey introduced a sampling bias because the 500 city residents surveyed were all dog owners. This sample is not representative of all city residents.

Choice A is incorrect because when the sampling method isn't random, there is no guarantee that the survey results will be reliable; hence, they cannot be generalized to the entire population. Choice B is incorrect because a larger sample size would not correct the sampling bias. Choice C is incorrect because a survey sample of non-dog owners would likely have a biased opinion, just as a sample of dog owners would likely have a biased opinion.

## QUESTION 8

**Choice D is correct.** According to the table, 13 people chose vanilla ice cream. Of those people, 8 chose hot fudge as a topping. Therefore, of the people who chose vanilla ice cream, the fraction who chose hot fudge as a topping is  $\frac{8}{13}$ .

Choice A is incorrect because it represents the fraction of people at the party who chose hot fudge as a topping. Choice B is incorrect because it represents the fraction of people who chose vanilla ice cream with caramel as a topping. Choice C is incorrect because it represents the fraction of people at the party who chose vanilla ice cream.

## QUESTION 9

**Choice B is correct.** The land area of the coastal city can be found by subtracting the area of the water from the total area of the coastal city; that is,  $92.1 - 11.3 = 80.8$  square miles. The population density is the population divided by the land area, or  $\frac{621,000}{80.8} = 7,685$ , which is closest to 7,690 people per square mile.

Choice A is incorrect and may be the result of dividing the population by the total area, instead of the land area. Choice C is incorrect and may be the result of dividing the population by the area of water. Choice D is incorrect and may be the result of making a computational error with the decimal place.

## QUESTION 10

**Choice B is correct.** Let  $x$  represent the number of days the second voyage lasted. The number of days the first voyage lasted is then  $x + 43$ . Since the two voyages combined lasted a total of 1,003 days, the equation  $x + (x + 43) = 1,003$  must hold. Combining like terms yields  $2x + 43 = 1,003$ , and solving for  $x$  gives  $x = 480$ .

Choice A is incorrect because  $460 + (460 + 43) = 963$ , not 1,003 days. Choice C is incorrect because  $520 + (520 + 43) = 1,083$ , not 1,003 days. Choice D is incorrect because  $540 + (540 + 43) = 1,123$ , not 1,003 days.

## QUESTION 11

**Choice B is correct.** Adding the equations side-by-side eliminates  $y$ , as shown below.

$$\begin{array}{r} 7x + 3y = 8 \\ 6x - 3y = 5 \\ \hline 13x + 0 = 13 \end{array}$$

Solving the obtained equation for  $x$  gives  $x = 1$ . Substituting 1 for  $x$  in the first equation gives  $7(1) + 3y = 8$ . Subtracting 7 from both sides of the equation yields  $3y = 1$ , so  $y = \frac{1}{3}$ . Therefore,

the value of  $x - y$  is  $1 - \frac{1}{3}$ , or  $\frac{2}{3}$ .

Choice C is incorrect because  $1 + \frac{1}{3} = \frac{4}{3}$  is the value of  $x + y$ , not  $x - y$ . Choices A and D are incorrect and may be the result of some computational errors.

## QUESTION 12

**Choice D is correct.** The average growth rate of the sunflower over a certain time period is the increase in height of the sunflower over the period divided by the time. Symbolically, this rate is  $\frac{h(b) - h(a)}{b - a}$ , where  $a$  and  $b$  are the first and the last day of the time period, respectively. Since

the time period for each option is the same (21 days), the total growth over the period can be used to evaluate in which time period the sunflower grew the least. According to the graph, the sunflower grew the least over the period from day 63 to day 84. Therefore, the sunflower's average growth rate was the least from day 63 to day 84.

Alternate approach: The average growth rate of the sunflower over a certain time period is the slope of the line segment that joins the point on the graph at the beginning of the time period with the point on the graph at the end of the time period. Based on the graph, of the four time periods, the slope of the line segment is least between the sunflower's height on day 63 and its height on day 84.

Choices A, B, and C are incorrect. On the graph, the line segment from day 63 to 84 is less steep than each of the three other line segments representing other periods. Therefore, the average growth rate of the sunflower is the least from day 63 to 84.

### QUESTION 13

**Choice A is correct.** Based on the definition and contextual interpretation of the function  $h$ , when the value of  $t$  increases by 1, the height of the sunflower increases by  $a$  centimeters. Therefore,  $a$  represents the predicted amount, in centimeters, by which the sunflower grows each day during the period the function models.

Choice B is incorrect. In the given model, the beginning of the period corresponds to  $t = 0$ , and since  $h(0) = b$ , the predicted height, in centimeters, of the sunflower at the beginning of the period is represented by  $b$ , not by  $a$ . Choice C is incorrect. If the period of time modeled by the function is  $c$  days long, then the predicted height, in centimeters, of the sunflower at the end of the period is represented by  $ac + b$ , not by  $a$ . Choice D is incorrect. If the period of time modeled by the function is  $c$  days long, the predicted total increase in the height of the sunflower, in centimeters, during that period is represented by the difference  $h(c) - h(0) = (ac + b) - (a \cdot 0 + b)$ , which is equivalent to  $ac$ , not  $a$ .

### QUESTION 14

**Choice B is correct.** According to the table, the height of the sunflower is 36.36 cm on day 14 and 131.00 cm on day 35. Since the height of the sunflower between day 14 and day 35 changes at a nearly constant rate, the height of the sunflower increases by approximately

$\frac{131.00 - 36.36}{35 - 14} \approx 4.5$  cm per day. Therefore, the equation that models the height of the sunflower  $t$  days after it begins to grow is of the form  $h = 4.5t + b$ . Any ordered pair  $(t, h)$  from the table between day 14 and day 35 can be used to estimate the value of  $b$ . For example, substituting the ordered pair  $(14, 36.36)$  for  $(t, h)$  into the equation  $h = 4.5t + b$  gives  $36.36 = 4.5(14) + b$ . Solving this for  $b$  yields  $b = -26.64$ . Therefore, of the given choices, the equation  $h = 4.5t - 27$  best models the height  $h$ , in centimeters, of the sunflower  $t$  days after it begins to grow.

Choices A, C, and D are incorrect because the growth rates of the sunflower from day 14 to day 35 in these choices are significantly higher or lower than the true growth rate of the sunflower as shown in the graph or the table. These choices may result from considering time periods different from the period indicated in the question or from calculation errors.

### QUESTION 15

**Choice D is correct.** According to the table, the value of  $y$  increases by  $\frac{14}{4} = \frac{7}{2}$  every time the value of  $x$  increases by 1. It follows that the simplest equation relating  $y$  to  $x$  is linear and of the form  $y = \frac{7}{2}x + b$  for some constant  $b$ . Furthermore, the ordered pair  $\left(1, \frac{11}{4}\right)$  from the table must satisfy this equation. Substituting 1 for  $x$  and  $\frac{11}{4}$  for  $y$  in the equation  $y = \frac{7}{2}x + b$  gives  $\frac{11}{4} = \frac{7}{2}(1) + b$ . Solving this equation for  $b$  gives  $b = -\frac{3}{4}$ . Therefore, the equation in choice D correctly relates  $y$  to  $x$ .

Choices A and B are incorrect. The relationship between  $x$  and  $y$  cannot be exponential because the differences, not the ratios, of  $y$ -values are the same every time the  $x$ -values change by the same amount. Choice C is incorrect because the ordered pair  $\left(2, \frac{25}{4}\right)$  is not a solution to the equation  $y = \frac{3}{4}x + 2$ . Substituting 2 for  $x$  and  $\frac{25}{4}$  for  $y$  in this equation gives  $\frac{25}{4} = \frac{3}{4} + 2$ , which is false.

### QUESTION 16

**Choice B is correct.** In right triangle  $ABC$ , the measure of angle  $B$  must be  $58^\circ$  because the sum of the measure of angle  $A$ , which is  $32^\circ$ , and the measure of angle  $B$  is  $90^\circ$ . Angle  $D$  in the right triangle  $DEF$  has measure  $58^\circ$ . Hence, triangles  $ABC$  and  $DEF$  are similar. Since  $BC$  is the side

opposite to the angle with measure  $32^\circ$  and  $AB$  is the hypotenuse in right triangle  $ABC$ , the ratio  $\frac{BC}{AB}$  is equal to  $\frac{DF}{DE}$ .

Alternate approach: The trigonometric ratios can be used to answer this question. In right triangle  $ABC$ , the ratio  $\frac{BC}{AB} = \sin(32^\circ)$ . The angle  $E$  in triangle  $DEF$  has measure  $32^\circ$  because

$m(\angle D) + m(\angle E) = 90^\circ$ . In triangle  $DEF$ , the ratio  $\frac{DF}{DE} = \sin(32^\circ)$ . Therefore,  $\frac{DF}{DE} = \frac{BC}{AB}$ .

Choice A is incorrect because  $\frac{DE}{DF}$  is the inverse of the ratio  $\frac{BC}{AB}$ . Choice C is incorrect because  $\frac{DF}{EF} = \frac{BC}{AC}$ , not  $\frac{BC}{AB}$ . Choice D is incorrect because  $\frac{EF}{DE} = \frac{AC}{AB}$ , not  $\frac{BC}{AB}$ .

## QUESTION 17

**Choice B is correct.** Isolating the term that contains the riser height,  $h$ , in the formula  $2h + d = 25$  gives  $2h = 25 - d$ . Dividing both sides of this equation by 2 yields  $h = \frac{25-d}{2}$ , or  $h = \frac{1}{2}(25-d)$ .

Choices A, C, and D are incorrect and may result from incorrect transformations of the riser-tread formula  $2h + d = 25$  when expressing  $h$  in terms of  $d$ .

## QUESTION 18

**Choice C is correct.** Since the tread depth,  $d$ , must be at least 9 inches, and the riser height,  $h$ , must be at least 5 inches, it follows that  $d \geq 9$  and  $h \geq 5$ , respectively. Solving for  $d$  in the riser-tread formula  $2h + d = 25$  gives  $d = 25 - 2h$ . Thus the first inequality,  $d \geq 9$ , is equivalent to  $25 - 2h \geq 9$ . This inequality can be solved for  $h$  as follows:

$$-2h \geq 9 - 25$$

$$2h \leq 25 - 9$$

$$2h \leq 16$$

$$h \leq 8$$

Therefore, the inequality  $5 \leq h \leq 8$ , derived from combining the inequalities  $h \geq 5$  and  $h \leq 8$ , represents the set of all possible values for the riser height that meets the code requirement.

Choice A is incorrect because the riser height,  $h$ , cannot be less than 5 inches. Choices B and D are incorrect because the riser height,  $h$ , cannot be greater than 8. For example, if  $h = 10$ , then according to the riser-tread formula  $2h + d = 25$ , it follows that  $d = 5$  inches. However,  $d$  must be at least 9 inches according to the building codes, so  $h$  cannot be 10.

### QUESTION 19

**Choice C is correct.** Let  $h$  be the riser height, in inches, and  $n$  be the number of the steps in the stairway. According to the architect's design, the total rise of the stairway is 9 feet, or  $9 \times 12 = 108$  inches. Hence,  $nh = 108$ , and solving for  $n$  gives  $n = \frac{108}{h}$ . It is given that  $7 < h < 8$ . It follows that  $\frac{108}{8} < \frac{108}{h} < \frac{108}{7}$ , or equivalently,  $\frac{108}{8} < n < \frac{108}{7}$ . Since  $\frac{108}{8} < 14$  and  $\frac{108}{7} > 15$  and  $n$  is an integer, it follows that  $14 \leq n \leq 15$ . Since  $n$  can be an odd number,  $n$  can only be 15; therefore,  $h = \frac{108}{15} = 7.2$  inches. Substituting 7.2 for  $h$  in the riser-tread formula  $2h + d = 25$  gives  $14.4 + d = 25$ . Solving for  $d$  gives  $d = 10.6$  inches.

Choice A is incorrect because 7.2 inches is the riser height, not the tread depth of the stairs. Choice B is incorrect and may be the result of calculation errors. Choice D is incorrect because 15 is the number of steps, not the tread depth of the stairs.

### QUESTION 20

**Choice C is correct.** Since the product of  $x - 6$  and  $x + 0.7$  equals 0, by the zero product property either  $x - 6 = 0$  or  $x + 0.7 = 0$ . Therefore, the solutions to the equation are 6 and  $-0.7$ . The sum of 6 and  $-0.7$  is 5.3.

Choice A is incorrect and is the result of subtracting 6 from  $-0.7$  instead of adding. Choice B is incorrect and may be the result of erroneously calculating the sum of  $-6$  and  $0.7$  instead of 6 and  $-0.7$ . Choice D is incorrect and is the sum of 6 and 0.7, not 6 and  $-0.7$ .

### QUESTION 21

**Choice D is correct.** The sample of 150 largemouth bass was selected at random from all the largemouth bass in the pond, and since 30% of them weighed more than 2 pounds, it can be concluded that approximately 30% of all largemouth bass in the pond weigh more than 2 pounds.

Choices A, B, and C are incorrect. Since the sample contained 150 largemouth bass, of which 30% weighed more than 2 pounds, the largest population to which this result can be generalized is the population of the largemouth bass in the pond.

## QUESTION 22

**Choice B is correct.** The median of a list of numbers is the middle value when the numbers are listed in order from least to greatest. For the electoral votes shown in the table, their frequency should also be taken into account. Since there are 21 states represented in the table, the middle number will be the eleventh number in the ordered list. Counting the frequencies from the top of the table ( $4 + 4 + 1 + 1 + 3 = 13$ ) shows that the median number of electoral votes for the 21 states is 15.

Choice A is incorrect. If the electoral votes are ordered from least to greatest taking into account the frequency, 13 will be in the tenth position, not the middle. Choice C is incorrect because 17 is in the fourteenth position, not in the middle, of the ordered list. D is incorrect because 20 is in the fifteenth position, not in the middle, of the ordered list.

## QUESTION 23

**Choice C is correct.** Since the graph shows the height of the ball above the ground after it was dropped, the number of times the ball was at a height of 2 feet is equal to the number of times the graph crosses the horizontal grid line that corresponds to a height of 2 feet. The graph crosses this grid line three times.

Choices A, B, and D are incorrect. According to the graph, the ball was at a height of 2 feet three times, not one, two, or four times.

## QUESTION 24

**Choice D is correct.** To find the percent increase of the customer's water bill, the absolute increase of the bill, in dollars, is divided by the original amount of the bill, and the result is multiplied by 100%, as follows:  $\frac{79.86 - 75.74}{75.74} \approx 0.054; 0.054 \times 100\% = 5.4\%$ .

Choice A is incorrect. This choice is the difference  $79.86 - 75.74$  rounded to the nearest tenth, which is the (absolute) increase of the bill's amount, not its percent increase. Choice B is incorrect and may be the result of some calculation errors. Choice C is incorrect and is the result of dividing the difference between the two bill amounts by the new bill amount instead of the original bill amount.

## QUESTION 25

**Choice B is correct.** A linear function has a constant rate of change, and any two rows of the shown table can be used to calculate this rate. From the first row to the second, the value of  $x$  is increased by 2 and the value of  $f(x)$  is increased by 6 = 4 – (–2). So the values of  $f(x)$  increase by 3 for every increase by 1 in the value of  $x$ . Since  $f(2) = 4$ , it follows that  $f(2 + 1) = 4 + 3 = 7$ . Therefore,  $f(3) = 7$ .

Choice A is incorrect. This is the third  $x$ -value in the table, not  $f(3)$ . Choices C and D are incorrect and may result from errors when calculating the function's rate of change.

## QUESTION 26

**Choice C is correct.** Since Gear A has 20 teeth and Gear B has 60 teeth, the gear ratio for Gears A and B is 20:60. Thus the ratio of the number of revolutions per minute (rpm) for the two gears is 60:20, or 3:1. That is, when Gear A turns at 3 rpm, Gear B turns at 1 rpm. Similarly, since Gear B has 60 teeth and Gear C has 10 teeth, the gear ratio for Gears B and C is 60:10, and the ratio of the rpms for the two gears is 10:6. That is, when Gear B turns at 1 rpm, Gear C turns at 6 rpm. Therefore, if Gear A turns at 100 rpm, then Gear B turns at  $\frac{100}{3}$  rpm, and Gear C turns at  $\frac{100}{3} \times 6 = 200$  rpm.

Alternate approach: Gear A and Gear C can be considered as directly connected since their “contact” speeds are the same. Gear A has twice as many teeth as Gear C, and since the ratios of the number of teeth are equal to the reverse of the ratios of rotation speeds, in rpm, Gear C would be rotated at a rate that is twice the rate of Gear A. Therefore, Gear C will be rotated at a rate of 200 rpm since Gear A is rotated at 100 rpm.

Choice A is incorrect and may result from using the gear ratio instead of the ratio of the rpm when calculating the rotational speed of Gear C. Choice B is incorrect and may result from comparing the rpm of the gears using addition instead of multiplication. Choice D is incorrect and may be the result of multiplying the 100 rpm for Gear A by the number of teeth in Gear C.

## QUESTION 27

**Choice A is correct.** One way to find the radius of the circle is to put the given equation in standard form,  $(x - h)^2 + (y - k)^2 = r^2$ , where  $(h, k)$  is the center of the circle and the radius of the circle is  $r$ . To do this, divide the original equation,  $2x^2 - 6x + 2y^2 + 2y = 45$ , by 2 to make the leading coefficients of  $x^2$  and  $y^2$  each equal to 1:  $x^2 - 3x + y^2 + y = 22.5$ . Then complete the square to put the equation in standard form. To do so, first rewrite  $x^2 - 3x + y^2 + y = 22.5$  as  $(x^2 - 3x + 2.25) - 2.25 + (y^2 + y + 0.25) - 0.25 = 22.5$ . Second, add 2.25 and 0.25 to both sides of the equation:  $(x^2 - 3x + 2.25) + (y^2 + y + 0.25) = 25$ . Since  $x^2 - 3x + 2.25 = (x - 1.5)^2$ ,  $y^2 - x + 0.25 = (y + 0.5)^2$ , the equation is in standard form:  $(x - 1.5)^2 + (y + 0.5)^2 = 25$ .

$-0.5)^2$ , and  $25 = 5^2$ , it follows that  $(x - 1.5)^2 + (y - 0.5)^2 = 5^2$ . Therefore, the radius of the circle is 5.

Choices B, C, and D are incorrect and may be the result of errors in manipulating the equation or of a misconception about the standard form of the equation of a circle in the  $xy$ -plane.

### QUESTION 28

**Choice A is correct.** The coordinates of the points at a distance  $d$  units from the point with coordinate  $a$  on the number line are the solutions to the equation  $|x - a| = d$ . Therefore, the coordinates of the points at a distance of 3 units from the point with coordinate  $-4$  on the number line are the solutions to the equation  $|x - (-4)| = 3$ , which is equivalent to  $|x + 4| = 3$ .

Choice B is incorrect. The solutions of  $|x - 4| = 3$  are the coordinates of the points on the number line at a distance of 3 units from the point with coordinate 4. Choice C is incorrect. The solutions of  $|x + 3| = 4$  are the coordinates of the points on the number line at a distance of 4 units from the point with coordinate  $-3$ . Choice D is incorrect. The solutions of  $|x - 3| = 4$  are the coordinates of the points on the number line at a distance of 4 units from the point with coordinate 3.

### QUESTION 29

**Choice B is correct.** The average speed of the model car is found by dividing the total distance traveled by the car by the total time the car traveled. In the first  $t$  seconds after the car starts, the time changes from 0 to  $t$  seconds. So the total distance the car traveled is the distance it traveled at  $t$  seconds minus the distance it traveled at 0 seconds. At 0 seconds, the car has traveled  $16(0)\sqrt{0}$  inches, which is equal to 0 inches. According to the equation given, after  $t$  seconds, the car has traveled  $16t\sqrt{t}$  inches. In other words, after the car starts, it travels a total of  $16t\sqrt{t}$  inches in  $t$  seconds. Dividing this total distance traveled by the total time shows the

car's average speed:  $\frac{16t\sqrt{t}}{t} = 16\sqrt{t}$  inches per second.

Choices A, C, and D are incorrect and may result from misconceptions about how average speed is calculated.

### QUESTION 30

**Choice D is correct.** The data in the scatterplot roughly fall in the shape of a downward-opening parabola; therefore, the coefficient for the  $x^2$  term must be negative. Based on the location of

the data points, the  $y$ -intercept of the parabola should be somewhere between 740 and 760. Therefore, of the equations given, the best model is  $y = -1.674x^2 + 19.76x + 745.73$ .

Choices A and C are incorrect. The positive coefficient of the  $x^2$  term means that these equations each define upward-opening parabolas, whereas a parabola that fits the data in the scatterplot must open downward. Choice B is incorrect because it defines a parabola with a  $y$ -intercept that has a negative  $y$ -coordinate, whereas a parabola that fits the data in the scatterplot must have a  $y$ -intercept with a positive  $y$ -coordinate.

### QUESTION 31

**The correct answer is 10.** Let  $n$  be the number of friends originally in the group. Since the cost of the trip was \$800, the share, in dollars, for each friend was originally  $\frac{800}{n}$ . When two friends decided not to go on the trip, the number of friends who split the \$800 cost became  $n - 2$ , and each friend's cost became  $\frac{800}{n - 2}$ . Since this share represented a \$20 increase over the original share, the equation  $\frac{800}{n} + 20 = \frac{800}{n - 2}$  must be true. Multiplying each side of  $\frac{800}{n} + 20 = \frac{800}{n - 2}$  by  $n(n - 2)$  to clear all the denominators gives

$$800(n - 2) + 20n(n - 2) = 800n$$

This is a quadratic equation and can be rewritten in the standard form by expanding, simplifying, and then collecting like terms on one side, as shown below:

$$800n - 1600 + 20n^2 - 40n = 800n$$

$$40n - 80 + n^2 - 2n = 40n$$

$$n^2 - 2n - 80 = 0$$

After factoring, this becomes  $(n + 8)(n - 10) = 0$ .

The solutions of this equation are  $-8$  and  $10$ . Since a negative solution makes no sense for the number of people in a group, the number of friends originally in the group was  $10$ .

### QUESTION 32

**The correct answer is 31.** The equation can be solved using the steps shown below.

$$2(5x - 20) - 15 - 8x = 7$$

$2(5x) - 2(20) - 15 - 8x = 7$  (Apply the distributive property.)

$10x - 40 - 15 - 8x = 7$  (Multiply.)

$2x - 55 = 7$  (Combine like terms.)

$2x = 62$  (Add 55 to both sides of the equation.)

$x = 31$  (Divide both sides of the equation by 2.)

### QUESTION 33

**The possible correct answers are 97, 98, 99, 100, and 101.** The volume of a cylinder can be found by using the formula  $V = \pi r^2 h$ , where  $r$  is the radius of the circular base and  $h$  is the height of the cylinder. The smallest possible volume, in cubic inches, of a graduated cylinder produced by the laboratory supply company can be found by substituting 2 for  $r$  and 7.75 for  $h$ , giving  $V = \pi(2^2)(7.75)$ . This gives a volume of approximately 97.39 cubic inches, which rounds to 97 cubic inches. The largest possible volume, in cubic inches, can be found by substituting 2 for  $r$  and 8 for  $h$ , giving  $V = \pi(2^2)(8)$ . This gives a volume of approximately 100.53 cubic inches, which rounds to 101 cubic inches. Therefore, the possible volumes are all the integers greater than or equal to 97 and less than or equal to 101, which are 97, 98, 99, 100, and 101. Any of these numbers may be gridded as the correct answer.

### QUESTION 34

**The correct answer is 5.** The intersection points of the graphs of  $y = 3x^2 - 14x$  and  $y = x$  can be found by solving the system consisting of these two equations. To solve the system, substitute  $x$  for  $y$  in the first equation. This gives  $x = 3x^2 - 14x$ . Subtracting  $x$  from both sides of the equation gives  $0 = 3x^2 - 15x$ . Factoring  $3x$  out of each term on the left-hand side of the equation gives  $0 = 3x(x - 5)$ . Therefore, the possible values for  $x$  are 0 and 5. Since  $y = x$ , the two intersection points are  $(0, 0)$  and  $(5, 5)$ . Therefore,  $a = 5$ .

### QUESTION 35

**The correct answer is 1.25 or  $\frac{5}{4}$ .** The  $y$ -coordinate of the  $x$ -intercept is 0, so 0 can be

substituted for  $y$ , giving  $\frac{4}{5}x + \frac{1}{3}(0) = 1$ . This simplifies to  $\frac{4}{5}x = 1$ . Multiplying both sides of  $\frac{4}{5}x$

$= 1$  by 5 gives  $4x = 5$ . Dividing both sides of  $4x = 5$  by 4 gives  $x = \frac{5}{4}$ , which is equivalent to 1.25.

Either  $\frac{5}{4}$  or 1.25 may be gridded as the correct answer.

### QUESTION 36

**The correct answer is 2.6 or  $\frac{13}{5}$ .** Since the mean of a set of numbers can be found by adding the numbers together and dividing by how many numbers there are in the set, the mean mass, in kilograms, of the rocks Andrew collected is  $\frac{2.4 + 2.5 + 3.6 + 3.1 + 2.5 + 2.7}{6} = \frac{16.8}{6} = 2.8$ . Since the mean mass of the rocks Maria collected is 0.1 kilogram greater than the mean mass of rocks Andrew collected, the mean mass of the rocks Maria collected is  $2.8 + 0.1 = 2.9$  kilograms. The value of  $x$  can be found by using the algorithm for finding the mean:

$\frac{x + 3.1 + 2.7 + 2.9 + 3.3 + 2.8}{6} = 2.9$ . Solving this equation gives  $x = 2.6$ , which is equivalent to  $\frac{13}{5}$ . Either 2.6 or  $\frac{13}{5}$  may be gridded as the correct answer.

### QUESTION 37

**The correct answer is 30.** The situation can be represented by the equation  $x(2^4) = 480$ , where the 2 represents the fact that the amount of money in the account doubled each year and the 4 represents the fact that there are 4 years between January 1, 2001, and January 1, 2005. Simplifying  $x(2^4) = 480$  gives  $16x = 480$ . Therefore,  $x = 30$ .

### QUESTION 38

**The correct answer is 8.** The 6 students represent  $(100 - 15 - 45 - 25)\% = 15\%$  of those invited to join the committee. If  $x$  people were invited to join the committee, then  $0.15x = 6$ . Thus,

there were  $\frac{6}{0.15} = 40$  people invited to join the committee. It follows that there were  $0.45(40) = 18$  teachers and  $0.25(40) = 10$  school and district administrators invited to join the committee. Therefore, there were 8 more teachers than school and district administrators invited to join the committee.