

PSATTM 10

Practice Test #1

Make time to take the practice test.
It's one of the best ways to get ready
for the PSAT 10.

After you take the practice test, score it right away
at .

Take the practice test on the following pages to become familiar with the kinds of questions on the PSAT™ 10. The test you take in school will contain the same four sections as this practice test: (1) a Reading Test, (2) a Writing and Language Test, (3) a portion of the Math Test on which a calculator is not allowed, and (4) a portion of the Math Test on which a calculator is allowed.

This is Practice Test #1. For Practice Test #2, as well as practice tests in MP3 audio and other formats, go to www.collegeboard.org/psat10. You can also call 212-713-8333 to request a practice test in specific formats.

Set aside about 3 hours to take the entire test (this includes two breaks), and use the practice answer sheet on pages 3–6. Have your calculator available only for the Math Test – Calculator section. After the test, check your answers to see how you scored.

- ☐ Use a No. 2 pencil.
- ☐ See “Marking Answers” below for instructions on marking your answer sheet.

Try these out when you take the practice test:

- ☐ **Focus on easy questions first.** You receive one point for each correct answer, no matter how hard or easy the question is.
- ☐ **Work steadily.** Use a watch to help with pacing. Don’t waste time on a question that is hard for you. If you cannot answer it, mark it in your test book and go on. Go back to it later if there is time.
- ☐ **It’s okay to guess** (see below).
- ☐ **Mark your answers in the correct row on the answer sheet.** Be especially careful if you skip questions.
- ☐ **For Math Test – No Calculator questions 14–17 and Math Test – Calculator questions 28–31, first write your answer in the boxes above the bubbles,** and then grid your answer accurately and as completely as the grid will accommodate. If you mark incorrect bubbles, the answer will be scored as incorrect, even if the right answer is given in the boxes. Double-check your grids to ensure that you haven’t marked more than one bubble in the same column.

You don’t have to get every question right. You can do well even if you answer some questions incorrectly.

STANDARD TIMING

Reading Test: **60 minutes**
Writing and Language Test: **35 minutes**

Math Test – No Calculator: **25 minutes**
Math Test – Calculator: **45 minutes**

SCORING

Each correct answer: One point
Wrong/blank answers: No points lost

GUESSING

There is no penalty for wrong answers, so it makes sense to give the best answer you can to every question, even if it is just your best guess.

MARKING ANSWERS

Make sure each mark is dark and completely fills the bubble. If you erase, do so completely. You may use the test book for scratch work, but for the actual test you will not receive credit for anything you write there.

CHECKING ANSWERS

When you take the test, you may check your work on a particular section if you finish it before time is called, but *you may not turn to any other section.*

PSAT 10 PRACTICE ANSWER SHEET

COMPLETE MARK ●

EXAMPLES OF
INCOMPLETE MARKS



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

TEST NUMBER

SECTION 1

ENTER TEST NUMBER

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

0 1

0	●	○
1	○	●
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5	○	○
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7	○	○
8	○	○
9	○	○

1	A B C D	13	A B C D	25	A B C D	37	A B C D
2	A B C D	14	A B C D	26	A B C D	38	A B C D
3	A B C D	15	A B C D	27	A B C D	39	A B C D
4	A B C D	16	A B C D	28	A B C D	40	A B C D
5	A B C D	17	A B C D	29	A B C D	41	A B C D
6	A B C D	18	A B C D	30	A B C D	42	A B C D
7	A B C D	19	A B C D	31	A B C D	43	A B C D
8	A B C D	20	A B C D	32	A B C D	44	A B C D
9	A B C D	21	A B C D	33	A B C D	45	A B C D
10	A B C D	22	A B C D	34	A B C D	46	A B C D
11	A B C D	23	A B C D	35	A B C D	47	A B C D
12	A B C D	24	A B C D	36	A B C D		



Download the College Board SAT Practice app to instantly score this test.
Learn more at collegeboard.org/psatscoring.

PSAT 10 PRACTICE ANSWER SHEET
COMPLETE MARK ●

**EXAMPLES OF
INCOMPLETE MARKS**


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SECTION 2

1 A B C D
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43 A B C D
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44 A B C D
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If you're scoring with our mobile app we recommend that you cut these pages out. The scoring does best with a flat page.



PSAT 10 PRACTICE ANSWER SHEET

COMPLETE MARK ●

EXAMPLES OF
INCOMPLETE MARKS



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

SECTION 3

1	A B C D	4	A B C D	7	A B C D	10	A B C D	13	A B C D
2	A B C D	5	A B C D	8	A B C D	11	A B C D		
3	A B C D	6	A B C D	9	A B C D	12	A B C D		

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

14	15	16	17
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2 ○ ○ ○ ○	2 ○ ○ ○ ○	2 ○ ○ ○ ○	2 ○ ○ ○ ○
3 ○ ○ ○ ○	3 ○ ○ ○ ○	3 ○ ○ ○ ○	3 ○ ○ ○ ○
4 ○ ○ ○ ○	4 ○ ○ ○ ○	4 ○ ○ ○ ○	4 ○ ○ ○ ○
5 ○ ○ ○ ○	5 ○ ○ ○ ○	5 ○ ○ ○ ○	5 ○ ○ ○ ○
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Did you know that you can print out these test sheets from the web? Learn more at sat.org/scoring.

NO CALCULATOR
ALLOWED



PSAT 10 PRACTICE ANSWER SHEET

COMPLETE MARK ●

EXAMPLES OF
INCOMPLETE MARKS



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SECTION 4

1 ☐ A ☐ B ☐ C ☐ D	7 ☐ A ☐ B ☐ C ☐ D	13 ☐ A ☐ B ☐ C ☐ D	19 ☐ A ☐ B ☐ C ☐ D	25 ☐ A ☐ B ☐ C ☐ D
2 ☐ A ☐ B ☐ C ☐ D	8 ☐ A ☐ B ☐ C ☐ D	14 ☐ A ☐ B ☐ C ☐ D	20 ☐ A ☐ B ☐ C ☐ D	26 ☐ A ☐ B ☐ C ☐ D
3 ☐ A ☐ B ☐ C ☐ D	9 ☐ A ☐ B ☐ C ☐ D	15 ☐ A ☐ B ☐ C ☐ D	21 ☐ A ☐ B ☐ C ☐ D	27 ☐ A ☐ B ☐ C ☐ D
4 ☐ A ☐ B ☐ C ☐ D	10 ☐ A ☐ B ☐ C ☐ D	16 ☐ A ☐ B ☐ C ☐ D	22 ☐ A ☐ B ☐ C ☐ D	
5 ☐ A ☐ B ☐ C ☐ D	11 ☐ A ☐ B ☐ C ☐ D	17 ☐ A ☐ B ☐ C ☐ D	23 ☐ A ☐ B ☐ C ☐ D	
6 ☐ A ☐ B ☐ C ☐ D	12 ☐ A ☐ B ☐ C ☐ D	18 ☐ A ☐ B ☐ C ☐ D	24 ☐ A ☐ B ☐ C ☐ D	

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

28	29	30	31
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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 ☐ ☐ ☐ ☐
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CALCULATOR
ALLOWED



If you're using our mobile app keep in mind that bad lighting and even shadows cast over the answer sheet can affect your score. Be sure to scan this in a well-lit area for best results.



Reading Test

60 MINUTES, 47 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 1-9 are based on the following passage.

This passage is adapted from Jane Austen, *Emma*, originally published in 1815.

Emma Woodhouse, handsome, clever, and rich, with a comfortable home and happy disposition, seemed to unite some of the best blessings of
Line 5 the world with very little to distress or vex her.

She was the youngest of the two daughters of a most affectionate, indulgent father, and had, in consequence of her sister's marriage, been mistress of his house from a very early period. Her mother had
Line 10 died too long ago for her to have more than an indistinct remembrance of her caresses, and her place had been supplied by an excellent woman as governess, who had fallen little short of a mother in affection.

Line 15 Sixteen years had Miss Taylor been in Mr. Woodhouse's family, less as a governess than a friend, very fond of both daughters, but particularly of Emma. Between *them* it was more the intimacy of sisters. Even before Miss Taylor had ceased to hold
Line 20 the nominal office of governess, the mildness of her temper had hardly allowed her to impose any restraint; and the shadow of authority being now long passed away, they had been living together as friend and friend very mutually attached, and Emma
Line 25 doing just what she liked; highly esteeming Miss Taylor's judgment, but directed chiefly by her own.

The real evils indeed of Emma's situation were the power of having rather too much her own way, and a
Line 30 disposition to think a little too well of herself; these were the disadvantages which threatened alloy to her many enjoyments. The danger, however, was at present so unperceived, that they did not by any means rank as misfortunes with her.

Line 35 Sorrow came—a gentle sorrow—but not at all in the shape of any disagreeable consciousness.—Miss Taylor married. It was Miss Taylor's loss which first brought grief. It was on the wedding-day of this beloved friend that Emma
Line 40 first sat in mournful thought of any continuance. The wedding over and the bride-people gone, her father and herself were left to dine together, with no prospect of a third to cheer a long evening. Her father composed himself to sleep after dinner, as
Line 45 usual, and she had then only to sit and think of what she had lost.

The event had every promise of happiness for her friend. Mr. Weston was a man of unexceptionable character, easy fortune, suitable age and pleasant
Line 50 manners; and there was some satisfaction in considering with what self-denying, generous friendship she had always wished and promoted the match; but it was a black morning's work for her. The want of Miss Taylor would be felt every hour of
Line 55 every day. She recalled her past kindness—the kindness, the affection of sixteen years—how she had taught and how she had played with her from five years old—how she had devoted all her powers to attach and amuse her in health—and how nursed her
Line 60 through the various illnesses of childhood. A large

debt of gratitude was owing here; but the intercourse of the last seven years, the equal footing and perfect unreserve which had soon followed Isabella's marriage on their being left to each other, was yet a dearer, tenderer recollection. It had been a friend and companion such as few possessed, intelligent, well-informed, useful, gentle, knowing all the ways of the family, interested in all its concerns, and peculiarly interested in herself, in every pleasure, every scheme of her's;—one to whom she could speak every thought as it arose, and who had such an affection for her as could never find fault.

How was she to bear the change?—It was true that her friend was going only half a mile from them; but Emma was aware that great must be the difference between a Mrs. Weston only half a mile from them, and a Miss Taylor in the house; and with all her advantages, natural and domestic, she was now in great danger of suffering from intellectual solitude. She dearly loved her father, but he was no companion for her. He could not meet her in conversation, rational or playful.

The evil of the actual disparity in their ages (and Mr. Woodhouse had not married early) was much increased by his constitution and habits; for having been a valetudinarian* all his life, without activity of mind or body, he was a much older man in ways than in years; and though everywhere beloved for the friendliness of his heart and his amiable temper, his talents could not have recommended him at any time.

* a person in weak health who is overly concerned with his or her ailments

1

The main purpose of the passage is to

- A) describe a main character and a significant change in her life.
- B) provide an overview of a family and a nearby neighbor.
- C) discuss some regrettable personality flaws in a main character.
- D) explain the relationship between a main character and her father.

2

Which choice best summarizes the first two paragraphs of the passage (lines 1-14)?

- A) Even though a character loses a parent at an early age, she is happily raised in a loving home.
- B) An affectionate governess helps a character to overcome the loss of her mother, despite the indifference of her father.
- C) Largely as a result of her father's wealth and affection, a character leads a contented life.
- D) A character has a generally comfortable and fulfilling life, but then she must recover from losing her mother.

3

The narrator indicates that the particular nature of Emma's upbringing resulted in her being

- A) despondent.
- B) self-satisfied.
- C) friendless.
- D) inconsiderate.

4

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

- A) Lines 1-5 ("Emma . . . her")
- B) Lines 9-14 ("Her . . . affection")
- C) Lines 28-32 ("The real . . . enjoyments")
- D) Lines 32-34 ("The danger . . . her")

5

As used in line 26, "directed" most nearly means

- A) trained.
- B) aimed.
- C) guided.
- D) addressed.

6

As used in line 54, “want” most nearly means

- A) desire.
- B) lack.
- C) requirement.
- D) request.

7

It can most reasonably be inferred that after Miss Taylor married, she had

- A) less patience with Mr. Woodhouse.
- B) fewer interactions with Emma.
- C) more close friends than Emma.
- D) an increased appreciation for Emma.

8

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

- A) Line 37 (“Miss . . . married”)
- B) Lines 47-48 (“The event . . . friend”)
- C) Lines 60-65 (“A large . . . recollection”)
- D) Lines 73-79 (“How . . . solitude”)

9

Which situation is most similar to the one described in lines 83-91 (“The evil . . . time”)?

- A) A mother and her adult son have distinct tastes in art and music that result in repeated family arguments.
- B) The differences between an older and a younger friend are magnified because the younger one is more active and athletic.
- C) An older and a younger scientist remain close friends despite the fact that the older one’s work is published more frequently.
- D) The age difference between a high school student and a college student becomes a problem even though they enjoy the same diversions.

Questions 10-19 are based on the following passage and supplementary material.

This passage is adapted from Marina Gorbis, *The Nature of the Future: Dispatches from the Socialstructured World*. ©2013 by Marina Gorbis.

- Visitors to the Soviet Union in the 1960s and 1970s always marveled at the gap between what they saw in state stores—shelves empty or filled with things no one wanted—and what they saw in people’s homes: nice furnishings and tables filled with food. What filled the gap? A vast informal economy driven by human relationships, dense networks of social connections through which people traded resources and created value. The Soviet people didn’t plot how they would build these networks. No one was teaching them how to maximize their connections the way social marketers eagerly teach us today. Their networks evolved naturally, out of necessity; that was the only way to survive.
- Today, all around the world, we are seeing a new kind of network of relationship-driven economics emerging, with individuals joining forces sometimes to fill the gaps left by existing institutions—corporations, governments, educational establishments—and sometimes creating new products, services, and knowledge that no institution is able to provide. Empowered by computing and communication technologies that have been steadily building village-like networks on a global scale, we are infusing more and more of our economic transactions with social connectedness.
- The new technologies are inherently social and personal. They help us create communities around interests, identities, and common personal challenges. They allow us to gain direct access to a worldwide community of others. And they take anonymity out of our economic transactions. We can assess those we don’t know by checking their reputations as buyers and sellers on eBay or by following their Twitter streams. We can look up their friends on Facebook and watch their YouTube videos. We can easily get people’s advice on where to find the best shoemaker in Brazil, the best

programmer in India, and the best apple farmer in
 40 our local community. We no longer have to rely on
 bankers or venture capitalists as the only sources of
 funding for our ideas. We can raise funds directly
 from individuals, most of whom we don't even know,
 45 post descriptions of their projects and generate
 donations, investments, or loans.

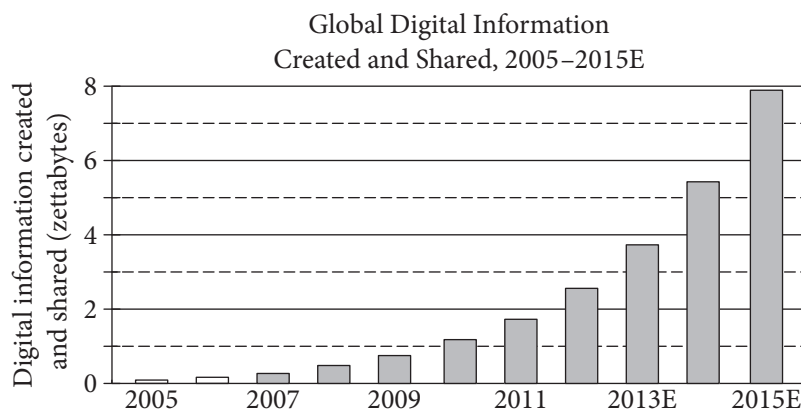
We are moving away from the dominance of the
 depersonalized world of institutional production and
 creating a new economy around social connections
 50 and social rewards—a process I call *socialstructing*.
 Others have referred to this model of production as
 social, commons-based, or peer-to-peer. Not only is
 this new social economy bringing with it an
 unprecedented level of familiarity and connectedness
 55 to both our global and our local economic exchanges,
 but it is also changing every domain of our lives,
 from finance to education and health. It is rapidly
 ushering in a vast array of new opportunities for us
 to pursue our passions, create new types of
 60 businesses and charitable organizations, redefine the
 nature of work, and address a wide range of
 problems that the prevailing formal economy has
 neglected, if not caused.

Socialstructing is in fact enabling not only a new
 65 kind of global economy but a new kind of society, in
 which amplified individuals—individuals

empowered with technologies and the collective
 intelligence of others in their social network—can
 take on many functions that previously only large
 70 organizations could perform, often more efficiently,
 at lower cost or no cost at all, and with much greater
 ease. Socialstructing is opening up a world of what
 my colleagues Jacques Vallée and Bob Johansen
 describe as the world of impossible futures, a world
 75 in which a large software firm can be displaced by
 weekend software hackers, and rapidly orchestrated
 social movements can bring down governments in a
 matter of weeks. The changes are exciting and
 unpredictable. They threaten many established
 80 institutions and offer a wealth of opportunities for
 individuals to empower themselves, find rich new
 connections, and tap into a fast-evolving set of new
 resources in everything from health care to education
 and science.

85 Much has been written about how technology
 distances us from the benefits of face-to-face
 communication and quality social time. I think those
 are important concerns. But while the quality of our
 face-to-face interactions is changing, the
 90 countervailing force of socialstructing is connecting
 us at levels never seen before, opening up new
 opportunities to create, learn, and share.

The following graph, from a 2011 report from the International Data Corporation, projects trends in digital information use to 2015
 (E=Estimated).



Note: 1 zettabyte = 1 trillion gigabytes

10

As used in line 10, “plot” most nearly means

- A) mark.
- B) form.
- C) plan.
- D) claim.

11

The references to the shoemaker, the programmer, and the apple farmer in lines 37-40 (“We can easily . . . community”) primarily serve to

- A) illustrate the quality of products and services in countries around the world.
- B) emphasize the broad reach of technologies used to connect people.
- C) demonstrate that recommendations made online are trustworthy.
- D) call attention to the limits of the expansion of the global economy.

12

The passage’s discussion of life in the Soviet Union in the 1960s and 1970s primarily serves to

- A) introduce the concept of social networking.
- B) demonstrate that technology has improved social connections.
- C) list differences between the Soviet Union and other countries.
- D) emphasize the importance of examining historical trends.

13

As used in line 45, “post” most nearly means

- A) publish.
- B) transfer.
- C) assign.
- D) denounce.

14

The author indicates that, in comparison to individuals, traditional organizations have tended to be

- A) more innovative and less influential.
- B) larger in size and less subject to regulations.
- C) less reliable and less interconnected.
- D) less efficient and more expensive.

15

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

- A) Lines 22-26 (“Empowered . . . connectedness”)
- B) Lines 40-42 (“We no longer . . . ideas”)
- C) Lines 47-50 (“We are moving . . . *socialstructing*”)
- D) Lines 66-72 (“amplified . . . ease”)

16

The author recognizes counterarguments to the position she takes in the passage by

- A) acknowledging the risks and drawbacks associated with new technologies and social networks.
- B) admitting that some people spend too much time unproductively on the Internet.
- C) drawing an analogy between conditions today and conditions in the Soviet Union of the 1960s and 1970s.
- D) conceding that the drawbacks of socialstructing may prove over time to outweigh the benefits.

17

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

- A) Lines 35-37 (“We can look . . . videos”)
- B) Lines 74-76 (“a world . . . hackers”)
- C) Lines 79-84 (“They . . . science”)
- D) Lines 85-87 (“Much . . . time”)

18

Which statement best summarizes the information presented in the graph?

- A) Far more people around the world own computers and cell phones today than in 2005.
- B) The number of people sharing digital information has more than tripled since 2005.
- C) The volume of digital information created and shared has increased tremendously in recent years.
- D) The amount of digital information created and shared is likely to be almost 8 zettabytes in 2015.

19

According to the graph, which statement is true about the amount of digital information projected to be created and shared globally in 2012?

- A) Growth in digital information creation and sharing was projected to be wildly out of proportion to growth in 2011 and 2013E.
- B) The amount of digital information created and shared was projected to begin a new upward trend.
- C) The amount of digital information created and shared was projected to peak.
- D) The amount of digital information created and shared was projected to pass 2 zettabytes for the first time.

Questions 20-28 are based on the following passage and supplementary material.

This passage is adapted from Tina Hesman Saey, "Lessons from the Torpid." ©2012 by Society for Science & the Public.

Understanding how hibernators, including ground squirrels, marmots and bears, survive their long winter's naps may one day offer solutions for problems such as heart disease, osteoporosis and muscular dystrophy.

Nearly everything about the way an animal's body works changes when it hibernates, and preparations start weeks or months in advance. The first order of business is to fatten up.

"Fat is where it's at for a hibernator," says Matthew Andrews, a molecular biologist at the University of Minnesota Duluth who studies 13-lined ground squirrels. "You bring your own lunch with you." Packing lunch is necessary because the animals go on the world's strictest diet during the winter, surviving entirely off their white fat. "They have their last supper in October; they don't eat again until March," Andrews says.

Bigger fat stores mean a greater chance of surviving until spring. "If they go in really chunky, nice and roly-poly, that's going to be a good hibernator," he says.

Bears also watch their waistlines expand in the months before settling in for the season. The brown bears cardiologist Ole Frøbert studies pack on the pounds by chowing down on up to 40 kilograms of blueberries a day. Such gluttony among humans could have severe consequences: Obesity is associated with a greater risk of heart attack and diabetes, among other ailments.

To see how fattening up affects Scandinavian brown bears, Frøbert and his colleagues ventured into the wilds of Sweden following signals given off by radio transmitters or GPS devices on tagged bears.

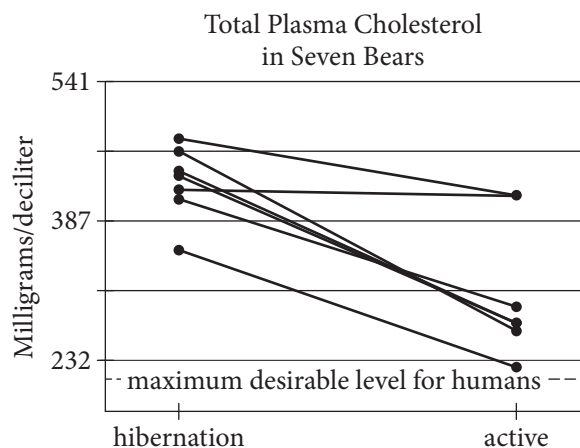
Bears can be dangerous close-up. Even hibernating bears can rouse to action quickly, so scientists tracking down bears in the winter use darts to tranquilize the animals from a distance. Scientists studying the bears in the summer tranquilize them from a helicopter.

Once a bear is under the tranquilizer's influence (which takes about five minutes), the scientists have 60 minutes max to get the animal from its den, weigh and measure it, draw blood samples and do minor surgeries to collect fat and other tissues. The bear is returned to its den by minute 61.

Precious materials collected during this high-pressure encounter need to be analyzed within 24 hours, so the researchers often test for levels of cholesterol or certain proteins in the blood while working in the snow or at a nearby research station. A pilot sometimes flies samples from field sites to a lab in Denmark in order to meet the deadline, Frøbert says. Samples such as bones and arteries that can't be collected from live bears come from bears killed by hunters during the legal hunting season.

Recent analyses revealed that Scandinavian brown bears spend the summer with plasma cholesterol levels considered high for humans; those values then increase substantially for hibernation, Frøbert and his colleagues reported. These "very, very fat" bears with high cholesterol also get zero exercise during hibernation. Lolling about in the den pinches off blood vessels, contributing to sluggish circulation. "That cocktail would not be advisable in humans," Frøbert says. It's a recipe for hardened arteries, putting people at risk for heart attacks and strokes.

Even healthy young adult humans can develop fatty streaks in their arteries that make the blood vessels less flexible, but the bears don't build up such artery-hardening streaks. "Our bears, they had nothing," Frøbert says. It's not yet clear how the bears keep their arteries flexible, but Frøbert hopes to find some protective molecule that could stave off hardened arteries in humans as well.



20

The passage is written from the perspective of someone who is

- A) actively involved in conducting hibernator research.
- B) a participant in a recent debate in the field of cardiology.
- C) knowledgeable about advances in hibernator research.
- D) an advocate for wildlife preservation.

21

It is reasonable to conclude that the main goal of the scientists conducting the research described in the passage is to

- A) learn how the hibernation patterns of bears and squirrels differ.
- B) determine the role that fat plays in hibernation.
- C) illustrate the important health benefits of exercise for humans.
- D) explore possible ways to prevent human diseases.

22

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

- A) Lines 1-5 (“Understanding . . . dystrophy”)
- B) Lines 10-13 (“Fat . . . squirrels”)
- C) Lines 31-35 (“To . . . bears”)
- D) Lines 42-46 (“Once . . . tissues”)

23

What main effect do the quotations by Andrews in lines 10-18 have on the tone of the passage?

- A) They create a bleak tone, focusing on the difficulties hibernators face during the winter.
- B) They create a conversational tone, relating scientific information in everyday language.
- C) They create an ominous tone, foreshadowing the dire results of Andrews’s research.
- D) They create an absurd tone, using images of animals acting as if they were human.

24

As used in line 19, “stores” most nearly means

- A) preservatives.
- B) reserves.
- C) stacks.
- D) shelters.

25

Based on the passage, what is Fröbert’s hypothesis regarding why bears’ arteries do not harden during hibernation?

- A) The bears’ increased plasma cholesterol causes the arteries to be more flexible.
- B) Sluggish circulation pinches off the blood vessels rather than hardening the arteries.
- C) Bears exercise in short, infrequent bursts during hibernation, which staves off hardened arteries.
- D) Bears possess a molecule that protects against hardened arteries.

26

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

- A) Lines 19-20 (“Bigger . . . spring”)
- B) Lines 24-27 (“The brown . . . day”)
- C) Lines 69-72 (“Even . . . streaks”)
- D) Lines 73-76 (“It’s . . . well”)

27

What information discussed in paragraph 10 (lines 58-68) is represented by the graph?

- A) The information in lines 58-62 (“Recent . . . reported”)
- B) The information in lines 62-64 (“These . . . hibernation”)
- C) The information in lines 64-65 (“Lolling . . . circulation”)
- D) The information in lines 67-68 (“It’s . . . strokes”)

28

Which statement about the effect of hibernation on the seven bears is best supported by the graph?

- A) Only one of the bears did not experience an appreciable change in its total plasma cholesterol level.
- B) Only one of the bears experienced a significant increase in its total plasma cholesterol level.
- C) All of the bears achieved the desirable plasma cholesterol level for humans.
- D) The bear with the lowest total plasma cholesterol level in its active state had the highest total plasma cholesterol level during hibernation.

Questions 29-37 are based on the following passage.

This passage is from Andrew Carnegie, "Wealth," originally published in 1889. Arriving penniless in Pennsylvania from Scotland in 1848, Carnegie became one of the richest people in the United States through the manufacture of steel.

The problem of our age is the proper administration of wealth, that the ties of brotherhood may still bind together the rich and poor in harmonious relationship. The conditions of human life have not only been changed, but revolutionized, within the past few hundred years. In former days there was little difference between the dwelling, dress, food, and environment of the chief and those of his retainers. . . . The contrast between the palace of the millionaire and the cottage of the laborer with us to-day measures the change which has come with civilization. This change, however, is not to be deplored, but welcomed as highly beneficial. It is well, nay, essential, for the progress of the race that the houses of some should be homes for all that is highest and best in literature and the arts, and for all the refinements of civilization, rather than that none should be so. Much better this great irregularity than universal squalor. Without wealth there can be no Maecenas.* The "good old times" were not good old times. Neither master nor servant was as well situated then as to-day. A relapse to old conditions would be disastrous to both—not the least so to him who serves—and would sweep away civilization with it. But whether the change be for good or ill, it is upon us, beyond our power to alter, and, therefore, to be accepted and made the best of. It is a waste of time to criticize the inevitable.

It is easy to see how the change has come. One illustration will serve for almost every phase of the cause. In the manufacture of products we have the whole story. It applies to all combinations of human industry, as stimulated and enlarged by the inventions of this scientific age. Formerly, articles were manufactured at the domestic hearth, or in small shops which formed part of the household. The master and his apprentices worked side by side,

the latter living with the master, and therefore subject to the same conditions. When these apprentices rose to be masters, there was little or no change in their mode of life, and they, in turn, educated succeeding apprentices in the same routine. There was, substantially, social equality, and even political equality, for those engaged in industrial pursuits had then little or no voice in the State.

The inevitable result of such a mode of manufacture was crude articles at high prices. To-day the world obtains commodities of excellent quality at prices which even the preceding generation would have deemed incredible. In the commercial world similar causes have produced similar results, and the race is benefited thereby. The poor enjoy what the rich could not before afford. What were the luxuries have become the necessities of life. The laborer has now more comforts than the farmer had a few generations ago. The farmer has more luxuries than the landlord had, and is more richly clad and better housed. The landlord has books and pictures rarer and appointments more artistic than the king could then obtain.

The price we pay for this salutary change is, no doubt, great. We assemble thousands of operatives in the factory, and in the mine, of whom the employer can know little or nothing, and to whom he is little better than a myth. All intercourse between them is at an end. Rigid castes are formed, and, as usual, mutual ignorance breeds mutual distrust. Each caste is without sympathy for the other, and ready to credit anything disparaging in regard to it. Under the law of competition, the employer of thousands is forced into the strictest economies, among which the rates paid to labor figure prominently, and often there is friction between the employer and the employed, between capital and labor, between rich and poor. Human society loses homogeneity.

The price which society pays for the law of competition, like the price it pays for cheap comforts and luxuries, is also great; but the advantages of this law are also greater still than its cost—for it is to this law that we owe our wonderful material development, which brings improved conditions in its train.

* Gaius Maecenas (70–8 B.C.E.) was a great patron of the arts.

29

Which choice best describes the structure of the first paragraph?

- A) A personal history is narrated, historical examples are given, and a method is recommended.
- B) A position is stated, historical context is given, and earnest advice is given.
- C) Certain principles are stated, opposing principles are stated, and a consensus is reached.
- D) A historical period is described, and its attributes are reviewed.

30

The author most strongly implies which of the following about “the ties of brotherhood” (line 2)?

- A) They were always largely fictitious and are more so at present.
- B) They are stronger at present than they ever were before.
- C) They are more seriously strained in the present than in the past.
- D) They will no longer be able to bring together the rich and the poor.

31

The author uses “dwelling, dress, food, and environment” (lines 7-8) as examples of

- A) things more valued in the present than in the past.
- B) bare necessities of life.
- C) things to which all people are entitled.
- D) possible indications of differences in status.

32

The author describes the people who live in the “houses of some” (line 15) as interested in the

- A) materials from which their houses are constructed.
- B) size of their homes.
- C) advantages of culture.
- D) pedigree of their guests.

33

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

- A) Lines 9-10 (“the palace . . . laborer”)
- B) Lines 15-16 (“all . . . arts”)
- C) Lines 18-19 (“Much . . . squalor”)
- D) Lines 19-20 (“Without . . . Maecenas”)

34

The author uses the phrase “good old times” (line 20) as an example of

- A) a cliché that still has life and usefulness left in it.
- B) a bit of folk wisdom from his childhood.
- C) something said by those who have acquired great riches.
- D) something said by people who do not share his viewpoint.

35

What is the author’s main point about the disadvantages of the modern economic system?

- A) It provides only a few people with the advantages of culture.
- B) It replicates many of the problems experienced in the past.
- C) It creates divisions between different categories of people.
- D) It gives certain people great material advantages over others.

36

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

- A) Lines 37-39 (“The master . . . conditions”)
- B) Lines 43-45 (“There was . . . State”)
- C) Lines 46-47 (“The inevitable . . . prices”)
- D) Lines 65-66 (“All intercourse . . . end”)

37

As used in line 82, “in its train” is closest in meaning to

- A) before it.
- B) with it.
- C) anticipating it.
- D) advancing it.

Questions 38-47 are based on the following passages.

Passage 1 is adapted from Stewart Brand, "The Case for Reviving Extinct Species." ©2013 by the National Geographic Society. Passage 2 is adapted from the editors at *Scientific American*, "Why Efforts to Bring Extinct Species Back from the Dead Miss the Point." ©2013 by Nature America, Inc.

Passage 1

Many extinct species—from the passenger pigeon to the woolly mammoth—might now be reclassified as "bodily, but not genetically, extinct." They're dead, but their DNA is recoverable from museum specimens and fossils, even those up to 200,000 years old.

Thanks to new developments in genetic technology, that DNA may eventually bring the animals back to life. Only species whose DNA is too old to be recovered, such as dinosaurs, are the ones to consider totally extinct, bodily and genetically.

But why bring vanished creatures back to life? It will be expensive and difficult. It will take decades. It won't always succeed. Why even try?

Why do we take enormous trouble to protect endangered species? The same reasons will apply to species brought back from extinction: to preserve biodiversity, to restore diminished ecosystems, to advance the science of preventing extinctions, and to undo harm that humans have caused in the past.

Furthermore, the prospect of de-extinction is profound news. That something as irreversible and final as extinction might be reversed is a stunning realization. The imagination soars. Just the thought of mammoths and passenger pigeons alive again invokes the awe and wonder that drives all conservation at its deepest level.

Passage 2

The idea of bringing back extinct species holds obvious gee-whiz appeal and a respite from a steady stream of grim news. Yet with limited intellectual bandwidth and financial resources to go around, de-extinction threatens to divert attention from the modern biodiversity crisis. According to a 2012 report from the International Union for Conservation of Nature, some 20,000 species are currently in grave danger of going extinct. Species today are vanishing in such great numbers—many from hunting and habitat

destruction—that the trend has been called a sixth mass extinction, an event on par with such die-offs as the one that befell the dinosaurs 65 million years ago. A program to restore extinct species poses a risk of selling the public on a false promise that technology alone can solve our ongoing environmental woes—an implicit assurance that if a species goes away, we can snap our fingers and bring it back.

Already conservationists face difficult choices about which species and ecosystems to try to save, since they cannot hope to rescue them all. Many countries where poaching and trade in threatened species are rampant either do not want to give up the revenue or lack the wherewithal to enforce their own regulations. Against that backdrop, a costly and flamboyant project to resuscitate extinct flora and fauna in the name of conservation looks irresponsible: Should we resurrect the mammoth only to let elephants go under? Of course not.

That is not to say that the de-extinction enterprise lacks merit altogether. Aspects of it could conceivably help save endangered species. For example, extinct versions of genes could be reintroduced into species and subspecies that have lost a dangerous amount of genetic diversity, such as the black-footed ferret and the northern white rhino. Such investigations, however, should be conducted under the mantle of preserving modern biodiversity rather than conjuring extinct species from the grave.

38

The author of Passage 1 suggests that the usefulness of de-extinction technology may be limited by the

- A) amount of time scientists are able to devote to genetic research.
- B) relationship of an extinct species to contemporary ecosystems.
- C) complexity of the DNA of an extinct species.
- D) length of time that a species has been extinct.

39

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

- A) Lines 7-9 (“Thanks . . . life”)
- B) Lines 9-11 (“Only . . . genetically”)
- C) Line 13 (“It will be . . . difficult”)
- D) Lines 13-14 (“It will take . . . succeed”)

40

As used in line 27, “deepest” most nearly means

- A) most engrossing.
- B) most challenging.
- C) most extensive.
- D) most fundamental.

41

The authors of Passage 2 indicate that the matter of shrinking biodiversity should primarily be considered a

- A) historical anomaly.
- B) global catastrophe.
- C) scientific curiosity.
- D) political problem.

42

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

- A) Lines 37-41 (“Species . . . ago”)
- B) Lines 42-45 (“A program . . . woes”)
- C) Lines 53-56 (“Against . . . irresponsible”)
- D) Lines 65-67 (“Such . . . grave”)

43

As used in line 37, “great” most nearly means

- A) lofty.
- B) wonderful.
- C) large.
- D) intense.

44

The reference to the “black-footed ferret and the northern white rhino” (line 64) serves mainly to

- A) emphasize a key distinction between extinct and living species.
- B) account for types of animals whose numbers are dwindling.
- C) provide examples of species whose gene pools are compromised.
- D) highlight instances of animals that have failed to adapt to new habitats.

45

Which choice best states the relationship between the two passages?

- A) Passage 2 attacks a political decision that Passage 1 strongly advocates.
- B) Passage 2 urges caution regarding a technology that Passage 1 describes in favorable terms.
- C) Passage 2 expands on the results of a research study mentioned in Passage 1.
- D) Passage 2 considers practical applications that could arise from a theory discussed in Passage 1.

46

How would the authors of Passage 2 most likely respond to the “prospect” referred to in line 21, Passage 1?

- A) With approval, because it illustrates how useful de-extinction could be in addressing widespread environmental concerns.
- B) With resignation, because the gradual extinction of many living species is inevitable.
- C) With concern, because it implies an easy solution to a difficult problem.
- D) With disdain, because it shows that people have little understanding of the importance of genetic diversity.

47

Which choice would best support the claim that the authors of Passage 2 recognize that the “imagination soars” (line 24, Passage 1) in response to de-extinction technology?

- A) Lines 28-30 (“The . . . news”)
- B) Lines 30-33 (“Yet . . . crisis”)
- C) Lines 58-59 (“That . . . altogether”)
- D) Lines 61-63 (“For . . . diversity”)

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 Nod to Nodding Off

With 30 percent of United States workers not getting enough sleep at night, according to the *Wall Street Journal*, US companies **1** lose a yearly sum of \$63.2 billion annually due to the drop in employee productivity resulting from sleep deprivation. Sleep-deprived workers generally have lower morale and are less able to retain information than their better-rested colleagues.

1

- A) NO CHANGE
- B) see an annual loss of \$63.2 billion each year
- C) lose \$63.2 billion annually
- D) have a yearly loss of \$63.2 billion annually

[1] One of the **2** big reasons behind workers' lack of sleep is the work itself. [2] To combat the problem of sleep deprivation in a demanding work environment, some companies have begun allowing workers to take naps. [3] The hours the average American **3** spend working have increased dramatically since the 1970s, making it hard for many workers to get a good night's sleep. [4] Although employees who sleep on the job are often considered lazy and unproductive, napping in the workplace has been shown to improve workers' efficiency and quality of life. [5] As long as companies continue to demand long hours from **4** workers, and managers should champion napping as a means to keep employees happy, healthy, and functional. **5**

2

- A) NO CHANGE
- B) main things leading up to
- C) huge things about
- D) primary causes of

3

- A) NO CHANGE
- B) have spent
- C) spends
- D) are spent

4

- A) NO CHANGE
- B) workers; managers
- C) workers, managers,
- D) workers, managers

5

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

- A) where it is now.
- B) before sentence 1.
- C) after sentence 1.
- D) after sentence 4.

Such a proposition may seem counterintuitive, but, in fact, allowing employees to nap could save companies hours of lost productivity. Studies reveal that napping improves memory and boosts wakefulness for the remainder of the day. **6** Napping can also have a positive effect on mood and overall job satisfaction, while constant drowsiness reduces reaction time and hampers one's ability to concentrate. Employee naps might also lead to reduced health care costs for companies, since regular napping leads to long-term health benefits, **7** and it improves workers' average weekly attendance.

6

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

Even fifteen-minute power naps improve alertness, creativity, and concentration.

Should the writer make this addition here?

- A) Yes, because it demonstrates that the benefits of napping can be gained without sacrificing large amounts of work time.
- B) Yes, because it explains the methodology of the studies mentioned in the previous sentence.
- C) No, because a discussion of the type of nap workers take is not important to the writer's main point in the paragraph.
- D) No, because it contradicts the writer's discussion of napping in the previous sentences.

7

Which choice provides a supporting example that reinforces the main point of the sentence?

- A) NO CHANGE
- B) including a lower risk of cardiovascular problems such as heart attack and stroke.
- C) which are essential in an era of rising health care costs.
- D) in addition to making employees more efficient.

Napping at work has already won corporate advocates in the worlds of technology, finance, and news media, and some businesses are beginning to set aside special nap rooms. A few companies, such as Google, have even invested in high-tech nap pods that block out light, play soothing music, and **8** gently waking nappers.

Zephryn Lasker, CEO of the mobile-advertising firm Pontiflex, has observed that employees are happier and more productive since he created a nap room in the company's Brooklyn headquarters. Ryan Hodson of Kodiak Capital Group and Arianna Huffington of the Huffington Post Media Group have promoted napping **9** throughout their workers and have been effusive about the results. In light of the benefits not only to employees' efficiency **10** and again to their health and sense of well-being, these executives' enthusiasm is not surprising. **11** These executives are among the most successful leaders in their respective fields.

8

- A) NO CHANGE
- B) gently wake
- C) gently to wake
- D) gentle waking of

9

- A) NO CHANGE
- B) among
- C) between
- D) into

10

- A) NO CHANGE
- B) but it benefits
- C) as also to
- D) but also to

11

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

- A) NO CHANGE
- B) Clearly, employers should consider reducing employees' hours when they are overworked.
- C) Companies should consider employee schedules carefully when implementing a napping policy.
- D) More businesses should follow their lead and embrace napping on the job.

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

Vanishing Honeybees: A Threat to Global Agriculture

Honeybees play an important role in the agriculture industry by pollinating crops. An October 2006 study found that as much as one-third of global agriculture depends on animal pollination, including honeybee **12** pollination—to increase crop output. The importance of bees **13** highlights the potentially disastrous affects of an emerging, unexplained crisis: entire colonies of honeybees are dying off without warning.

14 They know it as colony collapse disorder (CCD), this phenomenon will have a detrimental impact on global agriculture if its causes and solutions are not determined. Since the emergence of CCD around 2006, bee mortality rates have **15** exceeded 25 percent of the population each winter. There was one sign of hope: during the 2010–2012 winter seasons, bee mortality rates decreased slightly, and beekeepers speculated that the colonies would recover. Yet in the winter of 2012–2013, the **16** portion of the bee population lost fell nearly 10 percent in the United States, with a loss of 31 percent of the colonies that pollinate crops.

12

- A) NO CHANGE
- B) pollination: this is
- C) pollination,
- D) pollination;

13

- A) NO CHANGE
- B) highlights the potentially disastrous effects
- C) highlight the potentially disastrous effects
- D) highlight the potentially disastrous affects

14

- A) NO CHANGE
- B) Known as colony
- C) It is known as colony
- D) Colony

15

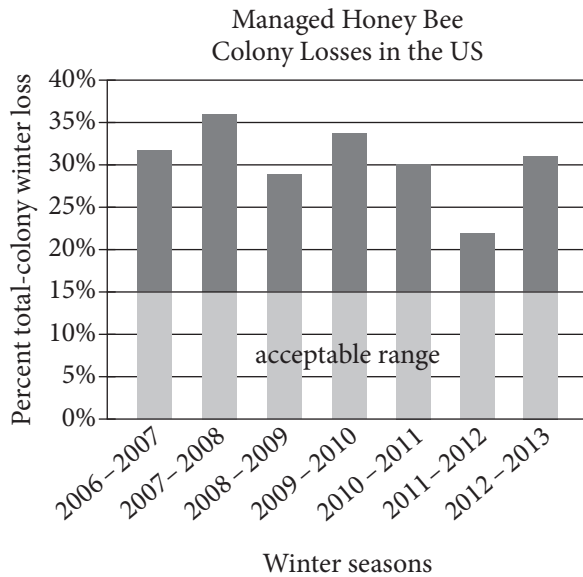
Which choice offers the most accurate interpretation of the data in the chart?

- A) NO CHANGE
- B) been above the acceptable range.
- C) not changed noticeably from year to year.
- D) greatly increased every year.

16

Which choice offers an accurate interpretation of the data in the chart?

- A) NO CHANGE
- B) portion of bees lost was double what it had been the previous year, rising to
- C) number of losses, which had fallen within the acceptable range the previous year, rose to
- D) portion of total colonies lost rose almost 10 percentage points, with a loss of



Adapted from Dennis van Engelsdorp et al., "Preliminary Results: Honey Bee Colony Losses in the United States, Winter 2012-2013." ©2013 by the Bee Informed Partnership.

17 Studies have offered several possible reasons that bees are vanishing. One reason that is often cited is the use of pesticides called neonicotinoids, which are absorbed by plants and linger much longer than do topical pesticides. **18** Chemicals such as herbicides and fungicides may also play a role, contaminating the pollen that bees typically feed on and inhibiting healthy insect maturation.

17

Which choice most smoothly and effectively introduces the writer's discussion of studies of CCD in this paragraph?

- A) NO CHANGE
- B) Bees are vanishing, and according to studies there are several possible reasons for this trend.
- C) Several possible reasons, offered by studies, may explain why bees are vanishing.
- D) DELETE the underlined sentence.

18

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

Prolonged exposure to neonicotinoids has been shown to increase bees' vulnerability to disease and parasitic mites.

Should the writer make this addition here?

- A) Yes, because it provides support for the claim made in the previous sentence.
- B) Yes, because it introduces a new idea that will become important later in the passage.
- C) No, because it would be better placed elsewhere in the passage.
- D) No, because it contradicts the main idea of the passage.

Given the role that honeybees play in agriculture, the impact of this loss of hives on fruit, vegetable, seed, and nut crops **19** is not to be scoffed at. A reduction in bee numbers leads to less pollination, which in turn leads to smaller harvests and higher food prices. Some farmers have resorted to renting hives from beekeepers to pollinate their **20** crops; when there is a shortage of bees this being an expensive proposition. Other farmers have increased **21** they're dependence on costly hand-pollination by human workers. Furthermore, there may be sociological repercussions. Agroecologist Alexandra-Maria Klein has suggested that rising produce prices could lead to an increase in obesity as people turn to cheaper, less wholesome fare.

Though the precise causes of CCD are yet unclear, some commonsense measures may be taken. A decrease in the use of certain pesticides, herbicides, and fungicides, as well as greater attention to the nutrition, habitat, and genetic diversity of managed hives, could begin a shift in a favorable direction. **22**

19

- A) NO CHANGE
- B) is a pretty big deal.
- C) can't be put on the back burner.
- D) cannot be ignored.

20

- A) NO CHANGE
- B) crops, this is an expensive proposition when there is a shortage of bees.
- C) crops, an expensive proposition when there is a shortage of bees.
- D) crops; an expensive proposition when there is a shortage of bees.

21

- A) NO CHANGE
- B) there
- C) their
- D) its

22

The writer wants a conclusion that addresses the future of efforts to combat CCD. Which choice results in the passage having the most appropriate concluding sentence?

- A) NO CHANGE
- B) Still, bee colonies have experienced such devastating losses that the consequences of the issue have been felt worldwide.
- C) Although CCD is a relatively new phenomenon, scientists have been studying other aspects of honeybees for over a century.
- D) Genetic variation in bee colonies generally improves bees' productivity, disease resistance, and ability to regulate body temperature.

Questions 23-33 are based on the following passage.

Lunar Farming

Late last autumn, Giuseppe Ferrua **23** stood, on the hillside he farms overlooking Italy’s Serchio River valley, a landscape of low mountains dotted **24** with vineyards. Ferrua grows grapes and olives, and he does so according to the phases of the Moon. He didn’t always farm this way. When he began, he exercised modern, one-size-fits-all farming methods but says he soon became convinced that “plants are completely prone to elements in the cosmos, the rhythms of day and night.”

Following the lunar calendar, this type of farming is driven by the belief that the Moon influences levels of moisture in the soil, just as the Moon’s gravitational pull affects great bodies of water. Lunar farmers believe, **25** for example, that from the new Moon to quarter Moon phases, when the Moon is waxing, a soil’s moisture content increases, whereas drier periods occur during the waning phase. **26** Although moisture influences seed germination, a lunar guide on when to plant and weed can be advantageous to a grower.

23

- A) NO CHANGE
- B) stood;
- C) stood—
- D) stood

24

- A) NO CHANGE
- B) inside
- C) for
- D) on

25

- A) NO CHANGE
- B) however,
- C) by contrast,
- D) thereafter,

26

- A) NO CHANGE
- B) Given that
- C) So
- D) DELETE the underlined portion and begin the sentence with a capital letter.

27 Nature has been around forever. First-century Roman naturalist Pliny the Elder stated in his *Natural History* that the Moon “replenishes the Earth; when she approaches it, she fills all bodies, while, when she recedes, she empties them.” Chinese and Egyptian people performed agricultural tasks according to the lunar calendar for millennia, and, to this day, the vaunted *Old Farmer’s Almanac* includes regional lunar calendars and advice on **28** when to conduct farm chores. The **29** almanacs editor, Janice Stillman, says, “That information is of value to our readers who practice these traditional methods—and claim great success.”

27

Which choice most effectively sets up the paragraph?

- A) NO CHANGE
- B) People all over the world farm by the Moon.
- C) Farming by the Moon is not new.
- D) Talk of the Moon’s influence is far-reaching.

28

Which choice provides the most specific information on the type of advice a lunar calendar offers?

- A) NO CHANGE
- B) actions relevant to farming.
- C) points in time at which to undertake certain tasks.
- D) optimal times to plant, weed, prune, and harvest.

29

- A) NO CHANGE
- B) almanacs’s
- C) almanac’s
- D) almanacs’

Lunar farming has its **30** skeptics, who are not sure of the method’s efficacy. Recalling advice he received on the best lunar time to plant potatoes, an English farmer says his first reaction was “Hoopla.” Current mainstream agriculture does not factor the Moon into **31** their practices, so the concept might seem quaint or irrational. Additionally, lunar farming is based in astrology as opposed to astronomy, and no extensive scientific studies have yet been conducted that measure the Moon’s overall influence on farming. **32** so supporters continue to wait for their practices to be verified scientifically.

Stillman says, “We are of the mind that you accept or believe by choice.” Indeed, despite his doubts, the skeptical English farmer wound up planting his potatoes according to the lunar cycle and claims they were “the best I have tasted.” Agricultural professor Jennifer Coffman has a similar response to Ferrua’s bounty in Italy. **33** “Smell this rosemary,” she says. “Smell how amazingly fragrant that is.” At this stage, one could say that the evidence must be experienced to be believed.

30

- A) NO CHANGE
- B) skeptics, who have yet to be convinced.
- C) skeptics—those who doubt the method.
- D) skeptics.

31

- A) NO CHANGE
- B) those
- C) it’s
- D) its

32

The writer wants to conclude the paragraph effectively while also reinforcing the point that skepticism toward lunar farming still exists. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) and therefore no sound scientific data on the subject exist to date.
- C) yet many continue to practice lunar farming.
- D) leading many to conclude that the practice is based in folklore, not fact.

33

Which choice gives an additional supporting example that emphasizes the importance of the senses in judging the success of the lunar farming method?

- A) NO CHANGE
- B) She has taken photographs of the grapevines and landscape.
- C) She takes careful notes about Ferrua’s farming methods, asking Ferrua to clarify how he prepares the soil.
- D) She dips bread into Ferrua’s olive oil as he explains a soil preparation he does in the fall.

Questions 34 -44 are based on the following passage.

Recipes for History: The Szathmary Cookbook Collection

In 1990, chef Louis Szathmary, a voracious collector of cookbooks, donated approximately 20,000 culinary artifacts to the University of Iowa library. The gift included more than 100 manuscript recipe books

34 —collections of recipes handwritten by the people who used them. The manuscripts, some of which date back to the seventeenth century, are an invaluable resource for food historians as well as the general public.

35 Because of the astonishing size and range of Szathmary's **36** donation to the University of Iowa, making this cornucopia of information available to readers was a challenge. Working in conjunction with the library, the University of Iowa Press published volumes as varied as *The P.E.O. Cookbook*, written in rural Iowa in 1908, and *Ladie Borlase's Receiptes Booke*, written in the English countryside from 1665 to 1822. Librarians were happy to show the Szathmary collection to people who were able to visit the library, **37** so the manuscripts, too delicate to be checked out to library patrons, remained largely unexplored.

34

The writer is considering deleting the underlined portion (ending the sentence with a period). Should the writer make this deletion?

- A) Yes, because the underlined portion detracts from the paragraph's focus on the Szathmary collection.
- B) Yes, because the information in the underlined portion is provided in the previous sentence.
- C) No, because the underlined portion defines a term that is important to the passage.
- D) No, because the underlined portion gives an example of a particular culinary artifact.

35

- A) NO CHANGE
- B) Regardless of
- C) In contrast to
- D) In addition to

36

- A) NO CHANGE
- B) donation of so many culinary artifacts,
- C) massive donation of cookbooks,
- D) donation,

37

- A) NO CHANGE
- B) for
- C) and
- D) but

This all started to change in 2012, when the university expanded its DIY History Project (“DIY” stands for “do it yourself”) to include the manuscripts. The project enlists volunteers to transcribe the recipes: working from **38** our home computers, the volunteers type up the scanned handwritten recipes. After a page is transcribed and proofread, it is digitized and becomes part of a searchable online archive. Volunteer transcribers need no particular expertise; **39** prosaic directives are provided on the DIY History website. Transcribing is easy. The ingredients (one recipe requires something called “ringon root”) and measurements (a “ditto” of baking soda), **40** moreover, can be puzzling. The goal is to digitize all the manuscripts in the Szathmary collection, making them available to anyone with **41** access of a computer and the Internet.

38

- A) NO CHANGE
- B) his or her
- C) their
- D) one’s

39

- A) NO CHANGE
- B) simple directions
- C) bare-bones how-tos
- D) facile protocols

40

- A) NO CHANGE
- B) therefore,
- C) however,
- D) in short,

41

- A) NO CHANGE
- B) access to
- C) excess of
- D) excess to

[1] The library is working hard to publicize the project and encourage the public to try the recipes. [2] It has formed a club dedicated to cooking manuscript recipes. [3] Some recipes don't fare well in the twenty-first century (one club member called her 1800s gingerbread a "molasses-laden brick"), while others [42] had worked just fine. [4] In another instance of library outreach, a competition at the 2013 Iowa State Fair, contestants baked desserts in three categories—[43] almond cheesecake, summer mince pie, and Marlborough pie—using recipes from the Szathmary collection. [44]

The efforts of the library and the volunteers are clearly bearing fruit. By January 2014, more than 38,000 manuscript pages had been transcribed, thanks to the volunteers who answered DIY History's call to "help build the historical record by doing it yourself."

42

- A) NO CHANGE
- B) work
- C) worked
- D) could have worked

43

- A) NO CHANGE
- B) almond, cheesecake summer, mince,
- C) almond cheesecake summer, mince
- D) almond, cheesecake, summer, mince,

44

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

The judges reported that the entries were delicious.

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

- A) after sentence 1.
- B) after sentence 2.
- C) after sentence 3.
- D) after sentence 4.

STOP

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



Math Test – No Calculator

25 MINUTES, 17 QUESTIONS

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

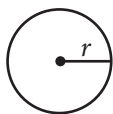
DIRECTIONS

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

NOTES

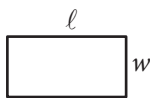
1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

REFERENCE

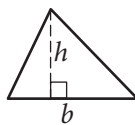


$$A = \pi r^2$$

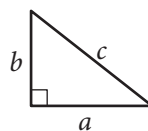
$$C = 2\pi r$$



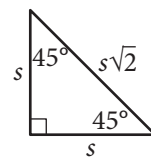
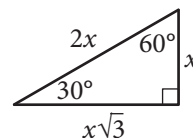
$$A = \ell w$$



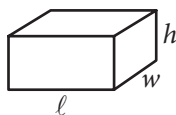
$$A = \frac{1}{2}bh$$



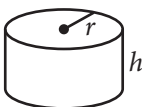
$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = \ell wh$$



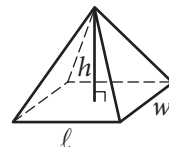
$$V = \pi r^2 h$$



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



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



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

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

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

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



1

A babysitter earns \$8 an hour for babysitting 2 children and an additional \$3 tip when both children are put to bed on time. If the babysitter gets the children to bed on time, what expression could be used to determine how much the babysitter earned?

- A) $8x + 3$, where x is the number of hours
- B) $3x + 8$, where x is the number of hours
- C) $x(8 + 2) + 3$, where x is the number of children
- D) $3x + (8 + 2)$, where x is the number of children

2

$$3(x + y) = y$$

If (x, y) is a solution to the equation above and

$y \neq 0$, what is the ratio $\frac{x}{y}$?

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

3

$$\frac{1}{2}x - \frac{1}{4}y = 10$$

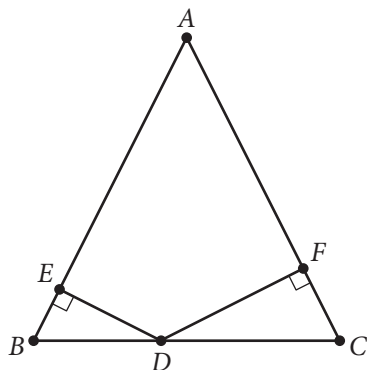
$$\frac{1}{8}x - \frac{1}{8}y = 19$$

Which ordered pair (x, y) satisfies the system of equations above?

- A) $(-112, -264)$
- B) $(64, 88)$
- C) $\left(\frac{232}{3}, \frac{224}{3}\right)$
- D) $(288, 536)$



4



Note: Figure not drawn to scale.

Triangle ABC above is isosceles with $AB = AC$ and $BC = 48$. The ratio of DE to DF is $5 : 7$. What is the length of $\overline{DC}$?

- A) 12
- B) 20
- C) 24
- D) 28

5

In a certain game, a player can solve easy or hard puzzles. A player earns 30 points for solving an easy puzzle and 60 points for solving a hard puzzle. Tina solved a total of 50 puzzles playing this game, earning 1,950 points in all. How many hard puzzles did Tina solve?

- A) 10
- B) 15
- C) 25
- D) 35

6

$$2x^2 + 7x - 15 = 0$$

If r and s are two solutions of the equation above and $r > s$, which of the following is the value of $r - s$?

- A) $\frac{15}{2}$
- B) $\frac{13}{2}$
- C) $\frac{11}{2}$
- D) $\frac{3}{2}$

7

To cut a lawn, Allan charges a fee of \$15 for his equipment and \$8.50 per hour spent cutting a lawn. Taylor charges a fee of \$12 for his equipment and \$9.25 per hour spent cutting a lawn. If x represents the number of hours spent cutting a lawn, what are all the values of x for which Taylor's total charge is greater than Allan's total charge?

- A) $x > 4$
- B) $3 \leq x \leq 4$
- C) $4 \leq x \leq 5$
- D) $x < 3$



8

$$n = 456 - 3T$$

The equation above is used to model the relationship between the number of cups, n , of hot chocolate sold per day in a coffee shop and the average daily temperature, T , in degrees Fahrenheit. According to the model, what is the meaning of the 3 in the equation?

- A) For every increase of 3°F , one more cup of hot chocolate will be sold.
- B) For every decrease of 3°F , one more cup of hot chocolate will be sold.
- C) For every increase of 1°F , three more cups of hot chocolate will be sold.
- D) For every decrease of 1°F , three more cups of hot chocolate will be sold.

9

A truck enters a stretch of road that drops 4 meters in elevation for every 100 meters along the length of the road. The road is at 1,300 meters elevation where the truck entered, and the truck is traveling at 16 meters per second along the road. What is the elevation of the road, in meters, at the point where the truck passes t seconds after entering the road?

- A) $1,300 - 0.04t$
- B) $1,300 - 0.64t$
- C) $1,300 - 4t$
- D) $1,300 - 16t$

10

If $f(x - 1) = 2x + 3$ for all values of x , what is the value of $f(-3)$?

- A) -7
- B) -5
- C) -3
- D) -1

11

Which of the following is equivalent to $(s - t)\left(\frac{s}{t}\right)$?

- A) $\frac{s}{t} - s$
- B) $\frac{s}{t} - st$
- C) $\frac{s^2}{t} - s$
- D) $\frac{s^2}{t} - \frac{s}{t^2}$



12

$$p(x) = 3(x^2 + 10x + 5) - 5(x - k)$$

In the polynomial $p(x)$ defined above, k is a constant. If $p(x)$ is divisible by x , what is the value of k ?

- A) -3
- B) -2
- C) 0
- D) 3

13

In the xy -plane, if the parabola with equation $y = ax^2 + bx + c$, where a , b , and c are constants, passes through the point $(-1, 1)$, which of the following must be true?

- A) $a - b = 1$
- B) $-b + c = 1$
- C) $a + b + c = 1$
- D) $a - b + c = 1$

**DIRECTIONS**

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

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or $7/2$. (If

3	1	/	2
☐	☐	☐	☐
☐	☐	☐	☐

 is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

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

Write answer in boxes. →

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

← Fraction line

Grid in result.

Answer: 2.5

	2	.	5
☐	☐	☐	☐
☐	☐	☐	☐
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

← Decimal point

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

	2	/	3
☐	☐	☐	☐
☐	☐	☐	☐
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8

.	6	6	6
☐	☐	☐	☐
☐	☐	☐	☐
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8

.	6	6	7
☐	☐	☐	☐
☐	☐	☐	☐
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8

Answer: 201 – either position is correct

	2	0	1
☐	☐	☐	☐
☐	☐	☐	☐
1	1	1	1
2	2	2	2
3	3	3	3

	2	0	1
☐	☐	☐	☐
☐	☐	☐	☐
1	1	1	1
2	2	2	2
3	3	3	3

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



14

For what value of h is $24 = \frac{h}{10} - 6$?

15

What is the value of a if $(2a + 3) - (4a - 8) = 7$?

16

If x is not equal to zero, what is the value

of $\frac{4(3x)^2}{(2x)^2}$?

17

If $x - 2$ is a factor of $x^2 - bx + b$, where b is a constant, what is the value of b ?

STOP

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



Math Test – Calculator

45 MINUTES, 31 QUESTIONS

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

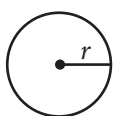
DIRECTIONS

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

NOTES

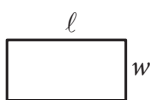
1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

REFERENCE

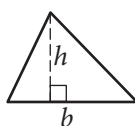


$$A = \pi r^2$$

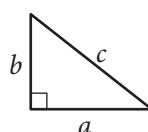
$$C = 2\pi r$$



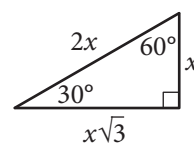
$$A = \ell w$$



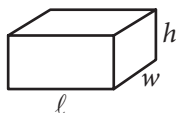
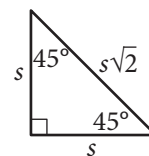
$$A = \frac{1}{2}bh$$



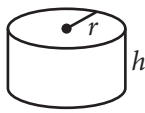
$$c^2 = a^2 + b^2$$



Special Right Triangles



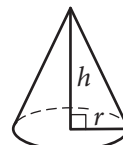
$$V = \ell wh$$



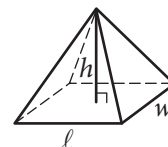
$$V = \pi r^2 h$$



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



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



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

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

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

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



1

Tyra subscribes to an online gaming service that charges a monthly fee of \$5.00 and \$0.25 per hour for time spent playing premium games. Which of the following functions gives Tyra's cost, in dollars, for a month in which she spends x hours playing premium games?

- A) $C(x) = 5.25x$
- B) $C(x) = 5x + 0.25$
- C) $C(x) = 5 + 0.25x$
- D) $C(x) = 5 + 25x$

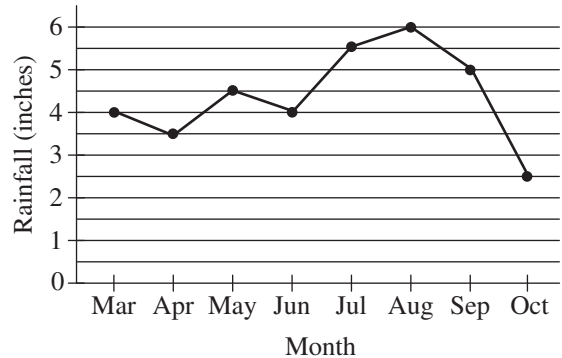
2

A grocery store sells a brand of juice in individual bottles and in packs of 6 bottles. On a certain day, the store sold a total of 281 bottles of the brand of juice, of which 29 were sold as individual bottles. Which equation shows the number of packs of bottles, p , sold that day?

- A) $p = \frac{281 - 29}{6}$
- B) $p = \frac{281 + 29}{6}$
- C) $p = \frac{281}{6} - 29$
- D) $p = \frac{281}{6} + 29$

3

Monthly Rainfall in Chestnut City



The line graph above shows the monthly rainfall from March to October last year in Chestnut City. According to the graph, what was the greatest change (in absolute value) in the monthly rainfall between two consecutive months?

- A) 1.5 inches
- B) 2.0 inches
- C) 2.5 inches
- D) 3.5 inches



4

A rectangle has perimeter P , length ℓ and width w . Which of the following represents ℓ in terms of P and w ?

A) $\ell = P - w$

B) $\ell = \frac{2P - w}{2}$

C) $\ell = \frac{P - 2w}{2}$

D) $\ell = 2P - 2w$

5

Which ordered pair (x, y) satisfies the system of equations shown below?

$$\begin{aligned} 2x - y &= 6 \\ x + 2y &= -2 \end{aligned}$$

A) $(-6, 2)$

B) $(-2, 2)$

C) $(2, -2)$

D) $(4, 2)$

6

A soda company is filling bottles of soda from a tank that contains 500 gallons of soda. At most, how many 20-ounce bottles can be filled from the tank? (1 gallon = 128 ounces)

A) 25

B) 78

C) 2,560

D) 3,200

7

A car traveled at an average speed of 80 miles per hour for 3 hours and consumed fuel at a rate of 34 miles per gallon. Approximately how many gallons of fuel did the car use for the entire 3-hour trip?

A) 2

B) 3

C) 6

D) 7



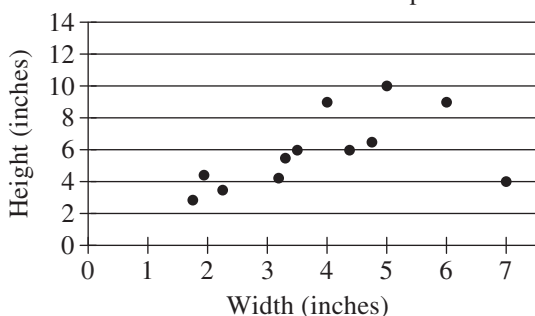
8

What is the slope of the line in the xy -plane that passes through the points $\left(-\frac{5}{2}, 1\right)$ and $\left(-\frac{1}{2}, 4\right)$?

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

9

Dimensions of Envelopes



The scatterplot above shows the widths and the heights of 12 types of rectangular envelopes. What is the width, in inches, of the envelope represented by the data point that is farthest from the line of best fit (not shown)?

- A) 2
- B) 5
- C) 7
- D) 12

10

A high school basketball team won exactly 65 percent of the games it played during last season. Which of the following could be the total number of games the team played last season?

- A) 22
- B) 20
- C) 18
- D) 14

11

$$110x + y = 1,210$$

A coffee shop is running a promotion where a number of free coffee samples are given away each day. The equation above can be used to model the number of free coffee samples, y , that remain to be given away x days after the promotion began. What does it mean that $(11, 0)$ is a solution to this equation?

- A) During the promotion, 11 samples are given away each day.
- B) It takes 11 days during the promotion to see 1,210 customers.
- C) It takes 11 days during the promotion until none of the samples are remaining.
- D) There are 11 samples available at the start of the promotion.

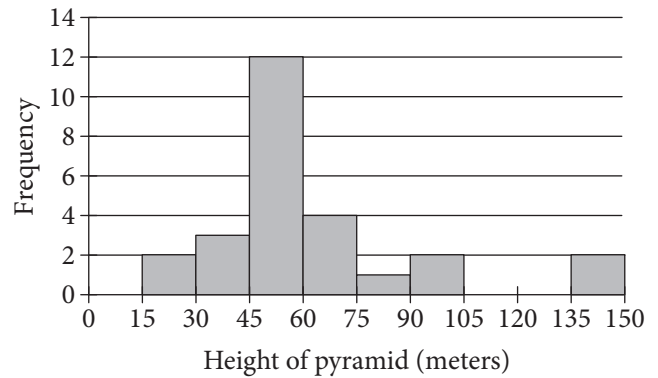


12

Which scatterplot shows a negative association that is not linear? (Note: A negative association between two variables is one in which higher values of one variable correspond to lower values of the other variable, and vice versa.)

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

13



The histogram above shows the distribution of the heights, in meters, of 26 pyramids in Egypt. Which of the following could be the median height of the 26 pyramids represented in the histogram?

- A) 44 meters
 B) 48 meters
 C) 63 meters
 D) 77 meters



Questions 14-16 refer to the following information.

A survey of 170 randomly selected teenagers aged 14 through 17 in the United States was conducted to gather data on summer employment of teenagers. The data are shown in the table below.

	Have a summer job	Do not have a summer job	Total
Ages 14–15	20	69	89
Ages 16–17	39	42	81
Total	59	111	170

14

Which of the following is closest to the percent of those surveyed who had a summer job?

- A) 22%
- B) 35%
- C) 47%
- D) 53%

15

In 2012 the total population of individuals in the United States who were between 14 and 17 years old (inclusive) was about 17 million. If the survey results are used to estimate information about summer employment of teenagers across the country, which of the following is the best estimate of the total number of individuals between 16 and 17 years old in the United States who had a summer job in 2012 ?

- A) 8,200,000
- B) 3,900,000
- C) 2,000,000
- D) 390,000

16

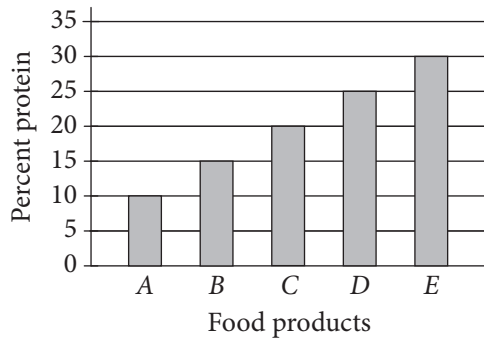
Based on the data, how many times more likely is it for a 14 year old or a 15 year old to NOT have a summer job than it is for a 16 year old or a 17 year old to NOT have a summer job? (Round the answer to the nearest hundredth.)

- A) 0.52 times as likely
- B) 0.65 times as likely
- C) 1.50 times as likely
- D) 1.64 times as likely



17

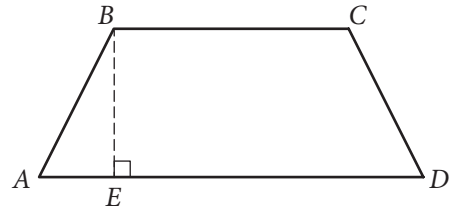
Percent Protein in Five Food Products



The graph above shows the amount of protein supplied by five different food products, A , B , C , D , and E , as a percentage of their total weights. The costs of 10 grams of products A , B , C , D , and E are \$2.00, \$2.20, \$2.50, \$4.00, and \$5.00, respectively. Which of the five food products supplies the most protein per dollar?

- A) A
- B) B
- C) C
- D) E

18



In quadrilateral $ABCD$ above, $\overline{BC}$ is parallel to $\overline{AD}$, and $AB = CD$. If BC and AD were each doubled and BE was reduced by 50 percent, how would the area of $ABCD$ change?

- A) The area of $ABCD$ would be decreased by 50 percent.
- B) The area of $ABCD$ would be increased by 50 percent.
- C) The area of $ABCD$ would not change.
- D) The area of $ABCD$ would be multiplied by 2.

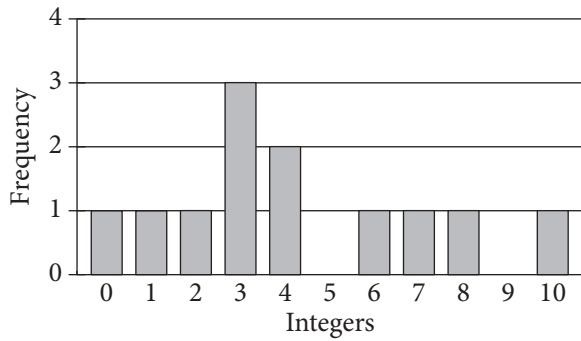
19

Boyd grows only tomatoes and raspberries in his garden. Last year, he grew 140 pounds of tomatoes and 60 pounds of raspberries. This year, the production, by weight, of tomatoes declined by 20 percent, and the production, by weight, of raspberries declined by 50 percent. By what percentage did the total yield, by weight, of Boyd's garden decline?

- A) 29 percent
- B) 30 percent
- C) 35 percent
- D) 70 percent



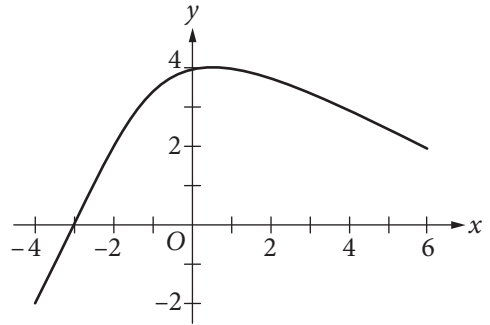
20



The graph above shows the frequency distribution of a list of randomly generated integers between 0 and 10. What is the mean of the list of numbers?

- A) 3.0
- B) 3.5
- C) 4.25
- D) 12.0

21



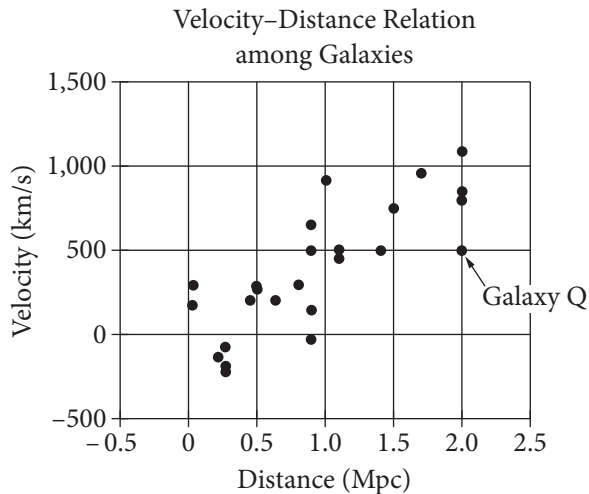
What is the minimum value of the function graphed on the xy -plane above, for $-4 \leq x \leq 6$?

- A) $-\infty$
- B) -4
- C) -2
- D) 1



Questions 22–24 refer to the following information.

In 1929, the astronomer Edwin Hubble published the data shown. The graph plots the velocity of galaxies relative to Earth against the distances of galaxies from Earth.



Hubble's data can be modeled by the equation $v = 500d$, where v is the velocity, in kilometers per second, at which the galaxy is moving away from Earth and d is the distance, in megaparsecs, of the galaxy from Earth. Assume that the relationship is valid for larger distances than are shown in the graph. (A megaparsec (Mpc) is 3.1×10^{19} kilometers.)

23

There are four galaxies shown in the graph at approximately 0.9 Mpc from Earth. Which of the following is closest to the range of velocities of these four galaxies, in kilometers per second?

- A) 100
- B) 200
- C) 450
- D) 700

24

Based on the model, what is the velocity, in kilometers per second, of a galaxy that is 15 Mpc from Earth?

- A) 7,500 km/s
- B) 5,000 km/s
- C) 1,100 km/s
- D) 750 km/s

22

According to Hubble's data, how fast, in meters per second, is Galaxy Q moving away from Earth?

- A) 2×10^6 m/s
- B) 5×10^5 m/s
- C) 5×10^2 m/s
- D) 2.5×10^2 m/s

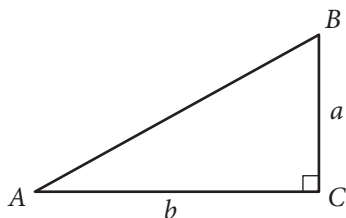


25

Janice puts a fence around her rectangular garden. The garden has a length that is 9 feet less than 3 times its width. What is the perimeter of Janice's fence if the area of her garden is 5,670 square feet?

- A) 342 feet
- B) 318 feet
- C) 300 feet
- D) 270 feet

26

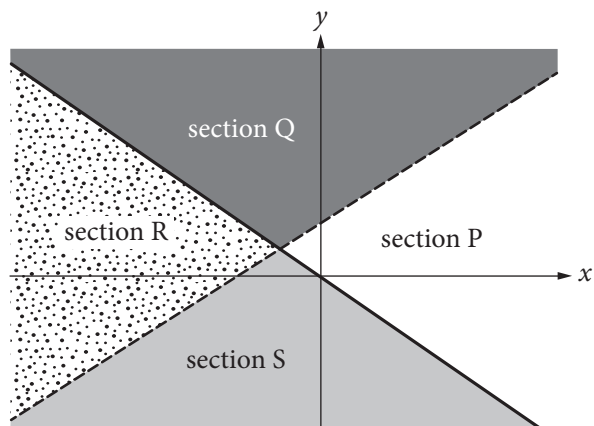


Given the right triangle ABC above, which of the following is equal to $\frac{b}{a}$?

- A) $\sin A$
- B) $\sin B$
- C) $\tan A$
- D) $\tan B$

27

$$\begin{cases} y \leq -x \\ 2y > 3x + 2 \end{cases}$$



A system of inequalities and a graph are shown above. Which section or sections of the graph could represent all of the solutions to the system?

- A) Section R
- B) Sections Q and S
- C) Sections Q and P
- D) Sections Q, R, and S


DIRECTIONS

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

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If

3	1	/	2
☐	☐	☐	☐
☐	☐	☐	☐
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

 is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write answer in boxes. →

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

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

← Fraction line

Grid in result.

Answer: 2.5

	2	.	5
☐	☐	☐	☐
☐	☐	☐	☐
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

← Decimal point

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

	2	/	3
☐	☐	☐	☐
☐	☐	☐	☐
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8

.	6	6	6
☐	☐	☐	☐
☐	☐	☐	☐
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8

.	6	6	7
☐	☐	☐	☐
☐	☐	☐	☐
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8

Answer: 201 – either position is correct

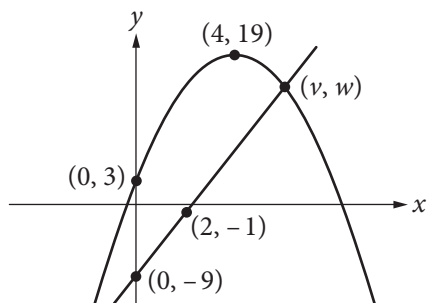
	2	0	1
☐	☐	☐	☐
☐	☐	☐	☐
1	1	1	1
2	2	2	2
3	3	3	3

	2	0	1
☐	☐	☐	☐
☐	☐	☐	☐
1	1	1	1
2	2	2	2
3	3	3	3

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



28



The xy -plane above shows one of the two points of intersection of the graphs of a linear function and a quadratic function. The shown point of intersection has coordinates (v, w) . If the vertex of the graph of the quadratic function is at $(4, 19)$, what is the value of v ?

29

In a college archaeology class, 78 students are going to a dig site to find and study artifacts. The dig site has been divided into 24 sections, and each section will be studied by a group of either 2 or 4 students. How many of the sections will be studied by a group of 2 students?



Questions 30 and 31 refer to the following information.

$$v = v_0 - gt \quad (\text{speed-time})$$

$$h = v_0 t - \frac{1}{2}gt^2 \quad (\text{position-time})$$

$$v^2 = v_0^2 - 2gh \quad (\text{position-speed})$$

An arrow is launched upward with an initial speed of 100 meters per second (m/s). The equations above describe the constant-acceleration motion of the arrow, where v_0 is the initial speed of the arrow, v is the speed of the arrow as it is moving up in the air, h is the height of the arrow above the ground, t is the time elapsed since the arrow was projected upward, and g is the acceleration due to gravity (9.8 m/s^2).

30

What is the maximum height from the ground the arrow will rise to the nearest meter?

31

How long will it take for the arrow to reach its maximum height to the nearest tenth of a second?

STOP

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

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Black letter after answer indicates difficulty level
(e = easy, m = medium, h = hard).

1.	e	8.	m	15.	m	22.	m	29.	m	36.	h	43.	e
2.	h	9.	m	16.	m	23.	m	30.	h	37.	m	44.	m
3.	m	10.	e	17.	m	24.	m	31.	m	38.	m	45.	m
4.	m	11.	e	18.	m	25.	m	32.	m	39.	m	46.	h
5.	m	12.	m	19.	m	26.	m	33.	h	40.	h	47.	m
6.	h	13.	e	20.	h	27.	m	34.	h	41.	m		
7.	e	14.	m	21.	m	28.	m	35.	m	42.	m		
1.	m	8.	m	15.	m	22.	h	29.	m	36.	h	43.	e
2.	m	9.	e	16.	m	23.	e	30.	h	37.	m	44.	m
3.	m	10.	m	17.	m	24.	e	31.	m	38.	m		
4.	m	11.	m	18.	m	25.	m	32.	h	39.	m		
5.	h	12.	m	19.	e	26.	m	33.	m	40.	m		
6.	m	13.	m	20.	h	27.	m	34.	h	41.	e		
7.	h	14.	m	21.	e	28.	m	35.	h	42.	h		
1.	e	4.	m	7.	m	10.	m	13.	h	16.	m		
2.	m	5.	m	8.	m	11.	m	14.	e	17.	h		
3.	m	6.	m	9.	m	12.	m	15.	m				
1.	e	6.	e	11.	m	16.	h	21.	h	26.	h	31.	h
2.	e	7.	m	12.	m	17.	m	22.	h	27.	h		
3.	m	8.	m	13.	m	18.	m	23.	h	28.	m		
4.	m	9.	m	14.	m	19.	h	24.	m	29.	h		
5.	m	10.	m	15.	h	20.	m	25.	h	30.	h		

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