Section 1 – Reading

Instructions

You will see passages (or groups of two passages), followed by one or more questions relating to the passages. Read the passages, then select the best answer, keeping in mind any accompanying graphics you see alongside the passages.

3

You have 65 minutes to complete this section (52 questions).

Questions 1-10 refer to the following passage.

The following passage depicts an English solicitor (lawyer) in the mid-1800s.

When I became a solicitor, I believed I had 1 a righteous purpose. I would translate wishes into codified legal documents. A man needs a grounding purpose in life, and as a young

5 man, I was sure I had found just that. But now I find myself squinting at pages late into the night, and I begin to doubt my

youthful conviction. My parents chose my career for me. I would follow my father and

- 10 my father's father, and so on: a succession of grim-faced men in portraits that line the halls of my childhood home. Their eyes glimmered I thought — with a passion for rectitude. But today, as I follow their footsteps, I wonder
- 15 if I misinterpreted their gaze.

After ruminating for months, I had chosen to focus my legal practice on the writing of wills. I was no doubt drawn to this career by a youthful fancy for musing about human

- 20 mortality. I imagined myself a priest, ministering last rites to dying men. I envisioned how, with each line of legal jargon, I would sanctify my client's memory. This narrative still rings true in my heart, and yet my reality seems out
- 25 of tune. I had expected grand testaments to the eternal memory of the deceased. Yet, as I have found, people, even to the point of death, can be so petty.

Consider the case of Mr. Saul Bartridge,

a businessman with plenty of money and a 30 large family. At first, I hoped he might help me fulfill my spiritual mission. He spoke of justice and of leaving something worthy behind. I imagined drafting a will of profound public beneficence. But as he drew me into his

college vine

confidence, his manner shifted. He would still talk about justice. But then he would complain about his profligate son, conceited parson, or the "dirty" poor. He wheezed and coughed

- 40 and yet still had breath enough to complain. I drafted and re-drafted his will, first dividing his assets this way, and then that way. At his bequest I researched charities that would honor him with a plaque. "Surely," he snorted,
- 45 "one can buy remembrance cheap!" All the while, I sat there smiling. But inside my heart sank every time he entered the office. And he was one of many clients.

I left my last consultation with Bartridge feeling downtrodden. On such days, I try to take a turn through the park. The fresh air and greenery can brighten the spirit. But on this particular day, I found little comfort. The evening was already approaching. All around

- the trees loomed over me, and they looked
 like the gallery of portraits in my father's hall.
 Their old growth was also lively, but animated
 it seemed to me by human folly. They
 seemed to be laughing at me, with gnarled
- 60 faces hardened by experience. Perhaps my lot was only to record the petty final whimpers of the human psyche.

1.

Which choice best summarizes the passage?

- A) A solicitor regrets not living a more spiritual life and decides to reform.
- B) A solicitor questions the values of his dying client.
- C) A solicitor is troubled by discovering that his father was immoral.
- D) A solicitor realizes that his profession does not line up with his ideals.

2.

4

The main function of the first sentence of the first paragraph is to

- A) set up a stylistic framework for the rest of the essay.
- B) show that the narrator was once idealistic.
- C) establish the narrator's priorities and views of other people.
- D) foreshadow the narrator's growing irrationality.

3.

In the third paragraph, the narrator's tone shifts from

A) descriptive to normative.

B) introspective to externally focused.

- C) measured to increasingly agitated.
- D) rational to enthusiastic.

4.

The use of the words "doubt" and "wonder" in the second paragraph mainly have which effect?

- A) They create an ebullient tone.
- B) They show that the narrator is questioning himself.
- C) They connect the author's predicament to larger social problems.
- D) They help the narrator transition between radically different ideas.

The passage indicates that Mr. Batridge talks in the manner that he does because

- A) he has lost respect for the narrator.
- B) he has become comfortable speaking freely with the narrator.
- C) deep down he values spiritual concerns.
- D) he does not want his family to think poorly of him.

6.

The passage indicates that when the narrator first took Mr. Bartridge on as a client, he saw Bartridge as

A) an elderly gentleman.

B) a spirit awaiting salvation.

C) an admirable individual.

D) a selfish businessman.

7.

Which choice provides the best evidence for the answer to the previous question?
A) Lines 31-34 ("At first... worthy behind")
B) Lines 35-36 ("But as... manner shifted")
C) Lines 39-40 ("He wheezed... to complain")
D) Lines 42-44 ("At his... a plaque")

8.

At the end of the fifth paragraph, the description of trees primarily serves to

- A) emphasize a change in perspective.
- B) convey an unshaken resolve.
- C) illustrate the difference between faith and reason.
- D) underscore the uniqueness of a predicament.

9.

The last paragraph indicates that the narrator understands himself as

- A) confused.
- B) defeated.
- C) noble.
- D) self-sacrificing.

10.

Which choice provides the best evidence for the answer for the previous question?
A) Lines 49-50 ("I left... downtrodden")
B) Lines 51-53 ("The fresh... little comfort")
C) Lines 54-56 ("All around... father's hall")
D) Lines 60-62 ("Perhaps my... human psyche")

college vine

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

This passage is adapted from Stuart Russell, Sabine Hauert, Russ Altman, and Manuela Veloso, "Ethics of Artificial Intelligence." ©2015 by Nature.

- Artificial intelligence (AI) is a prominent symbol of the future. Movies like the Terminator fascinate and frighten us. As with any cutting-edge technology, robots equipped with
- 5 AI bring risks and benefits.

Stuart Russell focuses on Lethal Autonomous Weapons Systems or LAWS. He says that LAWS will start a revolution in modern warfare. Drones will use AI to navigate precise

- 10 spaces, assess targets, and fire. To tackle the the problem of LAWS, we will need to apply international wartime codes. The 1949 Geneva Convention stipulates that nations must minimize collateral damage. But this is impos-
- 15 sible to do when autonomous machines are doing the attacking. Human rights groups do not think computers can observe the Geneva Convention.

The laws of physics might keep automated

- 20 drones from getting too dangerous. An agile quadricopter can only carry so many lethal projectiles, while a large drone is slow. Still, the proliferation of these drones, large and small, seems inevitable. Russell urges us to consider
- 25 where this military expansion might take us. He imagines that an international swarm of drones might inflict massive harm. Even more problematic, humans will not be able to sort out or understand what they are doing. Russell
- insists we need an interdisciplinary approach.
 Engineers, ethicists, and governments must come together to regulate AI weaponry.

Although LAWS are a hot topic, they are

not representative of the majority of evolving

- 35 uses for AI. Though media accounts often play up AI's dystopian potential, AI can also be useful. Russ Altman insists that AI might lead to unprecedented medical discoveries. AI can analyze the health data from millions of
- 40 patients and diagnose symptoms. By comparison, doctors can only look at patients one at a time. But there is one problem. Doctors and patients will have a hard time understanding computer-generated solutions. People will
- 45 probably not accept a health recommendation that they cannot comprehend.

In order to help people understand AI, experts will need to engage the public. Sabine Hauert has encouraged researchers to talk

- 50 with popular audiences. Other enthusiasts use Facebook and YouTube to discuss AI's bright future. Research in traditional journals can take decades to reach the public. Articles and videos shared online can reach millions. AI
- 55 will then sort through this media and find the pieces that are the most effective. By starting with material produced by humans, AI can start to advocate for itself.

To bring about a bright future for AI,

- 60 humans need to communicate with both each other and computers. Manuela Veloso's lab at Carnegie Mellon develops collaborative robots, or "CoBots." These robots combine human intelligence and artificial intelligence until
- 65 they are inseparable. When CoBots encounter a problem, they ask people for help. This AI depends on the exchange between man and machine. It offers hope that that AI can enhance, rather than replace, human experience.
- 70 Experts in the field of artificial intelligence emphasize the importance of discussion. AI raises philosophical questions about how we



interact with robots. AI also raises political questions about how we interact with each

75 other. We may not be able to end the fears Russell describes. But the work of Altman, Hauert, and Veloso suggest that AI might also improve our lives.





Adapted from Stuart Russell *et al.* "Ethics of Artificial Intelligence." ©2015 by *Nature*.

11.

The main purpose of the passage is to

- A) argue for increased social media use amongst the general public.
- B) consider the need for multilevel communication in mitigating the dangers of AI development.
- C) persuade readers to donate to robotics crowdfunding in the medical field.
- D) instill positive feelings about exponentially advancing technology.

12.

7

In the passage above, the author anticipates which of the following objections to the widespread use of AI?

- A) Humans might not be able to understand and accept the solutions that AI discovers.
- B) Robots will replace humans workers and cause widespread economic displacement.
- C) Governments will ban the use of robots before medical breakthroughs materialize.
- D) Agile quadricopters will not be able to carry heavy loads.

13.

Which choice provides the best evidence for the answer to the previous question?
A) Lines 26-27 ("He imagines... massive harm")
B) Lines 35-37 ("Though media... be useful")
C) Lines 47-48 ("In order... the public")
D) Lines 63-65 ("These robots... are inseparable")

14.

As used in line 36, "dystopian" most nearly means A) realistic B) beneficial C) nightmarish

D) useful

15.

The main purpose of the final paragraph (lines 70-78) is to

- A) introduce the discipline of philosophy to the discussion.
- B) present a counterargument to the previous paragraphs.
- C) stimulate further interest with a cliffhanger.
- D) conclude by restating the article's summarized themes.

As used in line 67, "exchange" most nearly means

- A) a monetary transaction.
- B) a cooperative dialogue.
- C) a heated argument.
- D) a rapid transformation.

17.

Which choice best illustrates the author's optimism for future developments?
A) Lines 68-69 ("It offers... human experience")
B) Lines 70-71 ("Experts in... of discussion")
C) Lines 71-73 ("AI raises... with robots")
D) Lines 73-75 ("AI also... each other")

18.

The main idea of the fifth and sixth paragraphs is that

- A) People may fear AI, but they should be educated about its useful applications.
- B) AI does not pose any real threat to human health and happiness
- C) More research needs to be done before we can know whether AI is mostly beneficial or harmful.
- D) AI's most promising applications are in the field of health medicine.

19.

Based on the graph, which of the following statements is true?

- A) Venture capitalists are engaged in reckless spending.
- B) There is a growing interest in the AI industry.
- C) Robots are getting more expensive to make.
- D) Technological advancement in the field of AI peaked in 2014.

20.

Data in the graph indicate that the greatest increase in funding for AI startups happened between

- A) 2010 and 2011.
- B) 2011 and 2012.
- C) 2012 and 2013.
- D) 2013 and 2014.

21.

Data in the graph provide the most direct support for which idea in the passage?

- A) AI promises revolutions in medical treatment.
- B) LAWS will need to be discussed internationally.
- C) AI is becoming the most profitable field of research.
- D) AI is becoming more ubiquitous.

college vine

Questions 22-32 are based on the following passage.

Passage 1 is adapted from Damian Carrington and George Arnett, "Clear Differences Between Organic and Non-Organic Food, Study Finds." ©2014 by The Guardian.

Passage 2 is adapted from Tim Harford, *The Undercover Economist*. ©2006 by Tim Harford.

Passage 1

- The jury is still out on whether organic foods are actually better for you. Organic food shoppers may find their preferences validated by recent scientific research. Studies show that
- 5 organic foods have 19-69% more antioxidants than non-organic foods. Antioxidants have a variety of positive health benefits. Dr. Carlo Leifert believes eating organic foods can help prevent blood vessel diseases and cancer. This
- 10 research has drawn both excitement and criticism. The Soil Association insists that organic farming techniques substantially improve food quality.

While organic food may have some health

- benefits, the nutritional benefits of organic food remain unproven. Some studies show that organic foods have higher nutritional value.Advertisers are quick to trumpet these studies.But others question those results. While the
- 20 antioxidant findings are robust, others are not so well established. The debate rages on.

With wave after wave of new research coming out, it can be hard for the average consumer to know what to do. Dr. Tom Sand-

25 ers argues that the best way to stay healthy is to eat more fruits and vegetables. Switching from non-organic to organic produce may offer some small health benefits. But the easiest thing to do is to load up your shopping cart

with lettuce, cucumbers, grapes, and apples.No matter what the advertisements say, you can't go wrong with simply eating more greens.

The true benefit of organic food lies in how it helps the environment. Two of the

- 35 main problems in agriculture are pollution from pesticides and fertilizers. Most insects can develop resistances to pesticides. Organic techniques that use few pesticides can help keep insects in check. Also, while fertilizer
- 40 can help crops grown on the farm, it can also harm other ecosystems. When rain washes the fertilizer into the water, it creates algae blooms that damage fisheries. Organic farming techniques that forgo fertilizer help keep fishermen
- in business. These environmental benefits are not lost on consumers. Soil Association polls show that environmental concerns motivate 44% of organic shoppers. If anything, organic eaters should publicize the verified environ-
- 50 mental benefits of organic food production rather than the inconclusive data on health advantages.

Passage 2

- 53 Organic food enthusiasts want many things. They want to protect the environment
- 55 and prove they are health-conscious consumers. Supermarkets looking for profits view these shoppers as low-hanging fruit. These consumers are often willing to pay exorbitant prices while overlooking conventional alterna-
- 60 tives. Supermarkets like Whole Foods Market offer shelves stocked with overpriced organic products. Organic food should indeed cost more because these products need special care

9

college vine

to grow and ship. But the markups at stores

65 like Whole Foods are far higher. Organic milk producers in the UK only get 20 cents extra for making a product that sells for a fifty cent premium. Consumers should be wary.

Supermarkets use careful placement to

- 70 maximize price increases. You have probably seen the "Organic" section when you walk into the supermarket. The organic carrots, organic mushrooms, and organic salads huddle together in a corner. The "regular" carrots, mush-
- 75 rooms, and salads are in other sections. At first, it may seem like supermarkets are doing this for the convenience of organic shoppers. But this strategy makes it harder for shoppers to compare the prices. Consumers can't tell if
- 80 they are getting fleeced!

Organic products do offer real benefits. Consumers should not ignore them completely. Organic products can help the environment and they have some health benefits. But we

- should be more careful about what we buy and how much we are paying for it. As things stand now, supermarkets get most of the profits. In response, consumers should demand that supermarkets display how much they pay
- 90 farmers. In this way, grocery store consumers might act like socially-conscious fashion shoppers. In the 1990s, activists drew attention to the fact that department stores profit from clothes made in sweatshops. Laborers received
- 95 seven cents for shirts that sold for a hundred dollars. Now some consumers demand transparent pricing in retail stores. They want to know how much the clothes they buy cost to make. The organic food movement can follow
- 100 the clothing industry's lead. The best way to promote sustainable farming practices is to make sure that farmers are well paid.

22.

10

The author of Passage 1 implies which of the following about the marketing of organic foods? A) It should be studied in research universities.

- B) It targets the upper class.
- C) It is detrimental to modern society.
- D) It exaggerates the significance of research findings.

23.

Which choice provides the best evidence for the previous answer?

- A) Lines 4-6 ("Studies show... non-organic foods")
- B) Lines 14-16 ("While organic... remain unproven")
- C) Line 18 ("Advertisers are.. these studies")
- D) Lines 22-24 ("With wave... to do")

24.

The author of Passage 1 indicates that organic foods advocates

- A) have no evidence that supports their claims.
- B) should study the nutritional benefits of organic foods.
- C) should promote the environmental benefits of organic farming techniques.
- D) will have a difficult time convincing people that organic foods are healthy.

25.

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

- A) physically
- B) inarticulately
- C) essentially
- D) significantly

The author of Passage 2 refers to milk farmers in the UK in order to

- A) raise doubts about the merits of organic eating.
- B) criticize their farming practices for harming the environment.
- C) illustrate the disproportionate markups with an anecdote.
- D) focus on the benefits of organic farming for animals.

27.

According to the author of Passage 2, supermarkets

- A) operate solely in terms of economic gain.
- B) analyze the needs of the individual.
- C) are the key to sustainable agriculture.
- D) will always increase their prices.

28.

The word choice in the final sentence of Passage 2, paragraph 2 has primarily which effect?

- A) It adds some humor to an otherwise factbased discussion.
- B) It ties together the main idea of the paragraph by summarizing and rhetorically flourishing the previous sentence.
- C) It makes the issues discussed in this passage look insignificant by comparison.
- D) It reverses conventional wisdom and asks readers to reconsider their biases.

29.

The main purpose of each passage is to

- A) discuss the factors behind the consumption and marketing of organic food.
- B) criticize those that take part in health crazes for their foolishness.
- C) defend the prevailing research produced in the nutritional field.
- D) propose new and effective tactics of advertising.

30.

Which choice best describes the relationship between the two passages?

- A) Passage 2 provides anecdotes that corroborate the conclusions of Passage 1.
- B) Passage 2 fills the call to action that is lacking in Passage 1.
- C) Passage 2 explains how corporations capitalize upon the trend described in Passage 1.
- D) Passage 2 critiques the conclusions drawn from the research discussed in Passage 1.

31.

On which of the following points would the authors of both passages most likely agree?

- A) "Organic" is a misnomer fabricated for purposes of marketing campaigns.
- B) Organic fruits and vegetables should be the same price as non-organic equivalents.
- C) Environmental degradation due to non-organic farming techniques is the most important issue facing consumers and producers.
- D) Supermarkets exaggerate the health benefits of organic products.

Which choice provides the best evidence that the author of Passage 2 would agree to some extent with the claim attributed to Carlo Leifert in lines 8-9, Passage 1?

- A) Lines 69-70 ("Supermarkets use... price increases")
- B) Lines 78-79 ("But this... the prices")
- C) Lines 83-84 ("Organic products... health benefits")
- D) Lines 84-86 ("But we... for it")

Questions 33-42 are based on the following passage.

This passage is adapted from Frederick Douglass's speech before the International Council of Women, in Washington, D.C. April 1888.

- In estimating the forces that women's suffrage has had to contend with for forty years, we should remembered that time itself is a conservative power—a very conservative
- ⁵ power. One shake of his hoary locks will sometimes paralyze the hand and palsy the tongue of the reformer. With respect to the relation of man to woman, some say that what is always was and always will be, world without end.
- 10 But we have heard this old argument before, and if we live very long we shall hear it again. When any aged error shall be assailed, and any old abuse is to be removed, we shall meet this same old argument. Man has been so long the
- king and woman the subject—man has been so long accustomed to command and woman to obey—that both parties to the relation have been hardened into their respective places. Thus has been piled up a mountain of iron
- 20 against women's enfranchisement.

The same thing confronted us in our conflicts with slavery. Long years ago Senator Henry Clay said, "I know there is a visionary dogma that man cannot hold property in

- 25 man," and, with a brow of defiance, he said, "That is property which the law makes property. Two hundred years of legislation has sanctioned and sanctified Negro slaves as property." But neither the power of time nor
- 30 the might of legislation has been able to keep life in that stupendous barbarism.

The universality of man's rule over woman is another factor in the resistance to the wom-

an-suffrage movement. They say that men have

- 35 not only always ruled over women, but that they do so rule everywhere. They easily think that a thing that is done everywhere must be right. Though the fallacy of this reasoning is too transparent to need refutation, it still
- 40 exerts a powerful influence. One year ago I stood on the Pincio in Rome and witnessed the unveiling of the statue of Galileo. It was an imposing sight. At no time before had Rome been free enough to permit such a statue to
- 45 be placed within her walls. It is now there, not with the approval of the Vatican. No priest took part in the ceremonies. It was all the work of laymen. One or two priests passed the statue with averted eyes. But the great truths of the
- 50 solar system were not angry at the sight, and the same will be true when woman have all the rights of American citizenship.

All good causes are mutually helpful. The benefits accruing from this movement for

- 55 the equal rights of woman are not confined to woman. They will spread to every effort to promote the progress and welfare of mankind every where and in all ages. The First Seneca Falls Convention was an example of what can
- 60 be accomplished by a few earnest women, clad only in the panoply of truth, and determined to live and die in what they considered a righteous cause.

When a great truth once gets abroad in

- 65 the world, no power on earth can imprison it, or prescribe its limits, or suppress it. It is bound to go on till it becomes the thought of the world. Such a truth is woman's right to equal liberty with man. She was born with it.
- 70 It was hers before she comprehended it. It is inscribed upon all the powers and faculties of her soul, and no custom, law or usage can

ever destroy it. Now that it has got fairly fixed in the minds of the few, it is bound to become

75 fixed in the minds of the many. At last it will be supported by a great cloud of witnesses, which no man can number and no power can withstand.

33.

The central topic of Douglass's speech is

- A) the difference between emancipated slaves and women advocating for suffrage.
- B) the obstacles that face the women's suffrage movement.
- C) the differences between men and women.
- D) the importance of religion in both the women's suffrage movement and the abolitionist movement.

34.

Douglass uses the phrase "world without end" (line 9) mainly to emphasize that

- A) he believes the relationship between men and women will remain the same.
- B) change is inevitable, if given enough time.
- C) entrenched ideas seem unchangeable.
- D) history will always repeat itself.

35.

Douglass claims which of the following was an argument against women's suffrage?

- A) Women need to focus on doing work in the home.
- B) The authority of the Catholic church was against women's suffrage.
- C) Women lack the education necessary to exercise the vote.
- D) Men have always ruled over women.

36.

Which choice provides the best evidence for the answer to the previous question?
A) Lines 5-7 ("One shake... the reformer")
B) Lines 14-18 ("Man has... respective places")
C) Lines 22-27 ("Long years... makes property")
D) Lines 45-46 ("It is... the Vatican")

37.

The second paragraph (lines 21-31) is primarily concerned with establishing a parallel between

- A) The abolitionist movement and the women's suffrage movement.
- B) Henry Clay and Frederick Douglass.
- C) The United States Legislature and the International Council of Women
- D) The barbarous past and civilized modernity.

38.

As used in line 17, "parties" most nearly refers to A) kings and subjects.

- B) slaves and women.
- C) Henry Clay and Frederick Douglass.
- D) men and women.

39.

It can reasonably be inferred that the priests "passed the statue with averted eyes" (lines 48-49) because the Catholic Church

- A) still opposes women's suffrage.
- B) is still uncomfortable celebrating Galileo given its historic views on the geocentric model.
- C) is contemptuous of the work of laymen.
- D) sees the causes of women's rights and astronomy as connected.

As used in line 55, "confined" most nearly means A) restricted

- B) imprisoned
- C) convinced
- D) surrendered

41.

Douglass contends that arguments he is making in this passage

- A) are now accepted by everyone.
- B) have not found popular support outside the suffrage movement.
- C) have become widespread enough that they might become the consensus view.
- D) can be met with reasonable counterarguments.

42.

Which choice provides the best evidence for the answer to the previous question?A) Lines 53-56 ("The benefits... to woman")B) Lines 58-63 ("The First... righteous cause")C) Lines 70-73 ("It is... destroy it")

D) Lines 73-75 ("Now that... the many")

college víne

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

This passage is adapted from Michael Pollan, "The Intelligent Plant." @2013 by The New Yorker.

- Neurobiological research has flourished over the past few decades. But we rarely think about the intelligence of one of the largest life groups on earth: plants. Recent studies have
- ⁵ begun to explore the thought life of plants and found that they're smarter than we realized.
 Plants are able to respond to and process many types of information for their own use. While plants do not have brains, they have analogous
- 10 structures that help them respond to sensory data. Once we understand plant neurobiology, we can begin to understand how they grow and adapt.

Researchers have found that plants have

- 15 at least as many senses as humans do. Plants immediately secreted defensive chemicals when researchers played the sound of a caterpillar eating a leaf. This response is evidence that plants can process auditory stimuli. But
- 20 plants can sense more than just sound. They can sense water and gravity. Their roots can even change course in order to avoid rocks.

Plants can react to stimuli. But do they have memories? Biologist Monica Gagliano

- 25 devised an experiment to test if plants can learn from past experience. She tested the mimosa pudica plant—a specimen that resembles a fern and is able to collapse its leaves when disturbed. Gagliano created a machine
- 30 that drops the mimosa plant every five or six seconds without harming it. The mimosa's leaves would collapse when it was dropped in response to the disturbance. However, after five or six drops the mimosa specimen

- 35 would stop collapsing its leaves. The plant had learned that it was not endangered by the drop and did not need to waste energy by closing its leaves. As Gagliano and her team further showed, this was not just a case where the
- 40 plant had become numb to danger. When the researchers started shaking the plants instead of dropping them, the mimosas collapse their leaves. When the researchers switched back to dropping the plants, the mimosas remembered
- 45 their original lesson. Once again they stopped collapsing their leaves. The plants retained this lesson for four weeks. In this case, it seems, plants have even more capacity for memory than animals. When subjected to an analogous
- 50 test, honeybees forgot what they had learned in as little as 48 hours.

This new research raises questions that span across many different disciplines. These discoveries raise some important philosophical

- 55 concerns. What does it mean to "remember" something? Are plants and animals really so different? This research can also help us understand how plants interact with their environment. Plants are not just passive receptors of
- 60 stimuli. They can learn and remember. These discoveries might change the way we grow our food. Maybe we can teach the plants that grow our food how to ward off pests without the use of pesticides. These discoveries might also
- change the way we think about conservation.
 What would it mean to conserve the memories of trees? These questions are just some of the food for thought both human and plant that the field of plant neurobiology has to offer.

16



This chart shows the leaf openness of mimosa plants when they are dropped at increasingly distant intervals (0 min, 10 min, 1 hr, 2 hr, 4 hr and 6 hr), when they are shaken (DIS-hab), and when they are dropped again (10 min post DIS-hab).

43.

The first paragraph serves mainly to

- A) debunk a misconception.
- B) describe two opposing viewpoints.
- C) present a new area of research.
- D) speculate about different possibilities.

44.

As used in line 9, "analogous" is closest in meaning to

- A) identical.
- B) similar.
- C) peculiar.
- D) aberrant.

45.

17

According to the passage, researching plant "thought" is crucial because

- A) it raises important philosophical and scientific questions.
- B) plants are frequently ignored by neurobiologists in favor of humans and animals.
- C) plants are more intelligent than animals.
- D) plant research is an underdeveloped field.

46.

Which choice provides the best evidence for the answer to the previous question? A) Lines 4-6 ("Recent studies... we realized")

- B) Lines 14-15 ("Researchers have... humans do")
- C) Lines 49-51 ("When subjected... 48 hours")

D) Lines 52-53 ("This new... different disciplines")

47.

As used in line 20, "sense" most nearly means A) understand.

- B) detect.
- C) smell.
- D) hear.

48.

Based on the information in the passage, it can reasonably be inferred that plants

- A) have emotions as well as senses, just like humans.
- B) can learn to adapt to new threats.
- C) can tell the difference between a live noise and a recording.
- D) cannot retain memories for more than four weeks.

Which choice provides the best evidence for the answer to the previous question?A) Lines 15-18 ("Plants immediately... a leaf")B) Lines 43-46 ("When the... their leaves")

C) Lines 46-47 ("The plants... four weeks")

D) Lines 53-55 ("These discoveries... philosophical concerns")

50.

In the graph, which displays the greatest increase in leaf openness between 0 min and 6 hr?

A) HL.

B) LL.

C) CTR HL.

D) CTR LL.

51.

Which concept is supported by the passage and by the information on the graph?

- A) The mimosa plants were not in danger when they were dropped.
- B) The shaking of the mimosa plants put them in danger.
- C) Mimosa plants learn slowly.
- D) The mimosa plants were not numbed to stimuli by the experiment.

52.

How does the graph support the author's point that plants are able to remember?

- A) It shows a decrease in the degree of openness during DIS-hab .
- B) It shows that the increase in the degree of openness happens during +10 mins post DIS-hab.
- C) It shows that mimosa plants increased their degree of openness over time.
- D) It shows that both HL and LL reached more than 60% of plant openness at at least one point throughout the experiment.



IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION ONLY.

DO NOT TURN TO ANY OTHER SECTION ON THE TEST.

Section 2 – Writing

Instructions

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.

20

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.

You have 35 minutes to complete this section. (44 questions)

Questions 1-11 are based on the following passage.

Robotic Hotels in a Human World

In recent years, the hotel industry has experienced **(1)** growing in the opportunities for automating its service staff. **(2)** Moreover, robotic hotels have been springing up in places like Japan and China since 2012. Interest in robotic establishments is rising. Overall employment in the United States will grow at a healthy rate for the next few years. But the hotel industry's employment is expected to decrease in the same period. Global tourism is also declining. These projections **(3)** <u>had</u> led some to maintain that automated hotels will soon become the norm. Many corporations see the advantages of staffing hotels with machines. But many clients still prefer an organic experience.

Hotel owners know that robots would be well equipped to take on many of the tasks humans currently do **(4)**.

1.

21

- A) NO CHANGE
- B) grow
- C) growth
- D) increased

2.

- A) NO CHANGE
- B) However,
- C) For instance,
- D) On the one hand,

3.

A) NO CHANGEB) haveC) willD) which have

4.

At this point, the writer is considering adding the following information: *"such as: organizing events, working the reception desk, and waiting on tables."* Should the writer make this addition here?

- A) No, because it is irrelevant to the topic discussed in the paragraph.
- B) No, because it weakens the focus of the passage by discussing too many different details.
- C) Yes, because it presents an unconventional observation about automation.
- D) Yes, because it lists specific examples of the sentence's general point.

Scientists have started to customize robots (5) for use in the hospitality industry. In the future, robots might converse with tourists, (6) waiting on tables, and even entertain guests. More importantly, robot staffers represent the possibility for greater profit. An automated workforce offers a competitive advantage. Robots do not need wages, do not complain about working conditions, and yield a steady profit. All of these factors make robots seem like a practical investment.

(7) <u>However, many people in the modern</u> world are looking for more human experiences. <u>For example, visitors get to experience a sen-</u> <u>timental and homey environment in bed-and-</u> <u>breakfast style hotels.</u>

5.

A) NO CHANGE

- B) used in the hospitality industry.
- C) using them in the hospitality industry.
- D) for the hospitality industry to use them.

6.

- A) NO CHANGE
- B) wait on tables,
- C) to wait,
- D) being a waiter,

7.

Which choice most effectively combines the underlined sentences?

- A) However, many people in the modern world are looking for more human experiences, like bed-and-breakfast style hotels where visitors get to experience a sentimental and "homey" environment.
- B) However, many people in the modern world are looking for more human experiences; visitors get to experience a sentimental and homey environment in bed-and-breakfast style hotels.
- C) However, many people in the modern world are looking for more human experiences in bed-and-breakfast style hotels where visitors get to experience a sentimental and "homey" environment.
- D) Bed-and-breakfast style hotels are just one place where people look for more human experiences in a sentimental and homey environment.

While many tourists continue to stay in massive resorts, **(8)** <u>however</u> they always prefer those with excellent service. **(9)** <u>Usually found</u> <u>in the lobby</u>, hotel employees who greet visitors with a warm smile are always a welcome sight. Hotels that employ real people also benefit the surrounding economy. The hospitality industry keeps people employed, **(10)** <u>stimulates com-</u> <u>merce with wages and tips</u>, and supports nations reliant on tourism.

In sum, robots can never truly replace fleshand-blood humans in the hotel industry. There will be a lot of pressure from investors in the years to come. And maybe some customers will learn to enjoy robotic servers. But projections of an all-robot service industry are probably overblown. **(11)** Just as e-readers did not replace books, robots will not replace service workers, despite the advantages they offer.

8.

A) NO CHANGE

- B) on the other hand,
- C) and
- D) DELETE the underlined portion

9.

Which choice most effectively sets up the examples at the end of the sentence?

A) NO CHANGE

- B) In difficult circumstances,
- C) Especially for those seeking rest and relaxation,
- D) While they must do their job regardless,

10.

A) NO CHANGE

B) while stimulating commerce with wages and tips

- C) stimulated commerce with wages and tips
- D) can stimulate commerce with wages and tips

11.

Which choice most clearly ends the passage with a restatement of the writer's primary claim?

A) NO CHANGE

- B) Although automating the hotel industry may represent some advantages for owners and investors, human employees offer personalized service that can never be fully replaced.
- C) The advancements in the fields of artificial intelligence makes the advent of robot hotels inevitable.
- D) Yet, there is more than meets the eye when it comes to robots. They might gain consciousness and rebel against their human makers.

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

A Palace Fit for a King

[1]

Seeing Versailles in person was a surreal experience. When I decided to go to Paris, at first I was mostly thinking about food, not history of architecture. **(12)** <u>Nevertheless</u>, I became fascinated with the 700,000 square foot palace that **(13)** <u>Louis XIV, the Sun King</u>, built during the height of his reign. The lavish and ornate buildings took my breath away as they had undoubtedly done for millions of visitors who came before me.

12.

A) NO CHANGE

college vine

- B) Additionally,
- C) Otherwise,
- D) Unexpectedly,

13.

- A) NO CHANGE
- B) Louis XIV the Sun King;
- C) Louis XIV the Sun King,
- D) Louis XIV the Sun King,

As I approached the palace, I became aware of (14) its massive size, during the French Revolution Versailles had a population of over 60,000. With more than 200 rooms, it had space for everything the royals could have wanted. There were bedrooms, government offices, grand ballrooms, and even chapels. (15) Built in the French Baroque style, Versailles is one of the most prominent symbols of the (16) Ancien <u>Régime, that is a system</u> that vested power and privilege in an absolute monarchy. Versailles was home to three generations of royals. But then, the French Revolution happened and Louis XVI and Marie Antoinette were thrown out of the palace. What was a symbol of aristocratic excess for them has become a tourist attraction for us.

[3]

Perhaps the most well-known part of Versailles is the Hall of Mirrors, which contains over 578 mirrors. As I walked through the hall, I imagined all the important functions it served. Think of the treaties signed, weddings held, and religious ceremonies conducted! The hall represents France at a moment in history when aristocrats thought that seeing and being seen was especially important. During events, every laugh, cough, and **(17)** <u>movement</u> was magnified across the room for everyone to see. Any false steps or awkward moments would be all the more embarrassing.

14.

A) NO CHANGE

B) it's massive size:

- C) it's massive size;
- D) its massive size;

15.

At this point, the writer is considering adding the following sentence: *"This population included officials of the French government, nobles, and of course the royal family and their advisors."* Should the writer make this addition here?

- A) Yes, because it is critical in understanding the rest of the paragraph.
- B) Yes, because it ties into information mentioned in the previous paragraph.
- C) No, because the details provided are redundant.
- D) No, because this sentence is not needed to understand the rest of the paragraph.

16.

- A) NO CHANGE
- B) Ancien Régime, a system
- C) Ancien Régime, for a system
- D) Ancien Régime a system

17.

Which choice gives a second supporting example that is most similar to the examples already in the sentence?

- A) NO CHANGE
- B) outburst
- C) wink
- D) death

[4]

Another famous part of Versailles is not actually part of the **(18)** <u>main palace. The Petit</u> <u>Trianon</u> is located on the grounds of Versailles in the Grand Trianon Park. It was constructed between 1762 and 1768 by Louis XVI for his wife, Marie Antoinette. The Petit Trianon features Corinthian pillars, a geometric garden, **(19)** <u>and it also features Rococo architecture</u>. While walking through these rooms, I heard a **(20)** <u>tourists' remark</u>, "You know, the Queen had control of all visitors, and no one could enter without her permission." Our guide added that Marie Antionette probably would not have let us in. The queen preferred solitude.

18.

What choice most effectively combines the sentences in the underlined portion?

A) NO CHANGE

B) main palace, so the Petit Trianon

C) main palace; the Petit Trianon

D) main palace, and the Petite Trianon

19.

Which choice most closely matches the stylistic pattern established earlier in the sentence?A) NO CHANGEB) and Rococo architecture.

C) and its architecture is Rococo.

D) and has Rococo architecture.

20.

A) NO CHANGEB) tourists remarking,

C) tourist remarked,

D) tourist remark,

[5]

While Versailles is no longer inhabited, its halls have not remained empty. I was just one of millions of visitors who came from all over the world to get a glimpse of French royalty. Walking through the gardens, gazing at the gold leaf plated ceilings, and inhaling the air of the French countryside made me feel like I really was in the 1700s. **(21)** Savoring their part of history, you might see the blinking ghosts of the past walking next to you. **(22)**

21.

A) NO CHANGE

B) The blinking ghosts of the past might see you walking next to them, savoring their part of history.

college vine

- C) Blink and you might savor the part of history of the blinking ghosts of the past walking next to you.
- D) Blink and you might see the ghosts of the past walking next to you, savoring their part of history.

22.

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

- A) before Paragraph 1.
- B) after Paragraph 4.
- C) after Paragraph 5.
- D) where it is now.

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

Froggy Exterminators

The presence of frogs **(23)** <u>in tropical or</u> <u>swampy areas would help</u> make that environment more comfortable for humans. This may be surprising because many people think of frogs as pests. But frogs eat the mosquitoes that are even more annoying. With frogs on patrol, people can find their home or getaway more enjoyable. In fact, **(24)** <u>the mosquito population falls more</u> <u>in one year than in five in a tropical area</u> (see chart).





Without frogs **(25)** <u>additionally</u>, these areas become breeding grounds for these pesky fliers. Hotels are especially prone to being overrun with mosquitoes. There are many places where pools of standing water can gather. Moreover, these pools are often out of reach from the fish that usually consume mosquito larvae. This is where frogs come in!

23.

A) NO CHANGE

- B) in tropical or swampy areas, help
- C) in tropical or swampy areas helps
- D) in tropical, or swampy areas helping

24.

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

- A) NO CHANGE
- B) just one year after introducing frogs, customer satisfaction began to decrease
- C) five years after introducing frogs, customer satisfaction has gone up by over fifty percent
- D) customers are most satisfied without the frogs eating mosquitoes

25.

- A) NO CHANGE
- B) thus,
- C) furthermore,
- D) DELETE the underlined portion.

^[1] Recently, a relationship has emerged among frogs, mosquitoes, and tourism. ^[2] Just like **(26)** <u>there</u> lizard cousins, frogs are part of a complicated swamp ecology. ^[3] Even though many scientists knew about the frogs' diet, hotel managers were not aware **(27)** <u>of their role</u> in keeping guests happy. ^[4] According to hotel managers, the number of customer complaints about mosquitoes has decreased by 75 percent **(28)**. ^[5] A study conducted by Dr. Carlos Ferrer and Dr. Amanda Greene **(29)** <u>asserts: that</u> in hotels where frogs are allowed to roam the grounds, customers are more **(30)** <u>questioning of</u> their overall experience. **(31)**

26.

A) NO CHANGEB) theirC) they'reD) its'

27.

A) NO CHANGE

- B) its role
- C) how big their role was
- D) their largest role yet

28.

At this point, the writer is considering adding the following information: *"since frogs were introduced at two hotels in the tropical island of Puerto Rico"*. Should the writer make this addition here?

- A) No, because the information is irrelevant to the topic of the passage.
- B) No, because it provides a trivial example.
- C) Yes, because it gives the reader more details on the statistics provided.
- D) Yes, because it provides a transition from the previous paragraph.

29.

- A) NO CHANGE
- B) asserts that
- C) asserts—that
- D) asserting; that

30.

- A) NO CHANGE
- B) entertained by
- C) accepting of
- D) satisfied with

29

TEST 2

However, Ferrer and Green warn about the negative consequences of **(32)** <u>welcoming exotic</u> <u>frog species</u> to deal with mosquitoes. Foreign amphibians, they claim, **(33)** <u>can disrupt local</u> <u>wildlife and lead to ecological imbalances</u>. Exotic frogs might eat mosquitoes. But they also might eat all kinds of other insects that play an important role in the ecosystem. Also, if predators do not eat these exotic frogs, they might start to overpopulate the area. The best way to address these issues is to conserve local frog populations.

31.

Where is the most logical place in this paragraph to add the following sentence? "Instead of becoming annoyed, guests have come to accept frogs as a part of the hotel ambiance."

- A) After sentence 4.
- B) Before sentence 1.
- C) After sentence 5.
- D) After sentence 1.

32.

A) NO CHANGE

- B) putting exotic frog species in
- C) introducing exotic frog species
- D) creating exotic frog species

33.

- A) NO CHANGE
- B) can disrupt local wildlife leading to ecological balances.
- C) can disrupt local wildlife, and lead to ecological imbalances.
- D) can disrupt local wildlife, or lead to ecological imbalances.

Questions 34-44 are based on the following passage.

The Ruins of Rome

The modern city of Rome is still linked to its past. It is full of ancient ruins (34) for which archaeologists have tried to preserve. Though archeologists have explored the city for hundreds of years, the ground still holds new surprises. When the city government was building a new subway line, workers discovered (35) Pompey's Theater; the site where archaeologists now think Julius Caesar died. Once city officials discovered this site, subway construction halted for months. The presence of these ruins often (36) conflicts with the development of modern infrastructure. (37) <u>Historians are not always certain about</u> whether valuable knowledge can be gleaned from these sites. Romans constantly have to decide between developing their future and preserving their past.

34.

A) NO CHANGE

- B) that
- C) whereby
- D) who

35.

- A) NO CHANGE
- B) Pompey's Theater the site
- C) Pompey's Theater, or, the site
- D) Pompey's Theater, the site

36.

A) NO CHANGE

- B) unsettles
- C) mitigates
- D) destroys

37.

Which choice provides information that best supports the claims made by this paragraph.

- A) NO CHANGE
- B) New construction projects have to go through a lengthy review process in order to ensure that historical sites are preserved.
- C) We are still not sure exactly where Julius Caesar was killed.
- D) Sometimes city residents are upset about the flood of tourists.

31

^[1] Less overtly **(38)** <u>problematic then</u> Rome's construction difficulties is its stray cat infestation. ^[2] Visitors **(39)** <u>who toured</u> these historical sites may find the ruins overrun with feral cats. ^[3] Cats are attracted to these **(40)** <u>sites: because</u> they offer protection from the dangers of the city and plenty of rodents. ^[4] Many sites have official "cat sanctuaries" where volunteers feed the cats that call these ancient ruins home. ^[5] City officials could have treated the cats as pests, but they tried a different strategy. ^[6] While **(41)** <u>visiting</u> these sites, patrons can make a donation to help keep these shelters open. **(42)**

38.

A) NO CHANGE

- B) problematic than
- C) problematic than,
- D) problematic, then

39.

- A) NO CHANGE
- B) whom tour
- C) who tour
- D) who are touring

40.

A) NO CHANGEB) sites, nevertheless, becauseC) sites, becauseD) sites because

41.

A) NO CHANGEB) they visitsC) they visitedD) having visited

42.

To make this paragraph more logical, sentence 5 should be placed A) where it is now. B) after sentence 1. C) after sentence 3. D) after sentence 6. Rome's relationship with its past extends beyond its visible ruins and the cats that inhabit them. Every part of the city shows signs of its long history. In the city center, buildings are packed close together. They were built before cars needed large roads. Every one of these narrow streets seems to lead to a different church. This is a remnant of Rome's place as the center of the Catholic faith for 1500 years. **(43)** Even the museums are standing on ancient sites like the Capitoline and Palatine hills. Much of Rome's modern economy is built on tourism to famous sites like the Coliseum and the Roman Forum.

Rome's position in both the ancient and modern world is unique **(44)** <u>in addition to that</u>. Milan is the industrial and economic center of Italy, but Rome remains its political capital. The President, Prime Minister, and Parliament are all located in the heart of the city. Furthermore, as a cultural center, Rome has little competition. With a huge cosmopolitan population, it echoes its past as a globally connected city. It attracts entrepreneurs and historians, artists and industrialists. Unlike many other ancient capitals, Rome has endured through the years, carrying its legacy onto the present.

43.

At this point, the writer is considering adding the following sentence: "In total, Rome houses more than 900 churches." Should the writer make this addition here?

- A) Yes, because it provides further information that backs up the previous counterargument.
- B) Yes, because it elaborates on the history of the city.
- C) No, because it blurs the paragraph's focus by introducing unnecessary information.
- D) No, because it contradicts the claims made in the rest of the paragraph.

44.

- A) NO CHANGE
- B) on top of that.
- C) moreover.
- D) DELETE the underlined portion, and end the sentence with a period.

33



IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION ONLY.

DO NOT TURN TO ANY OTHER SECTION ON THE TEST.

Section 3 – Math (no calculator)

Instructions

For questions 1-15, find the correct answer from the choices provided, and complete the corresponding bubble on your answer sheet. For questions 16-20, enter the correct answer in the grid on your answer sheet. Instructions are provided on how to fill out the grid. You may fill your booklet with scratchwork if necessary.

Notes

You may not use a calculator on this section.

All expressions and variables refer to real numbers unless otherwise specified.

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

All figures exist in a plane unless otherwise specified.

Unless otherwise specified, the domain of a given function g is the set of all real numbers x for which g(x) is a real number.

You have <u>25 minutes</u> to complete this section (20 questions).



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.

If 9x + 10 = 15, what is the value of 18x + 7?

- **A)** 10
- B) 15
- C) 17
- D) 26

2.

$$x + y = 0$$
$$5x - 3y = 8$$

Which of the following ordered pairs (x, y) satisfies the system of equations?

- A) (0, -1)
- B) (1, -1)
- C) (-1, 1)
- D) (-1, -1)

3.

A painting company estimates the price of a paint job, in dollars, using the expression 100 + 15nh, where *n* is the number of painters who will be working and *h* is the total number of hours the job will take using *n* painters. Which of the following is the best interpretation of the number 15 in the expression?

- A) The company charges \$15 per hour for each painter.
- B) A minimum of 15 painters will work on each job.
- C) The price of every paint job increases by \$15 every hour.
- D) Each painter works 15 hours a day.

4.

$$16c^4 + 24c^2d^2 + 9d^4$$

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

A)
$$(4c^2 + 3d^2)^2$$

B) $(2c + 3d)^4$
C) $(8c^4 + 3d^2)^2$
D) $(4c + d)^4$

:

$$\sqrt{3k^2+9} - x = 0$$

If k > 0 and x = 6 in the equation above, what is the value of k?

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

6.



In the *xy*-plane above, line e is parallel to line k. What is the value of p?

A) -4

- B) –7
- C) -10

7.

If $\frac{x^{a^2}}{x^{b^2}} = x^{36}$, x > 1, and a + b = 9, what is the value of a - b? A) 4 B) 34 C) 36

8.

D) 38

nA = 360

The measure A, in degrees, of an exterior angle of a regular polygon is related to the number of sides, n, of the polygon by the formula above. If the measure of an exterior angle of a regular polygon is greater than 25°, what is the greatest number of sides it can have?

A) 12

B) 13

- C) 14
- D) 15

.....

The graph of a line in the *xy*-plane has slope 8 and contains the point (1,6). The graph of a second line passes through the points (4,3) and (2,5). If the two lines intersect at the point (a, b), what is the value of a + b?

A) 1

B) 7

C) 6

D) -1

10.

Which of the following equations has a graph in the *xy* –plane for which *y* is never less than or equal to -3?

- A) y = |x| 4
- B) $y = x^2 4$
- C) $y = (x 4)^2$
- D) $y = x^3 4$

11.

Which of the following complex numbers is equivalent to

$$\frac{6-10i}{4+i}$$
 ? (Note: $i = \sqrt{-1}$)

A)
$$\frac{6}{4} - 10i$$

B) $\frac{6}{4} + 10i$
C) $\frac{14}{17} - \frac{46i}{17}$
D) $\frac{14}{17} + \frac{46i}{17}$

38

:

$$R = \frac{G}{G-B}$$

A travel agency uses the formula above to calculate a restaurant's rating, *R*, based on the number of good reviews, *G*, and bad reviews, *B*. Which of the following expresses the number of good reviews in terms of the other variables?

- A) $G = \frac{-RB}{R-1}$ B) $G = \frac{-RB}{1-R}$ C) $G = \frac{B}{1-R}$
- D) $G = \frac{-B}{R-1}$

13.

What is the sum of all values of *m* that satisfy $3m^2 - 9m + 18 = 0$?

A) -3B) $-i\sqrt{15}$ C) $i\sqrt{15}$ D) 3

14.

The trade-in value of a car depreciates at an annual rate of 8 percent. If the sticker price of the car is \$27500, which of the following functions f models the trade-in value of the car, in dollars, t years later?

A) $f(t) = 27500(0.92)^{t}$ B) $f(t) = 27500(0.08)^{t}$ C) $f(t) = 0.92(27500)^{t}$ D) $f(t) = 0.08(27500)^{t}$

:

The expression $\frac{7x-8}{x+5}$ is equivalent to which of the following?

A)
$$\frac{7-8}{5}$$

B) $7-\frac{8}{5}$
C) $7-\frac{8}{x+5}$
D) $7-\frac{43}{x+5}$

16.

A flower shop sells two bouquets: one with 10 roses and another with 20 roses. On a particular day, the flower shop receives a shipment with 80 roses. Assuming that at least one bouquet of 10 roses and at least one bouquet of 20 roses were created and sold on that day, what is one possible number of 10-rose bouquets sold? 17.

$$4x(5x+6) + 2(6x+3) = ax^2 + bx + c$$

In the equation above, a, b, and c are constants. If the equation is true for all values of x, what is the value of b?

18.



In the figure above, $\overline{AE} \parallel \overline{CD}$ and segment AD intersects segment CE at B. What is the length of segment CE?



In the *xy*-plane above, *O* is the center of the circle, and the measure of $\angle AOB$ is $x\pi$ radians. What is the value of *x* ?

20.

$$ax + by = 8$$
$$4x + 6y = 40$$

In the system of equations above, a and b are constants. If the system has infinitely many solutions, what is the value of a + b?

41

:



IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION ONLY.

DO NOT TURN TO ANY OTHER SECTION ON THE TEST.

Section 4 – Math (calculator)

Instructions

For questions 1–30, find the correct answer from the choices provided, and complete the corresponding bubble on your answer sheet. For questions 31–38, enter the correct answer in the grid on your answer sheet. Instructions are provided on how to fill out the grid. You may fill your booklet with scratchwork if necessary.

Notes

• You may use a calculator on this section.

- All expressions and variables refer to real numbers unless otherwise specified.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures exist in a plane unless otherwise specified.
- Unless otherwise specified, the domain of a given function g is the set of all real numbers x for which g(x) is a real number.

Reference



You have 55 minutes to complete this section (38 questions).



A mobile app developer just released a new application. The developer earns \$0.99 each time the app is downloaded and \$0.005 each time a user opens the app (and therefore views an ad). Which of the following expressions represents the amount, in dollars, that the developer earns if the app is downloaded x times and opened y times?

- A) -0.005y 0.99x
- B) 0.005y 0.99x
- C) 0.99x + 0.005y
- D) 0.99x 0.005y

2.

A meat inspector at a food distribution center selects 12 steaks at random for inspection out of every 600 steaks that pass through the distribution center. At this rate, how many steaks will be inspected if 30,000 steaks pass through the distribution center on a given day?

- A) 550
- **B)** 600
- C) 650
- D) 700

3.

÷

p = 36 + 4.5n

The equation above models the cost of a printing job, in cents, where n is the number of pages being printed and p is the total cost for the job. What is n when p is 90?

A) 12B) 28

C) 90

D) 441

Questions 4 and 5 refer to the following information.

Every year, a local high school puts on a school musical, and prints playbills for the audience. The number of playbills that are printed is directly proportional to the number of tickets sold. The school prints 210 playbills at a performance where 180 tickets were sold.

4.

How many playbills will be printed if 450 tickets are sold to a performance?

- A) 84
- B) 386
- C) 525
- D) 660

5.

Due to a computer malfunction, 12% of the printed playbills had a spelling error on the cover, and cannot be used for the performance. Assuming that 450 tickets were sold to the performance, how many playbills are available for use?

- A) 63
- B) 387
- C) 462
- D) 588

6.

:

When 6 times the number x is added to 18, the result is 6. What number results when 4 times x is added to 5?

A)	-2
B)	-3
C)	21
D)	4

7.

$$y = 2x^2 + 18x + 40$$

The equation above represents a parabola in the xy-plane. Which of the following equivalent forms of the equation displays the x-intercepts of the parabola as constants or coefficients?

A) $y-40 = 2x^2 + 18x$ B) $y+0.5 = (x-4.5)^2$ C) y = 2x(x+9) + 40D) y = 2(x+4)(x+5)



In a math class, each student begins the year with h homework points and loses 3 points each time an assignment is not completed. If a student who fails to complete 7 assignments has a score of 59 points, what is the value of h?

- A) 21
- B) 38
- C) 66
- D) 80

9.

One freight train locomotive is capable of hauling a maximum of 24 cars or 500 tons of cargo. There are two types of cars that the train can haul – iron cars, which carry 40 tons of ore, and coal cars, which carry 10 tons of ore. Let i be the number of iron cars, and c be the number of coal cars. Which of the following systems of inequalities models this situation?

- A) $40i + 10c \le 500$ $i + c \le 24$
- B) $\frac{i}{40} + \frac{c}{10} \le 500$ $i + c \le 24$
- $\begin{array}{rl} \text{C)} & 40i + 65c \leq 24 \\ & i + c \leq 500 \end{array}$
- D) $i + c \le 500$ $40i + 65c \le 500$

10.

÷

A function f satisfies f(6) = 4 and f(7) = 9. A function g satisfies g(7) = 6 and g(9) = 3. What is the value of f(g(7))?

A)	3
B)	4
C)	6
D)	7



:

11.

Number of hours Emma plans to type per day	2
Number of words Emma types per minute	90
Number of pages in the article draft	38
Number of words in the article draft	60,799

Emma has written, by hand, a draft copy of a journal article she plans to have published. The table above shows information about the article, Emma's typing speed, and how many hours per day she plans to spend typing up the article. If Emma types at the rate given in the table, which of the following is closest to the number of days it would take Emma to type the entire journal article?

- A) 4
- B) 6
- C) 19
- D) 338

12.

On the opening day of a new resort, the resort's artificial lagoon is being filled with water. The capacity of the lagoon is 450,000 liters, and there are currently 85,000 liters of water in the lagoon. Every day, 9,000 liters of water can be pumped into the lagoon. If t represents the number of days after the grand opening, which of the following inequalities represents the set of days where the lagoon is not yet fully filled?

A) $450,000 - 9,500 \ge t$ B) $450,000 \le 9,000t$ C) $365,000 \le 9,000t$ D) $85,000 + 9,000t \le 450,000$

13.

A college dining services manager wanted to conduct a study to determine the opinions of the students on the food quality in the campus dining halls. The manager surveyed 25 people in the first-year dining hall on one Saturday night during the semester, and all but one responded to the survey. Which of the following factors will not decrease the likelihood of a reliable conclusion being drawn from the data?

- A) Sample size
- B) Where the survey was given
- C) When the survey was given
- D) The number of people who refused to respond







According to the line of best fit in the scatterplot above, which of the following best approximates the year in which the GDP of Country Y was estimated to be \$475 billion?

- A) 1999
- B) 2004
- C) 2007
- D) 2012

15.

The distance traveled by the moon in one orbit around the Earth is about 1,500,000 miles. Assuming that the moon orbits the Earth every 28 days, which of the following is closest to the average speed of the Moon, in miles per hour, as it orbits the Earth?

- A) 2,200
- B) 4,100
- C) 4,800
- D) 53,600

16.

MCAT Results	Passed exam	Failed exam
Took review course	28	172
Did not take review course	50	150

The table above summarizes the results of 400 medical school graduates who took the MCAT. If one of the surveyed graduates who passed the MCAT is chosen at random for an interview, what is the probability that the person chosen did not take the review course?





collegevine

17.

An electronics store sells two types of TVs: a 55" and a 40". The 40" television costs approximately 35% less than the 55" television. If the 55" unit is being sold for \$1,500, what is the cost of the 40" unit?

- A) \$525
- B) \$1,465
- C) \$975
- D) \$2,025

18.

49

A survey was taken of the household income levels in a given community, and it was found that the mean household income was \$120,000 and the median household income was \$95,000. Which of the following situations could explain the difference between the mean and median income values in the community?

- A) The household incomes are close to each other.
- B) There are a few households that make much less money than the rest.
- C) There are a few households that make much more money than the rest.
- D) Many of the households have incomes between \$95,000 and \$120,000.



Questions 19 and 20 refer to the following information.

A veterinarian chose 250 families at random from each of two towns and asked how many pets each family has. The results are shown in the table below.

Number of pets	Town A	Town B
0	50	125
1	130	60
2	30	20
3	25	10
4	5	10

There is a total of 1,250 families in Town A and 1,750 families in Town B.

19.

What is the median number of pets for all the families surveyed?

A) 0

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

20.

Based on the survey data, which of the following most accurately compares the expected total number of families with 4 pets in the two towns?

- A) The total number of families with 4 pets is expected to be equal in the two towns.
- B) The total number of families with 4 pets in TownA is expected to be 45 more than in Town B.
- C) The total number of families with 4 pets in TownB is expected to be 45 more than in Town A.
- D) The total number of families with 4 pets in TownB is expected to be 500 more than in Town A.

21.

A biker estimates that a long, multi-day trip will take *h* hours to complete, where h > 50. The goal is for the estimate to be within 5 hours of the time it will actually take to complete the trip. If the biker meets the goal and it takes *a* hours to complete the trip, which of the following inequalities represents the relationship between the estimated time and the actual completion time?

A)	h + a < 5
B)	a > h + 5
C)	a < h - 5
D)	-5 < a - h < 5

50



Questions 22 and 23 refer to the following information.

$$I = \frac{2}{5}mr^2$$

The moment of inertia of a solid sphere, I is related to the mass, m, and the radius of the sphere, r, by the above equation.

22.

Which of the following expresses the square of the radius of the sphere in terms of the moment of inertia and the mass of the sphere?

A) $r^2 = \frac{5Im}{2}$ B) $r^2 = \frac{5I}{2m}$ C) $r^2 = \frac{2m}{5I}$ D) $r^2 = \frac{2Im}{5}$ ÷

For two spheres of identical mass A and B, the moment of inertia of sphere A is calculated to be 36 times the moment of inertia of sphere B. The radius of sphere B is what fraction of the radius of sphere A?

A)
$$\frac{1}{6}$$

B) $\frac{1}{36}$
C) $\frac{1}{72}$
D) $\frac{1}{1,188}$

24.

$$x^2 + y^2 - 6x + 8y = -16$$

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

- A) 3
- B) 4C) 9
- , D) 16



The graph of the linear function f has intercepts at (a, 0)and (0, -b) in the xy-plane. If a + b = 0 and $a \neq b$, which of the following is true about the slope of the graph of f?

- A) It is negative.
- B) It equals zero.
- C) It is undefined.
- D) It is positive.

26.

÷



The complete graph of the function f is shown in the xy-plane above. Which of the following are equal to 2?

- I. f(-2)II. $f(\frac{1}{2})$ III. f(5)
- A) I, II, and III
- B) I only
- C) II and III only
- D) I and II only



Two different planes, a jet–engine plane and a propeller plane, were flying at a cruising altitude of 30,000 feet. Both planes began their initial descent to ~15,000 feet at t = 0, and stopped their descent at t = 7 minutes. The above graph models the altitudes of the two planes every minute from t = 0 to t = 7. Which of the following statements correctly compares the average rates of descent of the two planes?

- A) In every minute-long interval, the magnitude of the rate of change of altitude of the jet-engine plane is greater than that of the propeller plane.
- B) In every minute-long interval, the magnitude of the rate of change of altitude of the propeller plane is greater than that of the jet-engine plane.
- C) During the first minute, the rate of change of altitude of the jet-engine plane is of greater magnitude, whereas during both the fifth and sixth minute, the rate of change of altitude of the propeller plane is of greater magnitude.
- D) During the first minute, the rate of change of altitude of the propeller plane is of greater magnitude, whereas during both the fifth and sixth minute, the rate of change of altitude of the jet-engine plane is of greater magnitude.





In the *xy*-plane above, *LMNO* is a square and point *P* is the center for the square. The coordinates of points *N* and *P* are (10,3) and (2,0), respectively. Which of the following is an equation of the line that passes through points *M* and *O* ?

A) $y = -\frac{1}{3}(8x - 4)$

B)
$$y = -\frac{1}{3}(8x - 16)$$

C)
$$y = 3(8x - 10)$$

D) y = 3(8x - 4)

29.

••••••

$$y = 3$$
$$y = ax^2 + b$$

In the system of equations above, *a* and *b* are constants. For which of the following values of *a* and *b* does the system of equations have exactly two real solutions?

A)
$$a = -4, b = 4$$

B) $a = -6, b = 3$
C) $a = 6, b = 5$
D) $a = 2, b = 6$

30.



The figure above shows a regular hexagon with sides of length x and a square with sides of length x. If the area of the hexagon is $96\sqrt{3}$ square inches, what is the area, in square inches, of the square?

- A) 64
- B) 48
- C) $16\sqrt{3}$
- D) $4\sqrt{3}$



college vine

31.

If the population of a city is declining at a rate of 4,500 people every year, how many years will it take for the city to lose 117,000 people?

32.

If x feet and 7 inches is equal to 415 inches, what is the value of x ?

33.

In the *xy* –plane, the point (6,32) lies on the graph of the function $f(x) = ax^2 - 12x + 40$. What is the value of *a* ?

34.

Over the course of a summer, Dylan and Tim earned a combined \$7,800. If Dylan earned \$1200 more than Tim did, how much did Tim earn? (Ignore the \$ sign when writing your answer)

35.

$$x = 150t + 2450$$

When he turned 20, Steven made a large initial donation to a charity. Each year after he donated a fixed amount to the same charity. The equation above models the amount x, in dollars, that Steven has donated after t yearly contributions. According to the model, how many dollars was Steven's initial donation? (Ignore the \$ sign when writing your answer)

36.



In the figure above, point *O* is the center of the circle, line segments *AB* and *BC* are tangent to the circle at points *A* and *C*, respectively, and the segments intersect at point *B* as shown. If the circumference of the circle is 126, what is the length of minor arc \hat{AC} ?



Questions 37 and 38 refer to the following information.

An up-and-coming educator decided to open a new private school in a big city. The initial enrollment at the school was 150 students, but the educator hopes to raise enrollment every year. The enrollment for the following year, S_1 can be estimated by the enrollment from the current year, S_0 , by the equation below.

$$S_1 = S_0 + 0.4(S_0)(1 - \frac{S_0}{T})$$

The constant T in this formula is the maximum number of students the school is able to enroll.

37.

According to the formula, what will be the number of students two years from now if T = 1000? (Round your answer to the nearest whole number)

38.

The educator would like to increase the population of students that the school can support so that the enrollment will increase more rapidly. If the educator's goal is that the number of students will increase from 150 this year to 207 next year, how many students must the school now be able to support? 56



IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION ONLY.

DO NOT TURN TO ANY OTHER SECTION ON THE TEST.

Section 5 – Essay

Directions

The essay asks you to demonstrate how effectively you can understand and analyze a passage. Your essay should show you have understood the passage, presented a clear and organized analysis, and used language effectively.

55

You must write your essay on the lines provided in your answer booklet; you will also have access to Planning Paper for preliminary brainstorming. Try to write legibly so that your writing can be understood by other readers. There is enough space for a full essay if you do not skip lines, avoid wide margins, and maintain a reasonable size for your handwriting.

Reminder

Write your essay on the lines of the pages in your answer booklet.

You have <u>50 minutes</u> to read the passage and write an essay in response to the prompt provided inside this booklet.

As you read the passage below, consider how the author uses

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

Adapted from Thomas Barrett, "Abolish the College." © 2017 by Modern Civics. Originally published February 6, 2017.

(1)

The United States of America can be lauded for creating a system of government that has withstood the test of time; however, not all parts of that system make sense in the modern world. In particular, the Electoral College, created over 200 years ago to prevent rural citizens from voting for a candidate about whom they knew nothing, inhibits America's democratic ideals.

(2)

The first presidential election I remember was the 2008 contest between Barack Obama and John McCain. We were all young and knew very little about the candidates, save for what our parents discussed at home. Nevertheless, the school held a poll to see which candidate was the most popular among students. The day of the poll was filled with palpable excitement. During recess, groups of children discussed who they were voting for and why, gesticulating wildly with their hands. When it came time to vote, I clutched my blue pen tightly as I stood in line to cast my ballot. I eagerly but meticulously wrote down the name of the candidate I chose, then wore the red, white, and blue "I voted!" sticker with pride. We all waited with bated breath for the old PA system to announce the winner. The room erupted in cheers when the distorted voice announced our favorite candidate. I felt determined to vote in every real election once I turned 18. It was exciting: it was a way for me to be heard, for my opinion make a difference.

(3)

The Electoral College was created as a check against uninformed voters like the 2008 version of myself. In presidential elections, after the popular vote is calculated, each state is allotted a number of representatives called electors. In most states, all the electors are expected to vote for the person who won that state's popular vote, while a few states reserve some votes for candidates who received a substantial minority of the popular vote. In mid-December, the 538 electors meet, and the candidate who receives 270 electoral votes wins the presidential election. This process gives more weight to the opinions of less populated states than they would have otherwise. It also gives the electors a final chance to override the wishes of the residents of their state. This check was necessary at our nation's inception. Before the advent of mandatory K-12 education and the Internet, citizens often would not have known enough about presidential candidates to cast informed votes.

57

(4)

But that was more than two hundred and forty years ago. In the twenty-first century, any bit of information can be easily accessed with the tap of your thumb. This is an age of information overload, and widespread literacy makes it possible for the vast majority of Americans to interpret that information. In modern elections, the public knows everything about the candidates: where they went to college, details about their families, inappropriate comments they made ten years ago, and more. It is nearly impossible for someone in the United States to know nothing about the candidates running. Therefore, it can be argued that all American citizens are qualified to make an informed decision and vote directly for the President of the United States. We no longer require a check on the popular vote.

(5)

For many decades, voter turnout for American presidential elections has been about 60% of the eligible population, a rather small number when compared to that in countries with mandatory voting laws like Belgium, which has an almost 90% voter turnout rate. The low turnout for Americans can be attributed to a part of the population that believes their vote will not affect the presidential election in any way. And it's true. In states like California that overwhelmingly favor one party, one person's vote will make no difference in the outcome. Even in swing states, one vote will likely have little impact. So why have a system in place that inhibits the rights of the American people?

(6)

It is time to put an end to the anachronistic practice of the Electoral College. Make each and every American's vote count; listen to the true voice of the people in electing their president, someone who will lead their country for better or for worse for four years. America needs a direct democracy. America deserves the right to choose.

58

Write an essay in which you explain how the author builds an argument to persuade her audience that the Electoral College should be replaced with a direct democracy. In your essay, analyze how the author uses one or more of the features listed in above (or features of your own choice) to strengthen the logic and persuasiveness of her argument. Be sure that your analysis focuses on the most relevant features of the passage.

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



IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION ONLY.

DO NOT TURN TO ANY OTHER SECTION ON THE TEST.