



CLT10 SAMPLE TEST

Classic Learning Test



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Each section will have a corresponding time limit. Do not begin the next section until told to do so.
The times for each section are:

Verbal Reasoning: 40 minutes
Grammar/Writing: 35 minutes
Quantitative Reasoning: 45 minutes

If you finish a section early, you may use the remaining time to check your work, but only on that section.
If you have any questions, raise your hand and ask your test proctor.

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I

Section I: Verbal Reasoning

Instructions:

You will have 40 minutes to complete Section I.

Read each passage and answer the corresponding questions to the best of your ability. 10 questions will follow each of the 4 passages, for a total of 40 questions. Choose your answer based on the evidence given in the passage; no outside knowledge is required.

The final two questions for each passage will be analogy questions. Use your knowledge of the passage and the relationships demonstrated within it to arrive at your answer and complete each analogy.

I

Literature

This passage is adapted from Edith Wharton's The Reef, first published in 1912.

- ¶1 The light of the October afternoon lay on an old high-roofed house which enclosed a grassy court filled with the shadow and sound of limes. From the entrance of the court a level drive, also shaded by limes, extended to a white-barred gate.
- ¶2 Mrs. Leath came forth from the house and descended into the sunlit court. She had come to meet her step-son, who was likely to be returning at that hour from an afternoon's shooting in one of the more distant plantations, and she carried in her hand the letter which had sent her in search of him; but with her first step out of the house all thought of him had been effaced by another series of impressions.
- ¶3 The scene about her was known to satiety. She had seen Givre at all seasons of the year, and for the greater part of every year, since the far-off day of her marriage; the day when, ostensibly driving through its gates at her husband's side, she had actually been carried there on a cloud of iris-winged visions.
- ¶4 The possibilities which the place had then represented were still vividly present to her. The mere phrase "a French chateau" had called up to her youthful fancy a throng of romantic associations, poetic, pictorial and emotional; and the serene face of the old house seated in its park among the poplar-bordered meadows of middle France, had seemed, on her first sight of it, to hold out to her a fate as noble and dignified as its own mien.
- ¶5 Though she could still call up that phase of feeling it had long since passed, and the house had for a time become to her the very symbol of narrowness and monotony. Then, with the passing of years, it had gradually acquired a less unfriendly character, had become, not again a castle of dreams, evoker of fair images and romantic legend, but the shell of a life slowly adjusted to its dwelling: the place one came back to, the place where one had one's duties, one's habits and one's books, the place one would naturally live in till one died: a dull house, an inconvenient house, of which one knew all the defects, the shabbinesses, the discomforts, but to which one was so used that one could hardly, after so long a time, think one's self away from it without suffering a certain loss of identity.
- ¶6 Now, as it lay before her in the autumn mildness, its mistress was surprised at her own insensibility. She had been trying to see the house through the eyes of an old friend who, the next morning, would be driving up to it for the first time; and in so doing she seemed to be opening her own eyes upon it after a long interval of blindness.
- ¶7 The court was very still, yet full of a latent life: the wheeling and rustling of pigeons about the rectangular yews and across the sunny gravel, the sweep of rooks above the lustrous greyish-purple slates of the roof, and the stir of the tree-tops as they met the breeze which every day, at that hour, came punctually up from the river.

This passage has been excerpted and adapted from the original, including minor punctuation changes, spelling changes, and other modifications that have not substantially changed content or intent.

I

1. Which of the following best describes the structure of the passage?
 - A) A young woman waiting for her husband thinks about her first experiences at the French chateau in which they live.
 - B) An old woman thinks about the life choices that have led to her present unhappiness and decides to run away.
 - C) A woman in search of her step-son pauses to reminisce about her many changing feelings about the estate that she is mistress of.
 - D) A woman packs up her belongings in preparation for a trip, but hesitates as she remembers the duties that bind her to her home.

2. Based on the information in the passage, how did Mrs. Leath's views of Givre change over time?
 - A) She went from first viewing Givre as a place of beauty to coming to understand its dangers and drawbacks.
 - B) She went from first seeing Givre as a harsh and ugly castle to viewing it as a beloved place of domestic comfort.
 - C) She went from first viewing Givre as a foreboding fortress to relishing in its whimsical luxuries.
 - D) She went from first seeing Givre as a whimsical fairytale to viewing it more plainly as her home.

3. Which lines in the passage best support the answer to the previous question?
 - A) Paragraph 1, Sentence 1 ("The light . . . limes")
 - B) Paragraph 3, Sentence 2 ("She had . . . visions")
 - C) Paragraph 5, Sentence 2 ("Then . . . identity")
 - D) Paragraph 7, Sentence 1 ("The court . . . river")

4. Which of the following must be true about the letter that Mrs. Leath is holding?
 - A) It was sent by her step-son before he left for the neighboring plantation.
 - B) It contained information that made her eager to see her step-son.
 - C) Mrs. Leath planned to deliver the letter to her step-son when he returned.
 - D) Mrs. Leath wrote the letter that morning before she knew her step-son was to return.

5. According to the passage, Mrs. Leath has most likely been married for
 - A) a few weeks.
 - B) a couple of months.
 - C) about one year.
 - D) more than a few years.

I

6. In Paragraph 6, Sentence 1, the word “insensibility” most closely means
- A) indifference.
 - B) inconstancy.
 - C) judiciousness.
 - D) unreasonableness.
7. Based on the passage, it can be inferred that Mrs. Leath
- A) has spent so much time at Givre that she has trouble viewing it objectively.
 - B) resents her husband for his long absences and wishes she could travel more.
 - C) longs for the freedom and comforts she had before taking on the responsibility of Givre.
 - D) has never been outside the gates of Givre after her marriage because of her serious illness.
8. Which of the following is true about the structure of the passage?
- A) It first discusses Mrs. Leath’s memories and then her current state.
 - B) It opens with Mrs. Leath’s very first memory of Givre.
 - C) It opens and closes with descriptions of Givre.
 - D) It closes with an ominous reference to Mrs. Leath’s departure.
9. chateau : romance ::
- A) court : comfort
 - B) house : monotony
 - C) plantation : felicity
 - D) meadow : despair
10. Givre : French chateau ::
- A) house : grounds
 - B) France : country
 - C) domesticity : bliss
 - D) court : rook

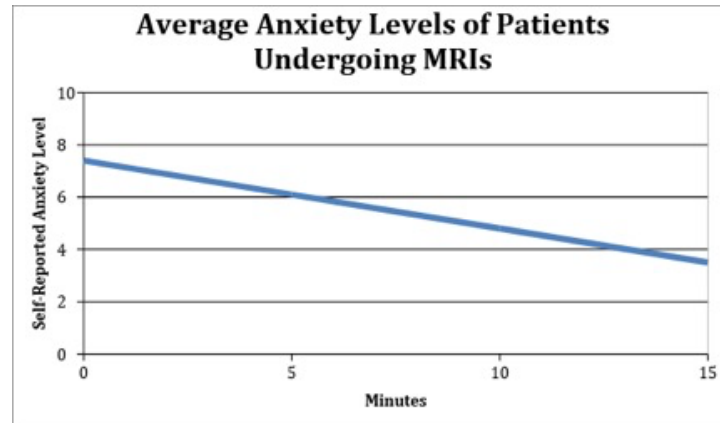
I

Science

This passage is adapted from Emilie Reas' "A neural code for emotion," first published in 2016 in PLOS Neuro Community, licensed under CC-BY.

- ¶1 Every day, we experience a number of different mental states, along with constant changes in mood and emotion. For example, as you take an important exam and do better than you expected, your emotions may change from anxiety to frustration, followed by surprise and finally contentment. All of these changes in mood are a defining feature of the human experience, but how do they stem from the underlying stream of brain activity? In a couple of new studies, researchers used functional MRI (fMRI) scans to look at brain signals of emotions. They discovered that patterns of brain activity during rest can actually reveal a variety of emotional experiences.
- ¶2 Earlier studies have shown that brain activity measured with fMRI can accurately decode a range of experiences, including how well the brain makes decisions or remembers facts. However, it has been unclear if this brain activity will also show us emotional experiences, like feeling anger or surprise.
- ¶3 Last year, researchers Philip Kragel and Kevin LaBar showed that brain activity shown on these scans accurately predicted emotions brought out by movies and music. However, like previous studies, their experiment could not separate the effects of emotion from what caused that emotion (sounds and images). Their new study sought to isolate emotion from its outside triggers, examining brain activity of spontaneous emotions.
- ¶4 To evaluate whether the activation of various emotions in the brain corresponds with individual mood and personality traits, the researchers performed resting fMRI on 499 young adults. Using algorithms derived from their earlier study of emotional responses to movies and music, they looked at how the brain activity showed seven different emotions (neutral, contentment, amusement, fear, anger, surprise, sadness). Brain activity patterns corresponding to neutral, surprise, and amusement occurred most often, whereas contentment was represented least often. Over time in the scanner, brain states of fear became less frequent, in line with the common experience of "scanner anxiety" at the start of an MRI session. Analysis of each emotion for each subject confirmed this trend, showing more negative emotions (fear and sadness) represented early, and more neutral or positive emotions (neutral and surprise) arising later.
- ¶5 Perhaps more importantly, they found that the prevalence of certain brain states mapped well onto self-reported mood and personality ratings. For instance, individuals who were more likely to later report having felt depressed or anxious during the scan showed more brain activity patterns corresponding with sadness or fear, respectively. Furthermore, those with higher anxious personality ratings showed more common fear and less common anger brain states, those with higher anger ratings had frequent anger brain states, and those with high depression ratings often showed fear and sadness brain states.
- ¶6 To test the accuracy of the researchers' algorithms on real-time measures of emotion, another group of 21 young adults underwent fMRI while reporting to the researchers their current feeling at regular intervals. The brain activity models predicted the self-reported emotional states better than chance, and the frequency with which the subjects reported those emotions was in line with the frequency of emotions predicted by the brain scans. Thus, while the first study could only indirectly associate brain states with general differences in individual emotion and personality, this second study confirmed sensitivity to real-time changes in emotion.

The studies hold important clinical implications; for example, fMRI could potentially be useful for diagnosing personality or mood disorders, or for tracking how well a particular therapy or treatment is working.



- *CLL, 2018. A scientist performs a new study in which she tracks the self-reported anxiety levels (from a low of 1 to a high of 10) of 50 participants while they undergo an MRI scan. She then graphs the data and comes up with a line of best fit, above.*

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11. Which of the following is a key difference between Kragel and LaBar's newest study on emotions and brain activity and previous studies on this topic?
 - A) Kragel and LaBar's study aimed to measure brain activity corresponding with emotional state, independent of outside triggers.
 - B) Kragel and LaBar's study aimed to measure brain activity brought out by music and movies, separate from memory and recall.
 - C) Kragel and LaBar's study aimed to map the brain's processing of sounds and images, independent of emotions.
 - D) Kragel and LaBar's study aimed to map the brain's various processing centers for emotion and recall, separate from outside triggers.

12. Which lines in the passage best support the answer to the previous question?
 - A) Paragraph 3, Sentence 2 ("However . . . images")
 - B) Paragraph 3, Sentence 3 ("Their new . . . emotions")
 - C) Paragraph 4, Sentence 1 ("To evaluate . . . adults")
 - D) Paragraph 4, Sentence 2 ("Using algorithms . . . sadness")

I

13. Which of the following best describes the structure of the passage?
- A) The author opens with a personal anecdote, discusses important new research, and gives advice on how best to apply that research.
 - B) The author gives a history of fMRI studies, offers suggestions on directions of new research, and mentions one groundbreaking study.
 - C) The author places the new research in context, describes the methodology and results of the new studies, and briefly mentions their potential effects.
 - D) The author discusses two important new studies, looks at the studies' limitations, and offers a solution on how to fix those limitations.
14. In Paragraph 1, Sentence 3, the word “stem” most closely means
- A) restrict.
 - B) arise.
 - C) shoot.
 - D) halt.
15. According to the passage, “scanner anxiety” is when
- A) an MRI session gradually decreases a person's stress levels.
 - B) a person's brain cycles through anxious stages at the hospital.
 - C) a person is anxious or afraid at the start of their MRI session.
 - D) a brain state of fear is generated by randomly placed fMRI noises.
16. Based on information in the passage, one of the reasons that additional studies are performed after an initial study is to
- A) prove the biases of the original study.
 - B) help isolate additional variables.
 - C) secure funding for additional research.
 - D) confirm the integrity of the initial researchers.
17. The author hints at the end of the passage that the results of the new study are
- A) surprising, since they contradict widely respected research.
 - B) suspicious, since they were performed in a closed laboratory setting.
 - C) redundant, since they only confirm the findings of previous studies.
 - D) important, since they hold potential clinical implications.

I

18. Based on the information in the graphic, it is possible to conclude that
- A) participants' peak anxiety levels occurred at about 15 minutes into the MRI.
 - B) every participant experienced a decrease in anxiety levels during the MRI.
 - C) the average level of anxiety of participants was lower after 15 minutes into the MRI than at the beginning.
 - D) most participants were afraid of the MRI and had an unpleasant experience.
19. feeling anger : emotional experience ::
- A) brain activity pattern : neutral
 - B) anxiety : therapy
 - C) depression : mood disorder
 - D) fMRI : brain
20. negative emotion : sadness ::
- A) positive emotion : anger
 - B) positive emotion : contentment
 - C) neutral emotion : anger
 - D) neutral emotion : depression

I

Philosophy/Religion

This passage is adapted from Adam Smith's "Of the Motives for Establishing New Colonies," from An Inquiry Into the Nature and Causes of the Wealth of Nations, which was first published in 1776.

¶1 The interest that led to the first settlement of the different European colonies in America and the West Indies was not altogether as plain and distinct as that which led to the establishment of those of ancient Greece and Rome.

¶2 The different states of ancient Greece each possessed only a very small territory. When the people in any of these states multiplied beyond what that territory could easily maintain, a part of them were sent in search of a new habitation. That new habitation was often in a remote, distant part of the world, since warlike neighbors surrounded them on all sides and made it difficult for them to expand their territory at home.

¶3 The European colonies in America and the West Indies were not established as a result of necessity. The Venetians, in the fourteenth and fifteenth centuries, carried on a very profitable trade in spices and other East India goods, which they distributed among the other European nations. The great profits of the Venetians tempted the greed of the Portuguese. The Portuguese had been trying, during the fifteenth century, to figure out how to travel by sea to the countries from which the Moors brought them ivory and gold across the desert.

¶4 Around this time, Columbus convinced the ruler Isabella of Castile that he could sail to the East Indies by the west. He set sail in August 1492, and after sailing between two and three months, discovered some of the small Bahama or Lucyan islands, and after the great island of St. Domingo.

¶5 But the countries that Columbus discovered in this or in later voyages had no resemblance to the ones he had gone in search of. Finding nothing either in the animals or vegetables of the newly discovered countries that could support a very profitable representation of them, Columbus turned his attention towards their minerals, especially their gold.

¶6 As a result of Columbus' representation of the countries, the council of Castile decided to take possession of them. The people of those countries were plainly unable to defend themselves, and the pious purpose of converting them to Christianity sanctified the injustice of the project. But the hope of finding treasures of gold was the sole motive that prompted the mission. And to give this motive greater weight, Columbus proposed that half of all the gold and silver found there should belong to the crown. The council approved of this proposal.

¶7 But though the judgment of sober reason and experience about such projects has always been extremely unfavorable, the judgment of human greed has commonly been otherwise. The same passion that has suggested to so many people the absurd idea of the philosopher's stone has suggested to others the equally absurd one of huge, rich mines of gold and silver. Columbus and his supporters did not consider that the value of those metals has, in all ages and nations, arisen mainly from their scarcity. That scarcity has arisen from the very small quantities of them that nature has anywhere deposited in one place, from the hard substances with which she has almost everywhere surrounded those small quantities, and consequently from the labor and expense which are everywhere necessary in order to reach them.

This passage has been excerpted and adapted from the original, including minor punctuation changes, spelling changes, and other modifications that have not substantially changed content or intent.

I

21. The passage is primarily focused on the
- A) protections mandated by the crown to protect native peoples.
 - B) life and travels of the explorer Christopher Columbus.
 - C) motives for the establishment of colonies in America and the West Indies.
 - D) Spanish crown's search for gold and subsequent interest in colonies.
22. Based on the passage, how does the author likely feel about Columbus and his voyages?
- A) He views the voyages as prompted by greed and disapproves of the false justifications for the project.
 - B) He views Columbus as an innovative pioneer whose journey is largely misrepresented by history.
 - C) He views the voyages as daring forays into dangerous territories but condemns the avarice of Columbus' leaders.
 - D) He views Columbus as a confused and misled explorer who was too frightened to admit his own mistakes.
23. Which lines in the passage best support the answer to the previous question?
- A) Paragraph 1, Sentence 1 ("The interest . . . Rome")
 - B) Paragraph 5, Sentence 1 ("But the . . . of")
 - C) Paragraph 5, Sentence 2 ("Finding nothing . . . gold")
 - D) Paragraph 6, Sentence 2 ("The people . . . project")
24. The passage opens with a discussion of Greek colonies in order to
- A) explain one of the main motivations for establishing new colonies.
 - B) foreshadow the sudden need for European colonies to expand.
 - C) contrast their purpose and establishment with that of European colonies.
 - D) provide evidence that colonies had long been a part of national empires.
25. Based on the passage, Greek colonies were usually
- A) adjacent and south of the main Greek territory.
 - B) adjacent and north of the main Greek territory.
 - C) nearby and accessible to the main Greek territory.
 - D) distant and remote from the main Greek territory.
26. According to the passage, Columbus
- A) initially arrived at the wrong islands before moving to his primary destination.
 - B) changed his mind halfway through his voyage and made for an unknown territory instead of a known one.
 - C) was lost at sea for three months before finally landing on the island of St. Domingo.
 - D) arrived in a country that was vastly different than the one he had been searching for.

I

27. In Paragraph 5, Sentence 2, the phrase “support a very profitable representation of them” most closely means
- A) help Columbus petition for additional voyage funding.
 - B) sustain an image of his own wealth and power.
 - C) show the colonies had mercantile value.
 - D) indicate the colonies were friendly to outsiders.
28. In the final paragraph, the author indicates that Columbus’ desire to find large amounts of silver and gold was
- A) foolish, given the way markets work.
 - B) short-sighted, given the amount of gold in India.
 - C) brilliant, given the weakness of the colonies.
 - D) feigned, given his true motivation for exploration.
29. ancient Greek colonies : habitation ::
- A) Portuguese colonies : difficulty
 - B) American colonies : revenge
 - C) Venetian colonies : war
 - D) European colonies : resources
30. the Venetians : spices ::
- A) Columbus : livestock
 - B) the Moors : ivory
 - C) the Greeks : gold
 - D) the Spanish : salt

I

Historical/Founding Documents

Passage 1 is adapted from Augustine's "On diversity of languages" in The City of God, originally published in 426 AD and translated here by Marcus Dods.

Passage 2 is adapted from Benjamin Franklin's Autobiography, first published in 1896.

Passage 1

- ¶1 Though these nations are said to have been dispersed according to their languages, yet there was a time when all had but one language. The nations agreed to come together, and with stone and mortar, they built for themselves a city whose tower stretched up to the sky. They were determined to make a name for themselves, before they could be scattered abroad the face of the earth.
- ¶2 And the Lord descended to see the city and the tower that the men of these nations had constructed. The Lord God said, Behold, the people is one, and they possess all one language. Now nothing will be restrained from them, which they have imagined to do. Come, and let us go down and confound their language, that they may not understand one another's speech. And God scattered them thence on the face of the earth, so that their work on the city and tower was arrested. Therefore, the name of the city is called Confusion, because there the Lord confounded the language of all the earth, and scattered them across that earth.
- ¶3 This city, which was called Confusion, is the same as Babylon, for Babylon means Confusion.

Passage 2

- ¶1 I had only one year's instruction in a Latin school, and that when very young, after which I neglected that language entirely. But, when I had attained an acquaintance with the French, Italian, and Spanish, I was surprised to find, on looking over a Latin Testament, that I understood so much more of that language than I had imagined, which encouraged me to apply myself again to the study of it, and I met with more success, as those preceding languages had greatly smoothed my way.
- ¶2 From these circumstances, I have thought that there is some inconsistency in our common mode of teaching languages. We are told that it is proper to begin first with the Latin, and, having acquired that, it will be easier to attain those modern languages which are derived from it. And yet, we do not begin with the Greek in order more easily to acquire the Latin.
- ¶3 I would therefore offer it to the consideration of those who superintend the education of our youth, whether—since many of those who begin with the Latin quit the same after spending some years without having made any great proficiency, and what they have learned becomes almost useless, so that their time has been lost—it would not have been better to have begun with the French, proceeding to the Italian, etc.; for, though, after spending the same time, they should quit the study of languages and never arrive at the Latin, they would, however, have acquired another tongue or two, that, being in modern use, might be serviceable to them in common life.

These passages have been excerpted and adapted from their originals, including minor punctuation changes, spelling changes, and other modifications that have not substantially changed content or intent.

I

31. In Passage 1, the author is
- A) narrating a personal anecdote.
 - B) telling a story about a city.
 - C) making a critical argument.
 - D) defending a novel viewpoint.
32. In Passage 1, Paragraph 2, Sentence 4, the word “confound” most closely means
- A) discover.
 - B) conspire.
 - C) eradicate.
 - D) muddle.
33. In Passage 1, the author indicates that Babylon is the city
- A) to which the nations fled after the tower was destroyed.
 - B) in which tower was initially constructed.
 - C) where men agreed to construct a number of new languages.
 - D) within the kingdom to which men were banished.
34. The author of Passage 2 makes clear that it is better to
- A) start by learning modern languages rather than Latin.
 - B) start by learning ancient Greek rather than Latin.
 - C) learn Latin and Greek at the same time.
 - D) learn modern languages and Latin at the same time.
35. Which lines in Passage 2 best support the answer to the previous question?
- A) Paragraph 1, Sentence 1 (“I had . . . entirely”)
 - B) Paragraph 2, Sentence 1 (“From these . . . languages”)
 - C) Paragraph 2, Sentence 3 (“And yet . . . Latin”)
 - D) Paragraph 3, Sentence 1 (“I would . . . life”)
36. In the final paragraph of Passage 2, the author indicates that he believes that
- A) those who decide to study languages have a career advantage over those who do not.
 - B) not all people who begin studying a language will become proficient in it.
 - C) most people do not enjoy studying modern languages as much as Latin.
 - D) superintendents are on the verge of abolishing the language requirement.

I

37. Which of the following best describes one of the crucial differences between Passage 1 and Passage 2?
- A) Passage 1 narrates a possible origin of a common state, while Passage 2 takes that common state for granted.
 - B) Passage 1 argues against the importance of something that Passage 2 argues in favor of.
 - C) Passage 1 presents a thesis and defends it, while Passage 2 builds on that thesis to come to a new conclusion.
 - D) Passage 1 tells a story from a limited perspective, while Passage 2 tells a story from a global perspective.

38. Both authors would likely agree that modern languages
- A) do not contain the same depth as ancient languages.
 - B) connect the world more easily than ancient languages.
 - C) are easier to learn than ancient languages.
 - D) have some connection to or origin in ancient languages.

39. The following analogy refers to Passage 1.

Babylon : Confusion ::

- A) arrest : stop
- B) scattered : descended
- C) nation : earth
- D) language : understanding

40. The following analogy refers to Passage 2.

Latin : French ::

- A) Greek : Latin
- B) Spanish : Latin
- C) Italian : Greek
- D) Latin : Greek

I

STOP

Do not go on to the next section until instructed to do so by the proctor.

**You may use any remaining time to check your work
on this section (Section I) only.**

**“Until I feared I would lose it, I never loved to read. One
does not love breathing.”**

- Harper Lee

II

Section II: Grammar/Writing

Instructions:

You will have 35 minutes to complete Section II.

Read each of the 4 passages in this section and answer the corresponding questions (40 total) to the best of your ability. Each question will ask you to either correct an error or suggest an improvement in the passage. If no change is necessary, select the option “NO CHANGE.”

Note: Most questions correspond to a numbered portion of the passage. In these questions, answer choices represent alternatives that could be substituted for the numbered portion. Select the best answer choice out of the given options.

II

Philosophy/Religion

This passage is adapted from Thomas More's "Of Their Military Discipline" in Utopia, first published in 1516 and translated here by Gilbert Burnet and Henry Morley. More is describing the attitude of a utopian society towards war.

The people detest war as a brutal thing. In opposition to the feelings [41] for almost all other nations, they think that there is nothing more inglorious than that glory that is gained by war. They accustom themselves daily to military exercises and the discipline of war, in which not only their men but also [42] their soldiers are trained up. However, they do not rashly engage in war, unless it is either to defend themselves or their friends from any unjust aggressors, or [43] assisting an oppressed nation in shaking off the yoke of tyranny.

As soon as they declare war, they take care to have a great many schedules that are sealed with their common seal, pinned in the most noticeable places of their enemies' country. [44] This is carried out secretly, and done in many places all at once. In these, they promise great rewards to anyone who kills the prince, and smaller rewards to those who kill anyone else who, next to the prince himself, is chiefly responsible for the war. And they double the sum to him that, instead of killing the person so marked out, shall take him alive, and put him in their hands. They offer not only protection, but rewards, to those people who take them up on [45] they're offer, if they will act against their countrymen.

By this means, those that are named in these schedules become not only distrustful of their fellow citizens, but also jealous of one another. [46] They become extremely distracted by fear and also extremely distracted by danger. This is because it has often fallen out that many of them, and even the prince himself, have been betrayed before by the people they had trusted most. And the rewards that the Utopians offer [47] had been so immeasurably great, that there is no sort of crime to which men cannot be drawn by them. They consider the risk that is run by those who [48] underwrite such services and offer a reward proportioned to the danger—not only a vast deal of gold, but great revenues in lands that lie among other nations that are their friends, where they may go and enjoy them very securely. The Utopians also take care to observe the promises they make of this kind most religiously.

They very much approve of this way of corrupting their [49] enemies, though it appears to others to be base and cruel. But they look on it as a wise course, to make an end of what would be otherwise a long war, without so much as risking one battle to decide it. They think it likewise an act of mercy and love to mankind to prevent the great slaughter of those that must otherwise be killed in the progress of the war, both on their own side and on that of their enemies, by the death of a few that are most guilty. [50] For instance, they believe that they are kind even to their enemies and pity them no less than their own people, since they understand that the greater part of them do not engage in the war of their own accord, but are driven into it by the passions of their prince.

These passages have been excerpted and adapted from their originals, including minor punctuation changes, spelling changes, and other modifications that have not substantially changed content or intent.

II

41. for

- A) NO CHANGE
- B) of
- C) by
- D) with

42. their soldiers

- A) NO CHANGE
- B) their battlegrounds
- C) their women
- D) their citizens

43. assisting

- A) NO CHANGE
- B) assisted
- C) to assist
- D) they assist

44. This is carried out secretly, and done in many places all at once.

- A) NO CHANGE
- B) This is something super secret they do in tons of places at once.
- C) This is carried out in a hush hush way, and done in a lot of different places.
- D) This is carried out clandestinely, in numerous locales at the same moment in geographical time.

45. they're

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

46. They become extremely distracted by fear and also extremely distracted by danger.

- A) NO CHANGE
- B) They become extremely distracted by fear and danger.
- C) They become, by fear and danger, extremely distracted of both those things.
- D) Of both fear and danger, they become extremely distracted by them.

II

47. had been

- A) NO CHANGE
- B) were
- C) are
- D) being

48. underwrite

- A) NO CHANGE
- B) undervalue
- C) understand
- D) undertake

49. enemies, though it

- A) NO CHANGE
- B) enemies; though it
- C) enemies though, it
- D) enemies: though it

50. For instance

- A) NO CHANGE
- B) In doing so
- C) However
- D) Despite this

II

Historical Profile

This passage is adapted from "Catharine of Aragon" in the book Women of History, written by various authors (here, Patrick Fraser Tytler) and first published in 1890.

Catharine of Aragon was first married to [51] Henry VIII's older brother, Arthur, who died before the end of his sixteenth year. Henry VII, divided between his policy and his [52] conscious, first agreed to have Catharine marry his son Henry. But when the latter reached his fourteenth year, Henry VII became alarmed and insisted on formally ending the engagement.

[53] In light of this, neither Catharine's father nor Catharine herself was told of the end of the engagement. The marriage between Catharine and Henry had required a papal dispensation¹, which had already been secured. In the meantime, Henry's heart became touched by the good-natured qualities of Catharine, who showed no reluctance or displeasure about the match. On the third of June, about six weeks after his father's death, Henry VIII [54] marries Catharine of Aragon, which was afterwards the cause of so many important changes.

The marriage was followed by the ceremony of the coronation, which was both [55] magnificent and highly expensive. On the day before the coronation, the king and the queen traveled from the Tower to Westminster. Beneath a robe of crimson velvet, furred with ermine, the king wore a coat of raised gold, along with a coat shining with [56] rubies emeralds great pearls and diamonds. The queen was seated on a magnificent chariot, and she was clothed in embroidered satin. Her hair hung down her back at great length, in a beautiful style.

Sixteen years later, Henry had separated himself from the society of his queen. He asked for a divorce, because he planned to marry Anne Boleyn instead. The new marriage to Anne took place quietly, and the parties separated as quickly as they had come together. Henry then sent Viscount Rochfort to the king of France to tell him about the marriage, and to ask the king of France to send [57] those confidential minister to England.

[58] Henry VIII also told Catharine that she should really just be happy with the style dowager Princess of Wales. No one was allowed to call Catharine queen any longer, and the title was taken from her. Her income was reduced to the sum that was given to her by Prince Arthur, her first husband. [59] The Duke of Suffolk personally told this ungrateful intelligence to Catharine, normally mild, who received the news from the duke with a great deal of indignation. She declared that she was, and would always remain, the queen, and that before she would renounce her title, she would be torn to pieces.

[60] As to her removal to any other residence, where she was to have a new household, and start a new life as princess dowager, Catharine absolutely refused to give her consent.

¹A type of special permission from the Pope.

These passages have been excerpted and adapted from their originals, including minor punctuation changes, spelling changes, and other modifications that have not substantially changed content or intent.

II

51. Henry VIII's older brother

- A) NO CHANGE
- B) Henry VIII's older brother
- C) Henry VIII older's brother
- D) Henry VIII older brother's

52. conscious

- A) NO CHANGE
- B) conscience
- C) cautious
- D) contentious

53. In light of this, neither

- A) NO CHANGE
- B) Naturally, it was crucial that neither
- C) Broadly received, neither
- D) Yet, strange as it may appear, neither

54. marries

- A) NO CHANGE
- B) married
- C) will have married
- D) marrying

55. magnificent and highly expensive.

- A) NO CHANGE
- B) magnificent and highly expense.
- C) magnify and highly expensive.
- D) magnify and high expense.

56. rubies emeralds great pearls and diamonds.

- A) NO CHANGE
- B) rubies, emeralds great pearls and, diamonds.
- C) rubies, emeralds, great, pearls, and diamonds.
- D) rubies, emeralds, great pearls, and diamonds.

II

57. those confidential

- A) NO CHANGE
- B) some confidential
- C) a confidential
- D) a few confidential

58. Henry VIII also told Catharine that she should really just be happy with the style dowager Princess of Wales.

- A) NO CHANGE
- B) Henry VIII also sent a letter to Catherine and told her not to make a fuss, and be happy with the style dowager Princess of Wales.
- C) Henry VIII also sent word to Catharine that she must, in future, be happy with the style of dowager Princess of Wales.
- D) Henry VIII also told Catharine to chill out and just, in future, be happy with the style dowager Princess of Wales.

59. The Duke of Suffolk personally told this ungrateful intelligence to Catharine, normally mild, who received the news from the duke with a great deal of indignation.

- A) NO CHANGE
- B) The Duke of Suffolk personally told this ungrateful intelligence to Catharine, and the normally mild Catharine received the news with a great deal of indignation.
- C) Catharine, normally mild, received the news from the Duke of Suffolk personally.
- D) The Duke of Suffolk, with a great deal of indignation, personally told this ungrateful intelligence to Catharine, normally mild.

60. The author is considering inserting the following sentence here:

The Duke of Suffolk could not stay long to plead any further with Catharine.

Should the writer make this insertion?

- A) NO CHANGE
- B) Yes, because the sentence explains why Catharine was so upset at the news the Duke delivered.
- C) No, because the sentence paints Catharine in a poor light, and the passage aims to defend her.
- D) No, because the sentence is not relevant to the focus of this paragraph, which is on Catharine's response.

II

Science

This passage is adapted from Alejandra Clark's "Negative Results: A Crucial Piece of the Scientific Puzzle," first published in 2017 in PLOS Collections, licensed under CC-BY. The passage addresses scientific studies, which are used by scientists to publicize important experiments and results.

Despite the value that negative studies² add to the scientific literature, they [61] remains rare. Why? Some may question the value of publishing negative results or replication studies³, arguing that doing so "litters" or "dilutes" the literature. [62] Because of this, with the creation of ever more powerful search engines that can sift through these studies, we believe that this is an outdated argument. Provided that the research question [63] asked by scientists is meaningful, appropriate, and conducted in a rigorous way that can be reproduced by other scientists, why shouldn't those results be published and made available? In today's era of social media and the quick spread of information (true and untrue), scientists have a responsibility to report valid research no matter what the results. Importantly, sharing these results can prevent others from following the same wrong [64] paths, or from wasting important resources, on questions that other scientists have already answered.

As to why so few studies reporting negative results are published, possible factors could include time restraints and the limited number of places willing to consider these studies for publication. [65] Some labs think it's totally a waste of time to publish negative results given the current culture, which is obsessed with positive findings that could have a high impact.

In addition, some scientists may be reluctant to publish studies that replicate previous ones if their results contradict the original research. Fortunately, as Fetterman and Sassenberg show in their study, scientists appear to [66] overcompensate just how much this failed replication effort of their own work will harm their reputation. [67] In fact, admitting wrongness about a finding that cannot be replicated, can be less harmful to a scientist's reputation than refusing to admit wrongness.

The scientific value of replication studies can be [68] shows by a series of recent publications, some of which are highlighted in A Decade of Missing Pieces. Alongside many other groups, the replication studies by Javidi-Parisjani and her co-authors and Khin and her co-authors showed that the reported genome editing activity of a type of DNA was not reproducible. These studies refuting the original observations shortly after the publication of the original study helped clarify the limitations of the technique and correct the scientific literature.

Time has shown the value of publishing negative results and replication studies, and scientists are increasingly reporting these. However, for this cultural shift to continue, researchers' concerns about publishing negative results must be overcome. [69] Organizations can play a role by recognizing the value of these studies, and journals can help by providing a place for the publication of all rigorously conducted science, that they ultimately fund regardless of outcome.

This collection, A Decade of Missing Pieces, highlights some of those studies published in our journal that have benefited the community by providing a different angle to a scientific story. By publishing this collection, we continue to [70] applaud those that have published their missing pieces.

²Studies whose results do NOT confirm a previous hypothesis.

³Studies which attempt to reproduce a previously published study, to check that scientists find the same results.

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II

61. remains

- A) NO CHANGE
- B) remain
- C) remaining
- D) remained

62. Because of this

- A) NO CHANGE
- B) As just one example
- C) However
- D) And therefore

63. asked by scientists is meaningful, appropriate, and conducted in a rigorous way that can be reproduced by other scientists, why

- A) NO CHANGE
- B) asked by scientists is meaningful, the study design is appropriate, conducted in a rigorous way, and reproduced by other scientists, why
- C) asked by scientists is meaningful, the study design is appropriate, and the study is conducted in a rigorous way that can be reproduced by other scientists, why
- D) asked by scientists is meaningful, the study design appropriate, the study conducted in a rigorous way, and that can be reproduced by other scientists, why

64. paths, or from wasting important resources, on

- A) NO CHANGE
- B) paths or from, wasting important resources, on
- C) paths or from wasting, important resources on
- D) paths or from wasting important resources on

65. Some labs think it's totally a waste of time to publish negative results given the current culture, which is obsessed with positive findings that could have a high impact.

- A) NO CHANGE
- B) Some labs may find that it is not worth their time to publish negative results given the current culture, which is driven by the desire to focus on positive findings that could have a high impact.
- C) Some labs may find that it is not worth it to publish negative results in our crazy culture, which is driven by the desire to focus on positive findings that could have a super big impact.
- D) Some labs may find that it is not worth it to publish negative results given all the stuff going on today, including the desire to focus on positive findings that could have a big impact.

III

66. overcompensate

- A) NO CHANGE
- B) overestimate
- C) overeducate
- D) overcomplicate

67. In fact, admitting wrongness about a finding that cannot be replicated, can be less harmful to a scientist's reputation than refusing to admit wrongness.

- A) NO CHANGE
- B) In fact admitting wrongness about a finding, that cannot be replicated, can be less harmful to a scientist's reputation than refusing to admit wrongness.
- C) In fact, admitting wrongness about a finding that cannot be replicated can be less harmful to a scientist's reputation than refusing to admit wrongness.
- D) In fact, admitting wrongness, about a finding that cannot be replicated, can be less harmful to a scientist's reputation, than refusing to admit wrongness.

68. shows

- A) NO CHANGE
- B) shown
- C) showing
- D) show

69. Organizations can play a role by recognizing the value of these studies, and journals can help by providing a place for the publication of all rigorously conducted science, that they ultimately fund regardless of outcome.

- A) NO CHANGE
- B) Organizations and journals can help by providing a place and a role for the value of these studies and the publication of all rigorously conducted science that they ultimately fund, regardless of outcome.
- C) Organizations can play a role by recognizing the value of these studies that they ultimately fund, regardless of outcome of all rigorously conducted science, and journals can help by providing a place for the publication.
- D) Organizations can play a role by recognizing the value of these studies that they ultimately fund, and journals can help by providing a place for the publication of all rigorously conducted science, regardless of outcome.

II

70. applaud those that have published their missing pieces.
- A) NO CHANGE
 - B) conduct additional scientific research.
 - C) make science friendlier towards academic institutions.
 - D) grow the number of journals scientists can submit to.

II

Modern/Influential Thinkers

This passage is adapted from Eric Holder's "Speech at the DOJ African-American History Month Program," first given in 2009.

Every year, in February, we attempt [71] to recognize and to appreciate black history. It is a worthwhile endeavor, because African Americans have made numerous and significant contributions to this nation. We need to confront our racial past and [72] understood our racial present in order to understand the history of African people in this country. We cannot truly understand America without understanding the historical experience of black people in [73] those nation. Simply put, to get to the heart of this country, we must examine its racial soul.

Even though this nation has [74] proud viewed itself as an ethnic melting pot, in too many ways we have always been, and continue to be, a nation of cowards when it comes to things racial. [75] And though race-related issues take up a large portion of our political discussion, and many unresolved racial issues in this nation, we average Americans simply do not talk enough with each other about racial issues. We have never been at ease with them.

[76] Look at our country's history—it's kind of understandable, you know? But if we are to make progress in this area, we have to feel comfortable enough with each other, and tolerant enough of each other, to have open and honest conversations about the racial matters that still divide us.

I would suggest that we use February of each year to not only celebrate and remember black history, but also to encourage a period of dialogue between the races. This is admittedly an [77] antithetical device to generate discussion that should come more naturally, but our history is such that we must find ways to force ourselves to confront that which we have become expert at avoiding.

To respect one another, we must have a basic understanding of one another. Thus, we should use events such as this to not only learn more about the facts of black history, but also to [78] analyze the machinations of our government. At first, this will be an awkward and painful process, but the rewards are potentially great.

Black history is a subject worthy of study by all of our nation's people. Blacks have played a unique, productive role in the development of America. Perhaps the greatest strength of this nation is the diversity of its people, and to truly understand this country, one must have a knowledge of the parts that make it up. [79] For instance an unstudied, not discussed, and ultimately misunderstood diversity can become a dividing force. An appreciation of the unique black [80] past which can be achieved through the study of black history, will help to lead to understanding and true compassion in the present, where it is still so sorely needed, and to a future where all of our people are truly valued.

These passages have been excerpted and adapted from their originals, including minor punctuation changes, spelling changes, and other modifications that have not substantially changed content or intent.

II

71. to recognize and to appreciate

- A) NO CHANGE
- B) to recognize and appreciating
- C) recognize and to appreciate
- D) recognizing and to appreciate

72. understood

- A) NO CHANGE
- B) understand
- C) understanding
- D) will understand

73. those

- A) NO CHANGE
- B) these
- C) this
- D) them

74. proud

- A) NO CHANGE
- B) proudly
- C) pride
- D) prideful

75. And though race-related issues take up a large portion of our political discussion, and many unresolved racial issues in this nation, we average Americans simply do not talk enough with each other about racial issues.

- A) NO CHANGE
- B) And though we average Americans simply do not talk enough with each other about racial issues, race-related issues and unresolved racial issues in this nation take up a large portion of our political discussion.
- C) And though race-related issues take up a large portion of our political discussion, we average Americans simply do not talk enough with each other about racial issues, though there are many unresolved racial issues in this nation.
- D) And though race-related issues take up a large portion of our political discussion, and though there are many unresolved racial issues in this nation, we average Americans simply do not talk enough with each other about racial issues.

II

76. Look at our country's history—it's kind of understandable, you know?
- A) NO CHANGE
 - B) In some ways, this is understandable, given our country's history.
 - C) In some ways, this is sort of understandable, you know, just given our nation's history and all.
 - D) In some ways, this is comprehensible by the national mind, given the country's historical record of events.
77. antithetical
- A) NO CHANGE
 - B) anecdotal
 - C) artificial
 - D) analytical
78. analyze the machinations of our government.
- A) NO CHANGE
 - B) learn more about each other.
 - C) understand the history of the women's movement.
 - D) share our own financial struggles.
79. For instance
- A) NO CHANGE
 - B) But
 - C) Along the same lines
 - D) Notwithstanding
80. past which can be achieved through the study of black history, will
- A) NO CHANGE
 - B) past—which can be achieved through the study of black history, will
 - C) past, which can be achieved through the study of black history, will
 - D) past, which can be achieved through the study of black history will

II

STOP

Do not go on to the next section until instructed to do so by the proctor.

**You may use any remaining time to check your work
on this section (Section II) only.**

“Tradition is not the worship of ashes
but the preservation of fire.”

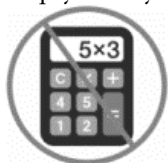
- Gustav Mahler

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Section III: Quantitative Reasoning

Instructions:

You will have 45 minutes to complete Section III. Answer each of the questions (40 total) to the best of your ability. You may not use a calculator for the math portion of this exam. Keep in mind that accompanying figures are NOT necessarily drawn to scale. You may use any of the following formulas to help you in your calculations.



Math Formulas:

Area of a circle = πr^2 , where r is the radius of the circle

Circumference of a circle = $2\pi r$, where r is the radius of the circle

There are 360 degrees in a circle.

There are 2π radians in a circle.

Volume of a sphere = $\frac{4}{3}\pi r^3$, where r is the radius of the sphere

Surface area of a sphere = $4\pi r^2$, where r is the radius of the sphere

Area of a rectangle = length \times width

Area of a triangle = $\frac{1}{2}$ (base \times height)

The sum of the measures of the interior angles of a triangle is 180° .

Pythagorean theorem (for a right triangle): If a , b , and c are the side lengths of the triangle, and c is the hypotenuse, then $a^2 + b^2 = c^2$.

Trigonometry:

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

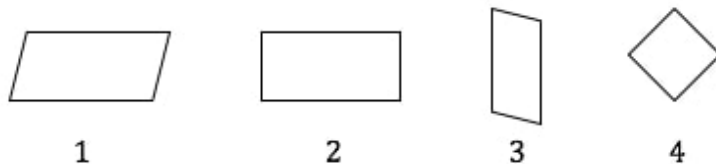
$$\cot \theta = \frac{1}{\tan \theta}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$30^\circ - 60^\circ - 90^\circ$ triangles have side lengths in a ratio of $1 : \sqrt{3} : 2$, corresponding to their angle.

$45^\circ - 45^\circ - 90^\circ$ triangles have side lengths in a ratio of $1 : 1 : \sqrt{2}$, corresponding to their angle.

81. Which of the following two shapes appear to be similar?



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

82. A single diagonal divides a square into how many equivalent right triangles?

- A) 0
- B) 1
- C) 2
- D) 3

83. All of the girls in Mrs. Bird's math class have at least one sibling. Given this information, which of the following statements must be true?

- A) None of the boys in Mrs. Bird's math class have siblings.
- B) All of the girls in Mrs. Bird's math class have at least one sister.
- C) All of the boys in Mrs. Bird's math class have at least one sibling.
- D) None of the above must be true.

84. An animal rescue center has four kittens for every one puppy. If the center has 60 kittens in total, how many puppies does it have?

- A) 12 puppies
- B) 15 puppies
- C) 20 puppies
- D) 240 puppies

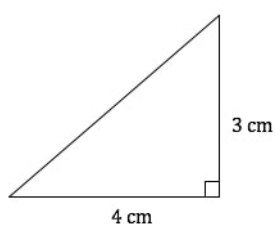
85. Which of the following is equivalent to $x(x + 3)$?

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

86. A line passes through the points (0,0) and (5,4). What is the slope of the line?

- A) $-\frac{5}{4}$
- B) $-\frac{4}{5}$
- C) $\frac{4}{5}$
- D) $\frac{5}{4}$

87. What is the area of the triangle below?



- A) 5 cm^2
- B) 6 cm^2
- C) 7 cm^2
- D) 12 cm^2

88. Which of the following could be the missing term in the sequence below?

$$\frac{1}{4}, \text{---}, \frac{1}{16}, \frac{1}{25}, \frac{1}{36}, \dots$$

- A) $\frac{1}{6}$
- B) $\frac{1}{8}$
- C) $\frac{1}{9}$
- D) $\frac{1}{10}$

89. If integer a is odd and positive, then $a + 2$ must be

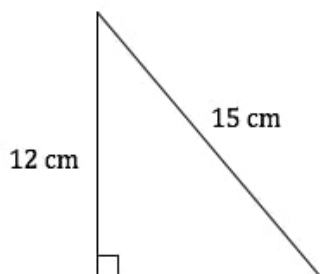
- A) odd and positive.
- B) odd and negative.
- C) even and positive.
- D) even and negative.

90. Which of the following is equivalent to $-5y > 35$?
- A) $y > 7$
 - B) $y < 7$
 - C) $y > -7$
 - D) $y < -7$
91. Equilateral triangle ABC has a side \overline{AB} that measures $\sqrt{3}$ inches. What is the measure of the opposite angle of side \overline{AB} ?
- A) 45°
 - B) 60°
 - C) 75°
 - D) It is impossible to determine from the given information.
92. The line $y = 5$ is reflected across the x -axis. What is the equation of the new line that results?
- A) $x = 5$
 - B) $x = -5$
 - C) $y = -5$
 - D) $y = 0$
93. Which of the following is equivalent to $|-25|$?
- A) 5^2
 - B) -5^2
 - C) $-30 - 5$
 - D) $-(-20 + 5)$
94. For rectangle $ABCD$, $AB = BC = CD$. Which of the following is false?
- A) $m\angle A = 90^\circ$
 - B) $AD = BC$
 - C) $m\angle A > m\angle B$
 - D) $m\angle A + m\angle D = 180^\circ$
95. If Maya's score was 16 percentage points higher than Lea's score, and Lea received a 17 out of 25, what was Maya's score?
- A) 20 out of 25
 - B) 21 out of 25
 - C) 22 out of 25
 - D) 23 out of 25

96. A triangle has one angle that measures 90° and two legs that are equal in length. Which of the following must be true about that triangle?
- I. It is an isosceles right triangle.
 - II. All of its side lengths are equal.
 - III. The remaining two angles of the triangle are both 45° .
- A) I only
 - B) II only
 - C) I and III only
 - D) I, II, and III
97. Which of the following pairs of lines are perpendicular?
- A) $y = 2x - \frac{1}{2}$ and $y = 2x + 2$
 - B) $y = -x$ and $y = -x - 1$
 - C) $y = -\frac{1}{2}x + 2$ and $y = 2x$
 - D) $y = \frac{1}{2}x - \frac{1}{2}$ and $y = 2x - 2$
98. How many integers between 1 and 30 (inclusive) meet both conditions below?
- 1. The integer is prime.
 - 2. The sum of the digits of the integer is equal to or less than 3.
- A) 1
 - B) 2
 - C) 3
 - D) 4
99. If integer a is a factor of 14, which of the following must always also be true?
- A) a is a multiple of 7
 - B) a is a factor of 7
 - C) a is a multiple of 28
 - D) a is a factor of 28

100. Brothers Drew, Daryl, and Dave all share one car. The brothers have a designated weekly schedule in which they take turns on specific days. Daryl takes the car on at least Wednesdays and Fridays, and Dave takes the car only on weekdays. If the brothers never use the car on the same day, which of the following must be true?
- A) Drew drives the car on all weekend days.
 - B) Daryl does not drive the car any Thursdays or Saturdays.
 - C) Dave does not drive more than three days per week.
 - D) All of the above are true.
101. A student analyzes a number of right triangles and comes up with the following conclusion:
- All right triangles have at least two side lengths that are equal.
- Which of the following is a counterexample that disproves the above statement?
- A) A right triangle with two angles measuring 45°
 - B) A scalene triangle with legs measuring 1 cm, 2 cm, and 3 cm
 - C) An isosceles triangle with one angle measuring 90°
 - D) A right triangle with an area of 10 in and one side length measuring 2 in
102. An isosceles triangle has one angle that measures 100° . What are the measures of its remaining two angles?
- A) 40° and 40°
 - B) 50° and 50°
 - C) 30° and 100°
 - D) There is not enough information to answer the question.
103. A square is divided by two diagonals into four equivalent triangles. What are the interior angle measures of each triangle?
- A) $45^\circ, 45^\circ, 90^\circ$
 - B) $40^\circ, 40^\circ, 100^\circ$
 - C) $30^\circ, 45^\circ, 105^\circ$
 - D) $30^\circ, 60^\circ, 90^\circ$
104. A seismologist is studying seismic activity and has data on 4 separate earthquakes from 2010 to 2018. The average magnitude of the 4 earthquakes was a 6.5 on the Richter scale. What is the lowest possible magnitude of a single one of those earthquakes, if no earthquake in that period was above a 7.0 magnitude?
- A) 3.0
 - B) 4.0
 - C) 5.0
 - D) It cannot be determined using the given information.

105. What is the area of the triangle below?



- A) 54.0 cm^2
B) 67.5 cm^2
C) 72.0 cm^2
D) 90.0 cm^2
106. Planet X has twice as much oxygen in its atmosphere as Planet Y . Planet Y has a third as much oxygen in its atmosphere as Planet Z . Which of the following represents the ratio of the oxygen in Planet X 's atmosphere to the oxygen in Planet Z 's atmosphere?

- A) 1 : 6
B) 2 : 3
C) 3 : 2
D) 6 : 1

107. What is the circumference of the circle that is represented by the equation below?

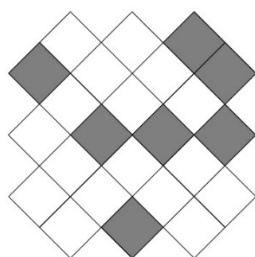
$$36 = \left(x - \frac{1}{2}\right)^2 + \left(y + \frac{5}{2}\right)^2$$

- A) $\frac{5}{2}\pi$
B) 6π
C) 12π
D) 78π
108. A sphere has a surface area of $16\pi \text{ ft}^2$. Which of the following is true?
- A) The radius of the sphere is 4 ft.
B) The volume of the sphere is $4\pi \text{ ft}^3$.
C) The sphere has the same radius as a sphere with a volume of $\frac{32\pi}{3} \text{ ft}^3$.
D) The sphere has the same surface area as a sphere with a radius of 1 ft.

109. Which of the following lines is perpendicular to a line whose slope is undefined?

- A) $y = x$
- B) $y = 5$
- C) $x = -7$
- D) $x = 0$

110. The grid of a board game is shown below. In the game, players compete to win as many squares as possible out of the 24 squares total. No player can share more than one adjacent side of a square with a competitor. Two players, Player A and Player B, compete in the game. If the shaded squares below represent all of the squares that Player A won in the game, what is the MAXIMUM possible number of squares that Player B won?



- A) 7 squares
- B) 12 squares
- C) 13 squares
- D) 17 squares

111. Which of the following is equivalent to $\frac{x^{-5}y^5z^3}{y^5z^{-1}}$?

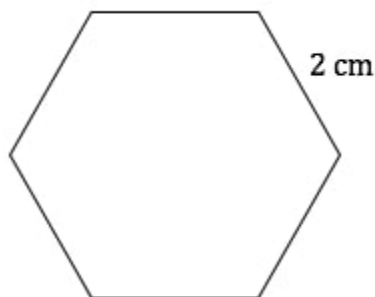
- A) $\frac{x^4}{x^5}$
- B) $\frac{x^3}{y^4}$
- C) $\frac{yz^4}{x^5}$
- D) $\frac{y}{x^5z^3}$

112. The stopping distance of a car (s) is given by the equation below.

$$s = \frac{v^2}{a}$$

In this equation, v is the car's velocity and a is the acceleration due to gravity (approximately 10 meters per second). As velocity of a car increases, stopping distance does which of the following?

- A) Increases linearly
 - B) Increases quadratically
 - C) Decreases linearly
 - D) Decreases logarithmically
113. What is the area of the regular hexagon below, if one side length of the hexagon measures 2 cm?



- A) $6\sqrt{3} \text{ cm}^2$
 - B) $12\sqrt{3} \text{ cm}^2$
 - C) 12 cm^2
 - D) There is not enough information to determine an answer.
114. What is the perimeter of an isosceles right triangle that has two legs that measure 5 cm?
- A) 12.5 cm
 - B) 15 cm
 - C) $10 + 5\sqrt{2} \text{ cm}$
 - D) $15 + 5\sqrt{3} \text{ cm}$

115. How many integers between 10 and 80 (inclusive) meet both conditions below?

1. One of the integer's digits is a solution to the equation $x^3 + x^2 + 11x = 0$.
2. The sum of the integer's digits is greater than or equal to 4.

- A) 5
- B) 8
- C) 10
- D) 19

116. Integer k is negative and integer c is the square of a positive integer less than 10. Which of the following must be true?

- A) $k^2 \geq c$
- B) $c - k \leq 0$
- C) $(kc)^2 \geq \sqrt{c}$
- D) $k^2 \leq c^2$

117. A right triangle has one angle that measures 60° . The hypotenuse of the triangle measures 10 inches. What is the length of the shortest side of the triangle?

- A) 3 inches
- B) 5 inches
- C) $5\sqrt{3}$ inches
- D) It is impossible to determine from the information given.

118. What is the z -coordinate of the point (x, y, z) that is a solution of all three equations below?

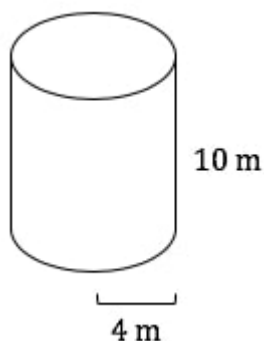
$$\begin{aligned} 5x - y - z &= 10 \\ 2x + y + z &= 11 \\ y + 5 &= z \end{aligned}$$

- A) 3
- B) 4
- C) 5
- D) 6

119. If $f(x, y) = \frac{x^2+5x+2}{xy+2y}$, then which of the following is equivalent to $f(\sqrt{3}, 5)$?

- A) $\frac{\sqrt{3}+1}{\sqrt{3}+2}$
- B) $\frac{7+\sqrt{3}+2}{5\sqrt{3}+10}$
- C) $\frac{3}{\sqrt{3}+2}$
- D) $\frac{27+5\sqrt{3}}{5\sqrt{3}+10}$

120. A chemical company uses the cylindrical storage containers shown below to store a viscous fluid with a density of $1.5 \frac{\text{g}}{\text{cm}^3}$. If the radius of the container is 4 m, and the height of the container is 10 m, what is the weight of the cylinder when it is full, in grams? (1 m = 100 cm)



- A) 450 g
- B) $1,600,000\pi$ g
- C) $2,400,000\pi$ g
- D) $240,000,000\pi$ g

STOP

You have reached the end of the test.

**You may use any remaining time to check your work
on this section (Section III) only.**

**“Intelligence plus character—that is the true goal
of education.”**

- Martin Luther King Jr.



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