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Digital SAT Prep Book

2024-2025

2 Practice Tests and SAT Study Guide

G. T. McDivitt

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Introduction

Congratulations on choosing to take the SAT! By purchasing this book, you've taken the first step toward your college career. This guide will provide you with a detailed overview of the digital SAT so you will know exactly what to expect on test day. We'll take you through all of the concepts covered on the exam and give you the opportunity to test your knowledge with practice questions. Even if it's been a while since you took a major test, don't worry; we'll make sure you're more than ready!

What is the SAT?

The Scholastic Aptitude Test (SAT) is an achievement test designed to assess what you've learned in school. Universities will look at your SAT score to help determine if you're ready to tackle college-level material. However, your test score won't be the only thing that schools look at; they'll also consider your high school transcript, letters of recommendation, and school activities. So, while the SAT is an important part of your college application, it's only one part of the application process.

What's on the SAT?

The digital SAT has some significant differences from the previous version of the SAT: it is shorter in both length and duration, and it consists of two sections instead of four, each with two modules:

- Reading and Writing
- Mathematics

Exam Section	Number of Modules	Duration	Number of Questions
Mathematics	2	35 minutes per module	44 (total of both modules)
Reading and Writing	2	32 minutes per module	54 (total of both modules)
TOTALS	4 (two sections)	134 minutes (2 hours 14 minutes)	98

Mathematics

One of the notable differences between the original SAT and the new digital version of the exam is that an approved calculator may now be used on the entire Mathematics portion of the exam, which consists of two modules. While most of the exam questions are multiple-choice, you may be required to enter an answer for certain math questions; these types of questions are known as "student-produced response (SBR)" questions. Approximately 25% of word problems require an SBR. Note that some SBR questions may have more than one correct answer; however, you may only enter one answer into the response

Reading and Writing

The Reading and Writing portion of the digital SAT also has some significant changes from the original version of the exam. Most notably, there is no longer an optional essay. Test takers will also see a wider variety of topics discussed in shorter (25 – 150 words) reading passages. The content of these reading passages will now more closely resemble what students are being taught in school and will focus on science, the humanities, literature (including plays and poetry), and social studies/history. Each short passage will now be followed by only one question.

Questions on this section will be organized in appearance on the exam by easiest to hardest, with questions that evaluate similar skills and knowledge grouped together. The final question on each Reading and Writing module will concern a bulleted list. Those final questions, known as “rhetorical synthesis” questions, typically feature a student’s set of research notes.

The question types in the Reading and Writing modules are understood to appear in the order in which they are listed in the following table.

Question Type	Skills Evaluated	Number of Questions
Craft and Structure	<ul style="list-style-type: none"> • words in context • structure and purpose • cross-text connections 	13 – 15 questions (about 28% of section)
Information and Ideas	<ul style="list-style-type: none"> • details • central Ideas • command of evidence • inferences 	12 – 14 questions (about 26% of section)
Standard English Conventions	<ul style="list-style-type: none"> • fragments • run-ons • punctuation • pronouns • subject-verb agreement • parallelism • modifiers • verb tense • idioms • diction 	11 – 15 questions (about 26% of section)
Expression of Ideas	<ul style="list-style-type: none"> • transitions • rhetorical synthesis 	8 – 12 questions (about 20% of section)

- an acceptable photo ID (valid, government-issued, has the same name used on the admission ticket, and is original—not a photocopy)
- pens/pencils in order to do scratch work
- an approved calculator (if not using the one embedded in the BlueBook app)

Though it is not required to bring the following items, it is strongly suggested to do so:

- charging cable
- a drink or snacks (for your break)
- a backup testing device

Students may take the exam as often as they feel is necessary.

About This Guide

This guide will help you master the most important test topics and develop critical test-taking skills. We have built features into our books to prepare you for your tests and increase your score. Along with a detailed summary of the format, content, and scoring of the SAT, we offer an in-depth overview of the content knowledge required to pass the exam. You can also test your knowledge with sample questions throughout the text and practice questions that reflect the content and format of the exams. We're pleased you've chosen Accepted, Inc. to be a part of your journey!

Part I - Evidence-Based Reading and Writing

Evidence-Based Reading and Writing

Reading and Writing: 54 questions | 64 minutes (two 32-minute modules)

The Reading and Writing portion of the SAT comprises two modules that each contain questions concerning one of the four following reading and writing content domains:

- Craft and Structure
 - Skills tested include using words in context and an understanding of structure, purpose, and cross-text connections.
- Information and Ideas
 - Skills tested include an understanding of the details and central ideas of a passage as well as a command of evidence and inferences.
- Standard English Conventions
 - Test takers must be able to recognize and understand how to correct sentence fragments, run-on sentences, punctuation, pronouns, subject-verb agreement, parallelism, modifiers, and verb tense.
 - Test takers should also understand idioms and diction.
- Expression of Ideas
 - Skills tested include an understanding of transitions and rhetorical synthesis.

The modules contain a combined total of 54 questions; the test taker will have 32 minutes to complete *each* module (64 minutes total). Each short passage will be followed by one question. Many of the passages will be literary in nature and cover a broad historical range; some passages may be excerpts of poetry and/or plays. Please see the table in the Introduction for a more specific breakdown of the test questions for the Reading and Writing portion of the SAT.

The last question on each module in the Reading and Writing portion of the SAT will relate to a bulleted list, table, or similar item. These types of questions typically concern rhetorical synthesis and may involve analyzing research notes.

of the passage, which discusses the specifics of her accomplishments and how they improved science and female participation in STEM for decades to come.

- The **theme** of the passage is female achievement. This is made clear by the inclusion of the last paragraph and the emphasis of Marie Curie as a *female* scientist at the beginning of the passage. This is the concept that is stressed the most throughout the passage.

QUICK REVIEW: A **topic** is the subject of the passage. A **theme** is an idea or concept that the author refers to repeatedly. A **main idea** is the argument that the writer is making about the topic.

Practice Question

It's easy to puzzle over the landscapes of our solar system's distant planets—how could we ever know what those far-flung places really look like? Scientists utilize a number of tools to visualize the surfaces of many planets. The topography of Venus, for example, has been explored by several space probes, including the Russian Venera landers and NASA's Magellan orbiter. These craft used imaging and radar to map the surface of the planet, identifying a whole host of features including volcanoes, craters, and a complex system of channels.

NASA has also used its series of orbiting telescopes to study distant planets. These four powerful telescopes allow scientists to examine planets using visible light, infrared and near-infrared light, ultraviolet light, X-rays and gamma rays.

Powerful telescopes aren't just found in space: NASA also makes use of Earth-bound telescopes. In fact, Earth-bound telescopes offer a distinct advantage over orbiting telescopes because they allow scientists to capture data from a fixed point, which allows them to effectively compare data collected over a long period of time.

- Which of the following sentences BEST describes the main idea of the passage?
 - It is impossible to know what the surfaces of other planets are really like.
 - Telescopes are an important tool for scientists studying planets in our solar system.
 - Venus's surface has many of the same features as Earth's surface and includes volcanoes, craters, and channels.
 - Scientists use a variety of advanced technologies to study the surface of the planets in our solar system.

Topic and Summary Sentences

The main idea of a paragraph usually appears within the topic sentence. The **topic sentence** introduces the main idea to readers; it indicates not only the topic of a passage, but also the writer's perspective on the topic.

Be alert for paragraphs in which writers do not include a clear topic sentence at all; even without a clear topic sentence, a paragraph will still have a main idea. You may also see a summary sentence at the end of a passage. As its name suggests, the **summary sentence** sums up the passage, often by restating the main idea and the author's key evidence that supports it.

Notice, for example, how the first sentence in the text about Marie Curie states that she was one of the most influential *female* scientists to ever live. This topic sentence introduces the main idea of the text, which is then continued by paragraphs that describe Curie's accomplishments and provide context for

Practice Question

Fortunately, none of Alyssa's coworkers have ever seen inside the large filing drawer in her desk. Disguised by the meticulous neatness of the rest of her workspace, the drawer betrays no sign of the chaos within. To even open it, she had to struggle for several minutes with the enormous pile of junk jamming the drawer, until it would suddenly give way and papers, folders, and candy wrappers spilled out onto the floor. It was an organizational nightmare, with torn notes and spreadsheets haphazardly thrown on top of each other and melted candy smeared across pages. She was worried the odor would soon waft to her coworkers' desks, revealing her secret.

3. Which sentence BEST describes the main idea of the paragraph above?

- A) Alyssa wishes she could move to a new desk.
- B) Alyssa wishes she had her own office.
- C) Alyssa is glad none of her coworkers know about her messy drawer.
- D) Alyssa is sad because she does not have any coworkers.

Supporting Details

Be on the lookout for **signal words** (or phrases), or **transitions**, which help the reader identify connections between ideas and can help the reader rule out sentences that do not contain the main idea or are not the topic sentence. Signal words can describe cause-and-effect relationships, the chronology of events, items in a list, summaries, contrasts and comparisons, examples, and clarifications; they can also lend emphasis. Examples of signal words include the following:

- one
- to begin with
- also
- further
- first (of all)
- for one thing
- in addition
- furthermore
- second(ly)
- other
- next
- last (of all)
- third(ly)
- another
- moreover
- final(ly)

Text Structure

Authors can structure passages in a number of different ways. These distinct organizational patterns, referred to as **text structure**, use the logical relationships between ideas to improve the readability and coherence of a text. The most common ways in which passages are organized include the following:

- Problem-solution: The author presents a problem and then discusses a solution.
- Compare-contrast: The author presents two situations and then discusses their similarities and differences.
- Cause-effect: The author presents an action and then discusses the resulting effects.
- Descriptive: The author describes an idea, object, person, or other item in detail.

Practice Question

The issue of public transportation has begun to haunt the fast-growing cities of the southern United States. Unlike their northern counterparts, cities like Atlanta, Dallas, and Houston have long promoted growth out and not up—these are cities full of sprawling suburbs and single-family homes, not densely concentrated skyscrapers and apartments. What to do then, when all of those suburbanites need to get into the central business districts for work? For a long time, it seemed highways were the twenty-lane wide expanses of concrete that would allow commuters to move from home to work and back again. But these modern miracles have become time-sucking, pollution-spewing nightmares. They may not like it, but it is time for these cities to turn toward public transport, like trains and buses, if they are to remain livable.

7. How can the organization of this passage BEST be described?

- A) as a comparison of two similar ideas
- B) as a description of a place
- C) as a discussion of several effects all related to the same cause
- D) as a discussion of a problem followed by the suggestion of a solution

The Author's Purpose

Whenever authors write texts, they always have a purpose. The purpose could be to entertain, inform, explain, or persuade. A short story, for example, is meant to entertain while an online news article would be designed to inform the public about something, such as a current event. Each of these different types of writing has a specific name:

- **Narrative writing** tells a story. (e.g., novel, short story, play).
- **Expository writing** informs people (e.g., newspaper and magazine articles).
- **Technical writing** explains something (e.g., product manual, instructions).
- **Persuasive writing** tries to convince the reader of something (e.g., an opinion column on a blog).

On the exam, you may be asked to categorize a passage as one of the types listed above; this may involve specifically naming the passage as such or identifying its general purpose. You may also be asked about primary and secondary sources.

These terms describe not the writing itself but the author's relationship to what is being written:

Practice Question

Exercise is critical for healthy development in children. Today, there is an epidemic of unhealthy children in the United States who will face health problems in adulthood due to poor diet and lack of exercise during childhood. This is a problem for all Americans, especially with the rising cost of health care.

It is vital that school systems and parents encourage their children to engage in a minimum of thirty minutes of cardiovascular exercise each day, mildly increasing their heart rate for a sustained period. This is proven to decrease the likelihood of developmental diabetes, obesity, and a multitude of other health problems. Children also need a proper diet rich in fruits and vegetables so that they can grow and develop physically and learn healthy eating habits early on.

9. Which of the following is a FACT in the passage (not an opinion)?

- A) Fruits and vegetables are the best way to help children be healthy.
- B) Children today are lazier than they were in previous generations.
- C) The risk of diabetes in children is reduced by physical activity.
- D) Children should engage in thirty minutes of exercise a day.

Drawing Conclusions

In addition to understanding the main idea and factual content of a passage, you will also be asked to take your analysis one step further and anticipate what other information could logically be added to the passage. In a nonfiction passage, for example, you might be asked which statement the author of the passage would agree with. In an excerpt from a fictional work, you might be asked to anticipate what a character would do next.

To answer these questions, you must have a solid understanding of the topic, theme, and main idea of the passage. Armed with this information, you can determine which of the answer options best fits within those criteria (or alternatively, which ones do not). For example, if the author of the passage is advocating for safer working conditions in textile factories, any supporting details that would be added to the passage should support that idea. You might add sentences that contain information about the number of accidents that occur in textile factories or information that would outline a new plan for fire safety.

It is important to remember that more than one of these clues can be present in the same sentence. The more there are, the easier it will be to determine the meaning of the word. For example, the following sentence uses both restatement and positive/negative clues:

- *Janet suddenly found herself destitute, so poor she could barely afford to eat.*

The second part of the sentence clearly indicates that *destitute* is a negative word. It also restates the meaning: "very poor."

Practice Question

Determine the meaning of the underlined words in the following passages.

The Great Gatsby by F. Scott Fitzgerald

James Gatz—that was really, or at least legally, his name. He had changed it at the age of seventeen and at the specific moment that witnessed the beginning of his career—when he saw Dan Cody's yacht drop anchor over the most insidious flat on Lake Superior. It was James Gatz who had been loafing along the beach that afternoon in a torn green jersey and a pair of canvas pants, but it was already Jay Gatsby who borrowed a rowboat, pulled out to the Tuolomee, and informed Cody that a wind might catch him and break him up in half an hour.

I suppose he'd had the name ready for a long time, even then. His parents were shiftless and unsuccessful farm people—his imagination had never really accepted them as his parents at all. The truth was that Jay Gatsby of West Egg, Long Island, sprang from his Platonic conception of himself. He was a son of God—a phrase which, if it means anything, means just that—and he must be about His Father's business, the service of a vast, vulgar, and meretricious beauty. So he invented just the sort of Jay Gatsby that a seventeen-year-old boy would be likely to invent, and to this conception he was faithful to the end.

11. What does the word *meretricious* MOST nearly mean as it is used in the above text?

- A) uniquely crafted
- B) unanimously offensive
- C) conveying genuineness
- D) attractive but lacking in integrity

The Blue Castle by L.M. Montgomery

The thought of her mother's expression made Valancy laugh—for she had a sense of humour nobody in her clan suspected. For that matter, there were a good many things about Valancy that nobody suspected. But her laughter was very superficial and presently she lay there, a huddled, futile little figure, listening to the rain pouring down outside and watching, with a sick distaste, the chill, merciless light creeping into her ugly, sordid room.

12. What does the word *sordid* MOST nearly mean as it is used in the above text?

- A) degraded
- B) compact
- C) welcoming
- D) cluttered

Autobiography of Benjamin Franklin by Benjamin Franklin

I have ever had pleasure in obtaining any little anecdotes of my ancestors. You may remember the inquiries I made among the remains of my relations when you were with me in England, and the journey I undertook for that purpose. Imagining it may be equally agreeable to you to know the circumstances of my life, many of which you are yet unacquainted with, and expecting the enjoyment of a week's uninterrupted leisure in my present country retirement, I sit down to write them for you.

14. What is the prefix, root, and suffix of the underlined word?

- A) prefix: *un-*, root: *acquaint*, suffix: *-ed*
- B) prefix: (none), root: *unacquaint*, suffix: *-ed*
- C) prefix: *unac-*, root: *quaint*, suffix: *-ed*
- D) prefix: *un-*, root: *acquainted*, suffix: (none)

Command of Evidence and Inferences

Having a strong command of evidence means being able to take information that is provided in the text to make inferences and support conclusions. This could include being able to logically finish a paragraph based on the information given throughout. It could also include using data from a table to draw a conclusion about a broader topic being discussed. Developing this skill means being able to identify portions of the text that support comprehension and strengthen answers about the author's argument.

Practice Question

"The Love Song of J. Alfred Prufrock" is a 1915 modernist poem by T.S. Eliot. It is a monologue in which the speaker explores themes of aging and regret: _____

15. Which quotation from "The Love Song of J. Alfred Prufrock" MOST effectively illustrates the claim that the monologue explores themes of aging and regret?

- A) "I have heard the mermaids singing, each to each./I do not think that they will sing to me."
- B) "In the room the women come and go/Talking of Michelangelo."
- C) "Do I dare/Disturb the universe?/In a minute there is time/For decisions and revisions which a minute will reverse."
- D) "Is it perfume from a dress/That makes me so digress?/Arms that lie along a table, or wrap about a shawl."

Pronouns can be singular or plural. **Singular pronouns** include the following:

- I, me, mine, my
- you, your, yours
- he, him, his
- she, her, hers
- it, its

Plural pronouns include the following:

- we, us, our, ours
- they, them, their, theirs

Practice Questions

The Vision Quest is a ritual practiced by Indigenous Native American tribes. During this ritual, the individual is secluded in nature, where they pray for spiritual guidance. They also fast during this time. The ritual is a rite of passage that is meant to transform participants lives as they connect with nature, the spirit world, and _____.

1. Which option completes the text so that it conforms to the conventions of Standard English?

- A) themselves
- B) theirself
- C) themselves
- D) them

In Celtic folklore, there is a mythical belief in a creature known as Bean Sidhe or Banshee. The Banshee is depicted as a woman, that is seen as a harbinger of death, and her wailing is a sign that a loved one is soon to perish.

2. Which option completes the text so that it conforms to the conventions of Standard English?

- A) a woman that is seen
- B) a woman; that is seen
- C) a woman who is seen
- D) a woman, who is seen

Other Parts of Speech

Prepositions generally help describe relationships in space and time and may express the location of a noun or pronoun in relation to other words and phrases in a sentence. For example, in the following sentence, the preposition *in* describes the position of the car in relation to the garage. The noun that follows the preposition is called its **object**. In the example below, the object of the preposition *in* is the noun *parking garage*:

- The nurse parked her car in a parking garage.

Other prepositions include the words *after, between, by, during, of, on, to, and with*.

includes the main verb and any helping verbs (e.g., “had been running”). Phrases cannot stand alone as sentences.

A clause is a group of words that contains both a subject and a verb. There are two types of clauses: independent clauses can stand alone as sentences, and dependent clauses cannot stand alone. Again, dependent clauses are recognizable as they begin with subordinating conjunctions.

Practice Questions

Hatshepsut, who reigned from 1479 to 1458 BC, was one of ancient Egypt’s most successful pharaohs. The role of pharaoh was usually reserved for men, but after the death of her husband, Hatshepsut took over the role for herself. She presented herself just as _____ traditional false beard and kilt. She did well in her role until her stepson Thutmose III succeeded her.

4. Which phrasing option MOST effectively completes the text while conforming to the conventions of Standard English?

- A) a male king would; she wore a
- B) a male king would... she wore a
- C) a male king would and she wore a
- D) a male king would, she wore a

Pride and Prejudice by Jane Austen

The evening altogether passed off pleasantly to the whole family. Mrs. Bennet had seen her eldest daughter much admired by the Netherfield party. Mr. Bingley had danced with her twice, and she had been distinguished by his sisters. Jane was as much gratified by this as her mother could be, though in a quieter way. Elizabeth felt Jane’s pleasure. Mary had heard herself mentioned to Miss Bingley as the most accomplished girl in the neighbourhood; and Catherine and Lydia had been fortunate enough to be never without partners, which was all that they had yet learnt to care for at a ball. They returned, therefore, in good spirits to Longbourn, the village where they lived, and of which they were the principal inhabitants. They found Mr. Bennet still up. With a book, he was regardless of time; and on the present occasion he had a good deal of curiosity as to the event of an evening which had raised such splendid expectations. He had rather hoped that all his wife’s views on the stranger would be disappointed; but he soon found that he had a very different story to hear.

5. Which of the following options does NOT include a prepositional phrase?

- A) “admired by the Netherfield party”
- B) “danced with her twice”
- C) “the principal inhabitants”
- D) “on the stranger”

Types of Sentences

A sentence can be classified as simple, compound, complex, or compound-complex based on the type and number of clauses it has.

Practice Question

The Legend of Sleepy Hollow by Washington Irving

I profess not to know how women's hearts are wooed and won. To me they have always been matters of riddle and admiration. Some seem to have but one vulnerable point, or door of access; while others have a thousand avenues, and may be captured in a thousand different ways.

6. Which of the following lines from the text is considered a compound-complex sentence?

- A) "I profess not to know how women's hearts are wooed and won."
- B) "To me they have always been matters of riddle and admiration."
- C) "Some seem to have but one vulnerable point, or door of access; while others have a thousand avenues, and may be captured in a thousand different ways."
- D) None of the sentences in the text are complex-compound.

Clause Placement

In addition to the sentence classifications described above, sentences can also be defined by the location of the main clause. In a **periodic sentence**, the main idea of the sentence is held until the end. In a **cumulative sentence**, the independent clause comes first, and any modifying words or clauses follow it. (Note that this type of classification—periodic or cumulative—is not used in place of the simple, compound, complex, or compound-complex classifications. A sentence can be both cumulative and complex.)

Practice Question

Dracula by Bram Stoker

I had visited the British Museum, and made search among the books and maps in the library regarding Transylvania; it had struck me that some foreknowledge of the country could hardly fail to have some importance in dealing with a nobleman of that country. I find that the district he named is in the extreme east of the country, just on the borders of three states, Transylvania, Moldavia and Bukovina, in the midst of the Carpathian mountains; one of the wildest and least known portions of Europe.

7. Which type of sentence BEST describes the underlined portion of text?

- A) cumulative-complex
- B) cumulative compound-complex
- C) periodic-complex
- D) periodic compound-complex

Punctuation

Basic rules for the use of major punctuation marks are described in Table 2.2.

Table 2.2. Basic Punctuation Rules

Punctuation	Purpose	Example
Period	to end a sentence	Periods go at the end of complete sentences.

Table 2.3. Point of View

Person	Pronoun	Who is acting?	Example
first	I, we	the writer	I take my time when shopping for shoes.
second	you	the reader	You prefer to shop online.
third	he, she, it, they	the subject	She buys shoes from her cousin's store.

First-person perspective appears when the writer's personal experiences, feelings, and opinions are an important element of the text. **Second-person perspective** is used when the author directly addresses the reader. **Third-person perspective** is most common in formal and academic writing; it creates distance between the writer and the reader. Whichever perspective, or point of view, is chosen for a sentence, it must be consistent within the sentence.

Practice Question

Twice-Told Tales by Nathaniel Hawthorne

One afternoon in April, 1689, Sir Edmund Andros and his favorite councillors, being warm with wine, assembled the red-coats of the governor's guard and made their appearance in the streets of Boston. The sun was near setting when the march commenced. The roll of the drum at that unquiet crisis seemed to go through the streets less as the martial music of the soldiers than as a muster-call to the inhabitants themselves. A multitude by various avenues assembled in King street, which was destined to be the scene, nearly a century afterward, of another encounter between the troops of Britain and a people struggling against her tyranny.

9. In which perspective is the above text written?

- A) first-person
- B) second-person
- C) third-person
- D) fourth-person

Active and Passive Voice

Sentences can be written in active voice or passive voice:

- **Active voice** means that the subjects of the sentences are performing the action of the sentence.
 - Example: "Justin wrecked my car."
 - This sentence is in the active voice because the subject (Justin) is doing the action (wrecked).
- In a sentence written in **passive voice**, the subjects are being acted on.
 - The example sentence above can be rewritten in passive voice by using a *to be* verb: "My car was wrecked by Justin."

Practice Question

Nelson Mandela joined the African National Congress in the 1940s to fight against the oppressive apartheid regime in South Africa. He was imprisoned for 27 years before being released. _____, he went on to become the first Black president of the country and brought stability and peace back to the nation.

11. Which option BEST completes the text with the most logical transition?

- A) However
- B) Additionally
- C) For example
- D) Subsequently

Wordiness and Redundancy

Sometimes sentences can be grammatically correct but still be confusing or poorly written. Often this problem arises when sentences are wordy or contain **redundant phrasing** (i.e., when several words with similar meanings are used). Such phrases are often used to make the writing seem more serious or academic when, in reality, redundant phrasing can confuse the reader.

Some examples of excessive wordiness and redundancy include the following:

- I will meet you in the place where I parked my car. → I'll meet you in the parking lot.
- The point I am trying to make is that the study was flawed. → The study was flawed.
- A memo was sent out concerning the matter of dishes left in the sink. → A memo was sent out about dishes left in the sink.
- The email was brief and to the point. → The email was terse.
- I don't think I'll ever understand or comprehend Italian operas. → I don't think I'll ever understand Italian operas.

Part I Answer Key

Chapter 1 Answers

- 1. D:** Option A can be eliminated because it directly contradicts the rest of the passage, which describes in varying detail how scientists have learned about the surfaces of other planets. Answer options B and C can also be eliminated because they offer only specific details from the passage but not enough to encompass the passage as a whole. Only answer option D provides an assertion that is both supported by the passage's content and general enough to cover the entire passage.
- 2.** The topic sentence is the first sentence in the paragraph. It introduces the topic of discussion, in this case the limits of the US Constitution on centralized power. The summary sentence is the last sentence in the paragraph and sums up the information that was just presented—that constitutional limits have helped sustain the United States of America for over two hundred years.
- 3. C:** Clearly, Alyssa has a messy drawer, and option C is the correct answer. The paragraph begins by indicating Alyssa's gratitude that her coworkers do not know about her drawer—"Fortunately, none of Alyssa's coworkers have ever seen inside the large filing drawer in her desk." Plus, notice how the drawer is described: as an organizational nightmare that apparently doesn't even function properly: "to even open the drawer, she had to struggle for several minutes . . ." The writer reveals that it even has an odor, with old candy inside. Alyssa is clearly ashamed of her drawer and fearful of being judged by her coworkers about it.
- 4. B:** Option B is the correct answer because the main idea of the passage is that satellites have numerous helpful purposes for humans, and the detail about debris collision shows that there is also a negative aspect to satellite launches. The author added this detail to include an opposing view of the satellites being discussed.
- 5. D:** Option D is the correct answer because it provides details that support the main idea, which is that the printing press revolutionized the spread of knowledge. The main idea is stated in Sentence 1, which is a summary sentence. Sentence 4 supports the main idea by saying that literacy rates and education increased after the invention of the printing press. This is evidence of the spread of knowledge being revolutionized. The sentence also uses the phrase *in addition*, which signals a supporting claim.
- 6. A:** Option A is the correct answer because sentence 4 is used to explain how Turing's breaking of the code enabled one side of the war to gain an advantage over the other. This is a supporting detail for the main idea, which claims Turing's breaking of the code changed the outcome of the war. The word *finally* also suggests that this is a supporting sentence.
- 7. D:** Answer option C can be excluded because the author provides no root cause or list of effects. From there this question gets tricky because the passage contains structures similar to those described above. For example, it compares two things (northern cities and southern cities) and describes a place (a sprawling city); however, if you look at the overall organization of the passage, you can see that it starts by presenting a problem (transportation) and then presents a solution (trains and buses), making option D the only option that encompasses the entire passage.

selves needs to be plural to agree with the pronoun. Option D, *them*, is not correct either, as it is unspecific and does not refer to the self of the person undergoing the ritual.

2. C: Option C is the correct answer because there should not be a comma after the word *woman*, since a restrictive clause follows it. Additionally, since the subject is a person, it is appropriate to use the word *who* rather than *that*. The word *that* should be used when referring to an object, not a person.

3. B: Option B is the correct answer because it uses the correct adverb and conjunction combination. Since the sentence has a negative function, as the speaker is saying she is not a rascal and is not a wretch, the adverb and conjunction should follow suit. They should match in quality; therefore, *neither* and *nor* are correct. Option C and D are incorrect because combining *either* and *nor* or *neither* and *or* would be inconsistent. Option A is incorrect because *either* and *or* do not match the context of the sentence, which is a denial of qualities that calls for negative words.

4. A: Option A is the correct answer because it combines two independent clauses that are connected in idea; therefore, a semicolon is the most appropriate punctuation. Option B is incorrect because ellipses are not needed, as there is no clear need for a pause. Option C is incorrect because the word *and* precedes an independent clause and would need to have a comma before it to be grammatically correct; it also provides more separation between the ideas than necessary. Option D is incorrect, as a comma cannot separate two independent clauses unless followed by a conjunction.

5. C: Option C is correct because it does not feature a preposition. To create a prepositional phrase, there must be a preposition before the noun or pronoun that reflects the relationship between the elements in the sentence. Option A has the preposition *by* and includes the object of the party. Option B has the preposition *with* and the object *her*. Option D includes the preposition *on* and the object of the stranger.

6. C: Option C is the compound-complex sentence because it has two independent clauses and a dependent clause. Options A and B feature simple sentences that do not have dependent clauses. Option D is incorrect because option C is a compound-complex sentence.

7. B: Option B is the correct answer because the sentence is cumulative, starting with an independent clause and building upon the main idea with independent and dependent clauses. The sentence is also compound-complex because it features two independent clauses and a dependent clause. The sentence is not a complex sentence due to having two independent clauses and a dependent clause, and it is not periodic because the main idea of the sentence is not held until the end.

8. A: Option A is the correct answer because the sentence has two independent clauses, which means that the most appropriate way to combine them is with a semicolon. A comma (option B) would require a dependent clause; however, this sentence has two independent clauses. A colon (option C) is not appropriate since a list, definition, or explanation is not being included. No punctuation (option D) would create a run-on sentence.

9. C: Option C is the correct answer because the passage's use of the words *his* and *their* rather than the first-person and second-person equivalents *I* or *you* indicates that it is written in the third person—not first person (option A) or second person (option B). Fourth person (option D) is not generally discussed as its own perspective within English literature.

10. B: Option B is written using passive voice because the focus of the sentence is on the daily stock being arranged rather than the flower-women who are arranging it. Since passive voice focuses on the subject being acted on rather than the person performing the action, this is the best answer. Options A

Part II - Mathematics

Module I: Approximately 22 questions | 35 minutes (with calculator)

Module II: Approximately 22 questions | 35 minutes (with calculator)

The Mathematics section of the SAT tests your knowledge of math concepts taught through the tenth grade. As with the Reading and Writing portion of the exam, the Mathematics portion of the SAT is composed of two modules. The first module will contain a variety of questions that, in terms of degree of difficulty, are considered either easy, medium, or difficult. The test taker's performance on the first module dictates the degree of difficulty for the second module.

Each module of the Mathematics portion of the exam will contain questions from all four of the following math categories:

- Algebra
- Advanced Math
- Problem-solving and Data Analysis
- Geometry and Trigonometry

Approximately 75 percent of the questions in each module will be multiple-choice; the remaining questions will be "set in context" (known as "grid-in" questions on the paper version of the exam) and require a student-produced response. Word problems will be based on social studies, science, or other real-world scenarios.

Unlike the original SAT, the digital version of the exam allows the test taker to use a graphing calculator for *both* modules of the Mathematics portion. Test takers may use the built-in Desmos graphing calculator on the exam, or they may bring a graphing calculator of their choosing as long as it meets the guidelines set forth by the College Board for use in the SAT Suite of Assessments. It is important to note that some questions may be answered more efficiently *without* the use of a calculator; it is therefore important for test takers to understand basic math concepts and employ reasoning abilities in order to save time.

The majority of the questions will require you to use complex reasoning to work through multiple steps. Test takers can expect to perform tasks like building equations from word problems, comparing expressions, and interpreting figures. In the digital version of the SAT, each word problem will be short (50 words or less) and have only one corresponding question, and student-produced response questions can now be negative and include an extra digit. The digital version of the SAT no longer contains questions concerning complex or imaginary numbers.

Working with Positive and Negative Numbers

Adding, multiplying, and dividing numbers can yield positive or negative values depending on the signs of the original numbers. Knowing these rules can help you better determine if an answer is correct:

- $(+) + (-)$ = the sign of the larger number
- $(-) + (-)$ = negative number
- $(-) \times (-)$ = positive number
- $(-) \times (+)$ = negative number
- $(-) \div (-)$ = positive number
- $(-) \div (+)$ = negative number

Practice Questions

4. Find the product of -10 and 47 .
5. What is the sum of -65 and -32 ?
6. Is the product of -7 and 4 less than -7 , between -7 and 4 , or greater than 4 ?
7. What is the value of -16 divided by 2.5 ?

Order of Operations

Operations in a mathematical expression are always performed in a specific order, which is described by the acronym **PEMDAS**:

1. **P**arentheses
 2. **E**xponents
 3. **M**multiplication
 4. **D**ivision
 5. **A**ddition
 6. **S**ubtraction
- Perform the operations within parentheses first, and then address any exponents.
 - After those steps, perform all multiplication and division.
 - These are carried out from left to right as they appear in the problem.
 - Finally, do all required addition and subtraction, also from left to right, as each operation appears in the problem.

Table 3.2. Units and Conversion Factors

Dimension	American	SI
force	pound-force	newton
pressure	pound-force per square inch	pascal
work and energy	cal/British thermal unit	joule
temperature	Fahrenheit	kelvin
charge	faraday	Coulomb
Conversion Factors		
1 in = 2.54 cm		1 lb = 0.454 kg
1 yd = 0.914 m		1 cal = 4.19 J
1 mile = 1.61 km		1 °F = $\frac{5}{9}(°F - 32)$
1 gallon = 3.785 L		1 cm ³ = 1 mL
1 oz = 28.35 g		1 hour = 3,600 s

Practice Questions

12. A fence measures 15 ft. long. How many yards long is the fence?
13. A pitcher can hold 24 cups. How many gallons can it hold?
14. A spool of wire holds 144 in. of wire. If Mario has 3 spools, how many feet of wire does he have?
15. A ball rolling across a table travels 6 inches per second. How many feet will it travel in 1 minute?
16. How many millimeters are in 0.5 meters?
17. A lead ball weighs 38 g. How many kilograms does it weigh?
18. How many cubic centimeters are in 10 L?
19. Jennifer's pencil was initially 10 centimeters long. After she sharpened it, it was 9.6 centimeters long. How many millimeters did she lose from her pencil by sharpening it?

Decimals and Fractions

When **adding and subtracting decimals**, the numbers should be arranged up so that the decimals are aligned. From there, subtract the ones place from the ones place, the tenths place from the tenths place, and so on.

When **multiplying decimals**, start by multiplying the numbers normally. You can then determine the placement of the decimal point in the result by adding the number of digits after the decimal in each of the numbers that were multiplied together.

Practice Questions

27. Find $\frac{7}{8} \div \frac{1}{4}$
28. What is the product of $\frac{1}{12}$ and $\frac{6}{8}$?
29. Find the quotient: $\frac{2}{5} \div 1\frac{1}{5}$
30. A recipe calls for $\frac{1}{4}$ cup of sugar. If 8.5 batches of the recipe are needed, how many cups of sugar will be used?

Adding and Subtracting Fractions

A **common denominator** is required when adding and subtracting fractions. To find the common denominator, multiply each fraction by the number 1. With fractions, any number over itself (e.g., $\frac{5}{5}, \frac{12}{12}$) is equivalent to 1, so multiplying by such a fraction can change the denominator without changing the value of the fraction. Once the denominators are the same, the numerators can be added or subtracted.

To **add mixed numbers**, first add the whole numbers and then add the fractions. To **subtract mixed numbers**, convert each number to an improper fraction, and then subtract the numerators.

Practice Questions

31. Simplify the expression: $\frac{2}{3} - \frac{1}{5}$
32. Find the difference between $2\frac{1}{3} - \frac{3}{2}$
33. Find the sum of $\frac{9}{16}, \frac{1}{2}$, and $\frac{7}{4}$
34. Sabrina has $\frac{2}{3}$ of a can of red paint. Her friend Amos has $\frac{1}{6}$ of a can. How much red paint do they have combined?

Converting Fractions To Decimals

Although calculators may be used on both modules of the Mathematics portion of the digital SAT, it is helpful to know the following techniques that can be used to navigate between the fractions and decimals.

Memorizing common decimals and their fractional equivalents (as seen in Table 3.3.) is one of the most helpful techniques. With these values, it is possible to convert more complicated fractions as well. For example, $\frac{2}{5}$ is just $\frac{1}{5}$ multiplied by 2, so $\frac{2}{5} = 0.2 \times 2 = 0.4$.

Converting Decimals to Fractions

Converting a decimal into a fraction is more straightforward than converting fractions to decimals. To **convert a decimal**, simply use the numbers that come after the decimal as the numerator in the fraction. The denominator will be a power of 10 that matches the place value for the original decimal. For example, the denominator for 0.46 would be 100 because the last number is in the hundredths place; likewise, the denominator for 0.657 would be 1,000 because the last number is in the thousandths place. Once this fraction has been set up, all that is left to do is to simplify it.

5	4	.	3	2
5×10^1	4×10^0		3×10^{-1}	2×10^{-2}
5×10	4×1		$3 \times \frac{1}{10}$	$2 \times \frac{1}{100}$
50	4		0.3	0.02
Tens	Ones	Decimal Point	Tenths	Hundredths

$$50 + 4 + 0.3 + 0.02 = 54.32$$

Figure 3.1. Decimal Places

Practice Question

37. Convert 0.45 into a fraction.

Ratios

A **ratio** describes the quantity of one thing in relation to the quantity of another. Unlike fractions, ratios do not give a part relative to a whole; instead, they compare two values. For example, if there are 3 apples and 4 oranges, the ratio of apples to oranges is 3 to 4. Ratios can be written using words (3 to 4), fractions ($\frac{3}{4}$), or colons (3: 4).

It is helpful to rewrite a ratio as a fraction that expresses a part to a whole. For instance, in the example above there are 7 total pieces of fruit, so the fraction of the fruit that is apples is $\frac{3}{7}$, while oranges make up $\frac{4}{7}$ of the fruit collection.

When working with ratios, the units of the values being compared should always be considered. Questions on the SAT may require you to revise a ratio using the same units on both sides. For example, the ratio “3 minutes to 7 seconds” would be revised as “180 seconds to 7 seconds” in order to ensure that the same units are used on either side of the ratio.

Note that when solving these problems, the units for the part and the whole should be the same. For example, if someone reading a book says that she has read 5 pages out of 15 chapters, it does not make any sense; however, saying that someone has read 5 chapters out of 15 chapters, for instance, would make sense.

Practice Questions

43. 45 is 15% of what number?

44. Jim spent 30% of his paycheck at the fair. He spent \$15 for a hat, \$30 for a shirt, and \$20 playing games. How much was his paycheck? (Round to the nearest dollar.)

45. What percent of 65 is 39?

46. Greta and Max sell cable subscriptions. In a given month, Greta sells 45 subscriptions and Max sells 51. If 240 total subscriptions were sold during that month, what percentage were NOT sold by Greta or Max?

47. Grant needs to score 75% on an exam. If the exam has 45 questions, AT LEAST how many does Grant need to answer correctly to get this score?

Percent Change

Percent change problems ask you to calculate how much a given quantity has changed. The problems are solved in a similar way to regular percent problems, except that the amount of change is used instead of the part. Note that the sign of the amount of change is important: if the original amount has increased, the change will be positive; if the original amount has decreased, the change will be negative. In the equations below, the percent is a decimal value that needs to be multiplied by 100 to get the actual percentage:

- $\text{percent change} = \frac{\text{amount of change}}{\text{original amount}}$
- $\text{amount of change} = \text{original amount} \times \text{percent change}$
- $\text{original amount} = \frac{\text{amount of change}}{\text{percent change}}$

Did You Know?

Seeing the following words can indicate that a math problem concerns percent change: *discount, markup, sale, increase, decrease*.

Practice Questions

48. A computer software retailer marks up its games by 40% above the wholesale price when it sells them to customers. Find the price of a game for a customer if the game costs the retailer \$25.

49. A golf shop pays its wholesaler \$40 for a certain club, and then sells it to a golfer for \$75. What is the markup rate?

50. A shoe store charges a 40% markup on the shoes it sells. How much did the store pay for a pair of shoes purchased by a customer for \$63?

51. An item originally priced at \$55 is marked 25% off. What is the sale price?

Table 3.4. Exponents and Radicals Rules

Rule	Example
$(x^a)^b = x^{ab}$	$(5^2)^3 = 5^6 = 15,625$
$\frac{x^a}{y} = \frac{x^a}{y^a}$	$\left(\frac{5}{6}\right)^2 = \frac{5^2}{6^2} = \frac{25}{36}$
$\frac{x^a}{x^b} = x^{a-b} (x \neq 0)$	$\frac{5^4}{5^3} = 5^1 = 5$
$x^{-a} = \frac{1}{x^a} (x \neq 0)$	$5^{-2} = \frac{1}{5^2} = \frac{1}{25}$
$x^{\frac{1}{3}} = \sqrt[3]{x}$	$25^{\frac{1}{2}} = \sqrt[2]{25} = 5$
$\sqrt[a]{x \times y} = \sqrt[a]{x} \times \sqrt[a]{y}$	$\sqrt[3]{8 \times 27} = \sqrt[3]{8} \times \sqrt[3]{27} = 2 \times 3 = 6$
$\sqrt[a]{\frac{x}{y}} = \frac{\sqrt[a]{x}}{\sqrt[a]{y}}$	$\sqrt[3]{\frac{27}{8}} = \frac{\sqrt[3]{27}}{\sqrt[3]{8}}$
$\sqrt[a]{x^b} = x^{\frac{b}{a}}$	$\sqrt[2]{5^4} = 5^{\frac{4}{2}} = 5^2 = 25$

Practice Questions

56. Simplify the expression $2^4 \times 2^2$

57. Simplify the expression $(3^4)^{-1}$

58. Simplify the expression $\left(\frac{9}{4}\right)^{\frac{1}{2}}$

Matrices

A **matrix** is an array of numbers aligned into horizontal rows and vertical columns. It is described by the number of rows (m) and columns (n) that it contains. For example, a matrix with 3 rows and 4 columns is a 3×4 matrix, as shown below:

$$\begin{bmatrix} 2 & -3 & 5 & 0 \\ 4 & -6 & 2 & 11 \\ 3.5 & 7 & 2.78 & -1.2 \end{bmatrix}$$

To add or subtract two matrices, simply add or subtract the corresponding numbers in each matrix. Only matrices with the same dimensions can be added or subtracted; the resulting matrix will also have the same dimensions.

In order to multiply two matrices, the number of columns in the first matrix must equal the number of rows in the second matrix. To multiply the matrices, multiply the numbers in each row of the first by the numbers in the column of the second and add. The resulting matrix will have the same number of rows

Chapter Four

Algebra

Algebraic Expressions

Algebraic expressions and equations include **variables**, or letters that stand in for numbers. These expressions and equations are made up of **terms**, which are groups of numbers and variables (e.g., $2xy$). An **expression** is simply a set of terms (e.g., $\frac{2x}{3yz} + 2$). When those terms are joined only by addition or subtraction, the expression is called a **polynomial** (e.g., $2x + 3yz$). When working with expressions, you will need to use many different mathematical properties and operations, including addition/subtraction, multiplication/division, exponents, roots, distribution, and the order of operations.

To **evaluate an algebraic expression**, simply plug the given value(s) in for the appropriate variable(s) in the expression.

Practice Question

1. Evaluate $2x + 6y - 3z$ if $x = 2$, $y = 4$, and $z = -3$.

Adding and Subtracting Expressions

Only **like terms**, which have the exact same variable(s), can be added or subtracted. **Constants** are numbers without variables attached, and those can be added and subtracted together as well. When simplifying an expression, like terms should be added or subtracted so that no individual group of variables occurs in more than one term. For example, the expression $5x + 6xy$ is in its simplest form, while $5x + 6xy - 11xy$ is not in its simplest form because the term xy appears more than once.

Practice Question

2. Simplify the expression: $5xy + 7y + 2yz + 11xy - 5yz$

Multiplying and Dividing Expressions

To multiply a single term by another, simply multiply the coefficients and then multiply the variables. Remember that the exponents are added together when multiplying variables with exponents. For example:

$$(x^5y)(x^3y^4) = x^8y^5$$

When multiplying a term by a set of terms inside parentheses, each term inside the parentheses needs to be distributed, as shown in Figure 4.1.

Solving Linear Equations

To solve an equation, the terms on each side need to be manipulated in order to isolate the variable; in other words, if you want to find x , you have to get the x alone on one side of the equal sign. To do this, many of the tools discussed above will need to be used: distributing, dividing, adding or subtracting like terms, or finding common denominators.

Think of each side of the equation as the two sides of a seesaw—as long as the two people on each end weigh the same amount (no matter what that amount is), the seesaw will be balanced:

- If there is a 120-pound person on each end, the seesaw is balanced.
- Giving each person a 10-pound rock to hold will change the weight on each end, but the seesaw itself will stay balanced.
 - Equations work the same way: people can add, subtract, multiply, or divide whatever they want, as long as they do the same thing to both sides.

Most equations that will be encountered on the SAT can be solved using the same basic steps:

1. Distribute to get rid of parentheses.
2. Use LCD to get rid of fractions.
3. Add/subtract like terms on either side.
4. Add/subtract so that constants appear on only one side of the equation.
5. Multiply/divide to isolate the variable.

Helpful Hint:

If you are stumped on a multiple-choice question, try plugging the answer options back into the original problem to see which one works.

Practice Questions

10. Solve for x : $25x + 12 = 62$

11. Solve the following equation for x : $2x - 4(2x + 3) = 24$

12. Solve the following equation for x : $\frac{x}{3} + \frac{1}{2} = \frac{x}{6} - \frac{5}{12}$

13. Find the value of x : $2(x + y) - 7x = 14x + 3$

Graphing Linear Equations

Linear equations can be plotted as straight lines on a coordinate plane. The **x -axis** is always the horizontal axis and the **y -axis** is always the vertical axis. The x -axis is positive to the right of the y -axis and negative to the left. The y -axis is positive above the x -axis and negative below it. To describe the location of any point on the graph, write the coordinates in the form (x, y) . The origin, the point where the x - and y -axes cross, is $(0, 0)$.

The **y -intercept** is the y coordinate where the line crosses the y -axis. The **slope** is a measure of how steep the line is. Slope is calculated by dividing the change along the y -axis by the change along the x -axis between any two points on the line.

Practice Questions

18. David, Jesse, and Mark shoveled snow during their snow day and made a total of \$100. They agreed to split it based on how much each person worked. David will take \$10 more than Jesse, who will take \$15 more than Mark. How much money will David get?

19. The sum of three consecutive numbers is 54. What is the MIDDLE number?

20. There are 42 people on the varsity football team. This is 8 more than half the number of people on the swim team. There are 6 fewer boys on the swim team than girls. How many girls are on the swim team?

Linear Inequalities

Inequalities look like equations, except that instead of having an equal sign, they have one of the following symbols:

- greater than: the expression left of the symbol is larger than the expression on the right
- $<$ less than: the expression left of the symbol is smaller than the expression on the right
- \geq greater than or equal to: the expression left of the symbol is larger than or equal to the expression on the right
- \leq less than or equal to: the expression left of the symbol is less than or equal to the expression on the right

Inequalities are solved like linear and algebraic equations. The only difference is that the symbol must be reversed when both sides of the equation are multiplied by a negative number.

Graphing a linear inequality is just like graphing a linear equation, except that you shade the area on one side of the line. The following steps can be used to graph a linear inequality:

1. Rearrange the inequality expression into $y = mx + b$ form.
2. Next, treat the inequality symbol like an equal sign and plot the line.
3. If the inequality symbol is $<$ or $>$, make a broken line.
 - a. If the symbol is \leq or \geq , make a solid line.
4. Finally, shade the correct side of the graph:
 - a. For $y < mx + b$ or $y \leq mx + b$, shade below the line.
 - b. For $y > mx + b$ or $y \geq mx + b$, shade above the line.

Practice Questions

21. Solve for x : $-7x + 2 < 6 - 5x$

22. Plot the inequality: $-3 \geq 4 - y$

Describing Functions

Functions are often written in $f(x)$ form:

- $f(x) = x^2$ means that for input x the output is x^2 . In relating functions to linear equations, you can think of $f(x)$ as equivalent to y .

The **domain** of a function is all the possible inputs of that function. The **range** of a function includes the outputs of the inputs. For example, for the function $f(x) = x^2$, if the domain includes all positive and negative integers, then the range will include 0 and only positive integers. When you graph a function, the domain is plotted on the x -axis and the range is plotted on the y -axis.

Practice Questions

26. Given $f(x) = 2x - 10$, find $f(9)$.

27. Given $f(x) = \frac{4}{x}$ with a domain of all positive integers except zero, and $g(x) = \frac{4}{x}$ with a domain of all positive and negative integers except zero, which function has a range that includes the number -2 ?

Exponential Functions

An **exponential function** is in the form $f(x) = a^x$, where $a > 0$. When $a > 1$, $f(x)$ approaches infinity as x increases and approaches 0 (zero) as x decreases. When $0 < a < 1$, $f(x)$ approaches 0 (zero) as x increases and infinity as x decreases. When $a = 1$, $f(x) = 1$. The graph of an exponential function where $a \neq 1$ will have a horizontal asymptote along the x -axis; the graph will never cross below the x -axis. The graph of an exponential function where $a = 1$ will be a horizontal line at $y = 1$. All graphs of exponential functions include the points $(0, 1)$ and $(1, a)$.

Practice Questions

28. Graph the function: $f(x) = 3^x$.

29. Given $f(x) = 2^x$, solve for x when $f(x) = 64$.

Logarithmic Functions

A **logarithmic function** is the inverse of an exponential function. The definition of a log is if $\log_a x = b$, then $a^b = x$. Logarithmic functions are written in the form $f(x) = \log_a x$, where a is any number greater than 0, except for 1. If a is not shown, it is assumed that $a = 10$. The function $\ln x$ is called a **natural log** and is equal to $\log_e x$. When $0 < a < 1$, $f(x)$ approaches infinity as x approaches zero and it approaches negative infinity as x increases. When $a > 1$, $f(x)$ approaches negative infinity as x approaches zero and infinity as x increases. In either case, the graph of a logarithmic function has a vertical asymptote along the y -axis; the graph will never cross to the left of the y -axis. All graphs of logarithmic functions include the points $(1, 0)$ and $(a, 1)$.

Practice Questions

30. Graph the function $f(x) = \log 4x$.

31. Given $f(x) = \log_3 3x$, solve for $f(81)$.

solution you calculated is listed as an answer option, it does not necessarily mean that you have done the problem correctly—you have to check your own answer to be sure.

The following list describes some general steps for word-problem solving:

1. Read the entire problem and determine what the question is asking.
2. List all of the given data and define the variables.
3. Determine the formula(s) needed or set up equations from the information in the problem.
4. Solve.
5. Check your answer. (Is the amount too large or small? Is the answer in the correct unit of measure?)

Word problems generally contain key words that can help you determine which math processes may be required in order to solve them.

- **Addition:** *added, combined, increased by, in all, total, perimeter, sum, and more than*
- **Subtraction:** *how much more, less than, fewer than, exceeds, difference, and decreased*
- **Multiplication:** *of, times, area, and product*
- **Division:** *distribute, share, average, per, out of, percent, and quotient*
- **Equals:** *is, was, are, amounts to, and were*

Basic Word Problems

A **word problem** in algebra is just an equation or a set of equations described using words. Your task when solving these problems is to turn the story of the problem into mathematical equations. Converting units can often help you avoid operations with fractions when dealing with time.

Practice Questions

37. A store owner bought a case of 48 backpacks for \$476.00. He sold 17 of the backpacks in his store for \$18 each, and the rest were sold to a school for \$15 each. What was the store owner's profit?

38. Thirty students in Mr. Joyce's room are working on projects over 2 days. The first day, he gave them $\frac{3}{5}$ of an hour to work. On the second day, he gave them $\frac{1}{2}$ as much time as the first day. How much time did each student have to work on the project?

Distance Word Problems

Distance word problems involve something traveling at a constant or average speed. Whenever you read a problem that involves how fast, how far, or for how long, you should think of the distance equation, where d stands for *distance*, r for *rate (speed)*, and t for *time*.

These problems can be solved by setting up a grid with d , r , and t along the top and each moving object on the left. When setting up the grid, make sure the units are consistent. For example, if the distance is in meters and the time is in seconds, the rate should be meters per second.

Chapter Five

Geometry

Area and Perimeter

area and perimeter problems require you to use the equations shown in the table below to find either the area inside a shape or the distance around it (the perimeter). These equations will not be given on the test, so you need to have them memorized on test day.

Table 5.1. Area and Perimeter Equations		
Shape	Area	Perimeter
Circle	$A = \pi r^2$	$C = 2\pi r = d$
Triangle	$A = b \times h/2$	$P = s_1 + s_2 + s_3$
Square	$A = s^2$	$P = 4s$
Rectangle	$A = l \times w$	$P = 2l + 2w$

Practice Questions

1. A farmer has purchased 100 meters of fencing to enclose his rectangular garden. If one side of the garden is 20 meters long and the other is 28 meters long, how much fencing will the farmer have left over?
2. Taylor is going to paint a square wall that is 3.5 meters high. How much paint will he need?

Volume

Volume is the amount of space taken up by a three-dimensional object. Different formulas are used to find the volumes of different shapes.

Table 5.2. Volume Formulas	
Shape	Volume
cylinder	$V = \pi r^2 h$
pyramid	$V = l \times w \times h/3$
cone	$V = \frac{\pi r^2 h}{3}$
sphere	$V = \frac{4}{3} \pi r^3$

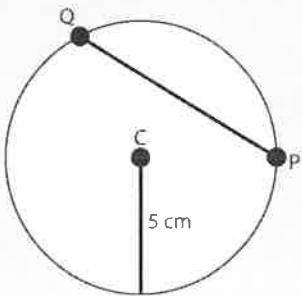
$$\text{Inscribed angle} = \frac{90^\circ}{\pi r}$$

To find the circumscribed angle, find the central angle formed by the same points A and B and subtract that angle from 180° .

Practice Questions

5. A circle has a diameter of 10 centimeters. What is the intercepted arc length between points A and B if the central angle between those points measures 46° ?

6. A chord is formed by line segment QP . The radius of the circle is 5 cm and the chord length is 6 cm. Find the distance from center C to the chord.



Congruence

congruence means having the same size and shape. Two shapes are congruent if you can turn (rotate), flip (reflect), and/or slide (translate) one to fit perfectly on top of the other. Two angles are congruent if they measure the same number of degrees; they do not have to face the same direction nor must they necessarily have rays of equal length. If two triangles have one of the combinations of congruent sides and/or angles listed below, then those triangles are congruent:

- sss – side, side, side
- asa – angle, side, angle
- sas – side, angle, side
- aas – angle, angle, side

There are a number of common sets of congruent angles in geometry. An isosceles triangle has two sides of equal length (called the legs) and two congruent angles. If you bisect an isosceles triangle by drawing a line perpendicular to the third side (called the base), you will form two congruent right triangles.

Where two lines cross and form an X, the opposite angles are congruent and are called vertical angles. parallel lines are lines that never cross; if you cut two parallel lines by a transversal, you will form four pairs of congruent corresponding angles.

A parallelogram is a quadrilateral in which both pairs of opposite sides are parallel and congruent (of equal length). In a parallelogram, the two pairs of opposite angles are also congruent. If you divide a parallelogram by either of the diagonals, you will form two congruent triangles.

Practice Questions

10. Phil is hanging holiday lights. To do so safely, he must lean his 20-foot ladder against the outside of his house at an angle of 15° or less. How far from the house can he safely place the base of the ladder?

11. Grace is practicing shooting hoops. She is 5 feet 4 inches tall. Her basketball hoop is 10 feet tall. From 8 feet away, at what angle does she have to look up to see the hoop? Assume that her eyes are 4 inches lower than that top of her head.

Coordinate Geometry

Coordinate geometry is the study of points, lines, and shapes that have been graphed on a set of axes.

Points, Lines, and Planes

In coordinate geometry, points are plotted on a coordinate plane, a two-dimensional plane in which the x-axis indicates horizontal direction and the y-axis indicates vertical direction. The intersection of these two axes is the origin. Points are defined by their location in relation to the horizontal and vertical axes. The coordinates of a point are written (x, y) . The coordinates of the origin are $(0, 0)$. The x-coordinates to the right of the origin and the y-coordinates above it are positive; the x-coordinates to the left of the origin and the y-coordinates below it are negative.

A line is formed by connecting any two points on a coordinate plane; lines are continuous in both directions. Lines can be defined by their slope, or steepness, and their y-intercept, or the point at which they intersect the y-axis. A line is represented by the equation $y = mx + b$. The constant m represents slope and the constant b represents the y-intercept.

Practice Questions

12. Matt parks his car near a forest where he goes hiking. From his car, he hikes 1 mile north, 2 miles east, then 3 miles west. If his car represents the origin, find the coordinates of Matt's current location.

13. A square is drawn on a coordinate plane. The bottom corners are located at $(-2, 3)$ and $(4, 3)$. What are the coordinates for the top right corner?

Distance and Midpoint Formulas

To determine the distance between the points (x_1, y_1) and (x_2, y_2) from a grid use the formula:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

The midpoint, which is halfway between the 2 points, is the point:

$$m = \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$$

Practice Questions

14. What is the distance between points $(3, -6)$ and $(-5, 2)$?

15. What is the midpoint between points $(3, -6)$ and $(-5, 2)$?

Pie Charts

pie charts present parts of a whole, and are often used with percentages. Together, all the slices of the pie add up to the total number of items, or 100%.

Line Graphs

Line graphs show trends over time. The number of each item represented by the graph will be on the y-axis, and time will be on the x-axis.

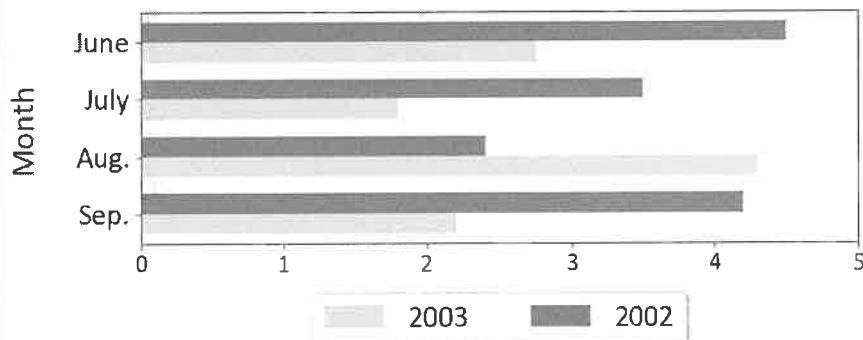
Histograms

A histogram shows a distribution of types within a whole in bar chart form. While they look like bar graphs, they are more similar to pie charts: they show you parts of a whole.

Practice Questions

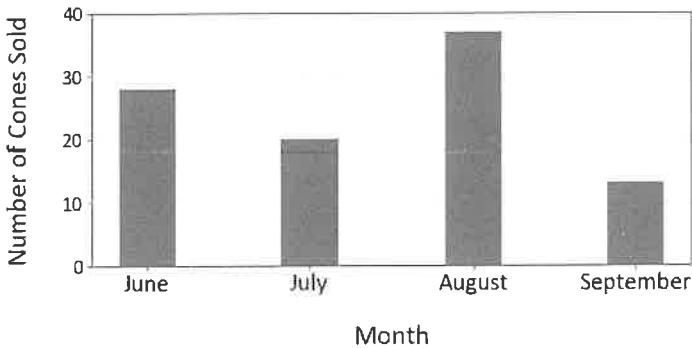
7. The chart below shows rainfall in inches per month. Which month had the least amount of rainfall? Which had the most?

Monthly Rainfall Comparison for 2002 and 2003

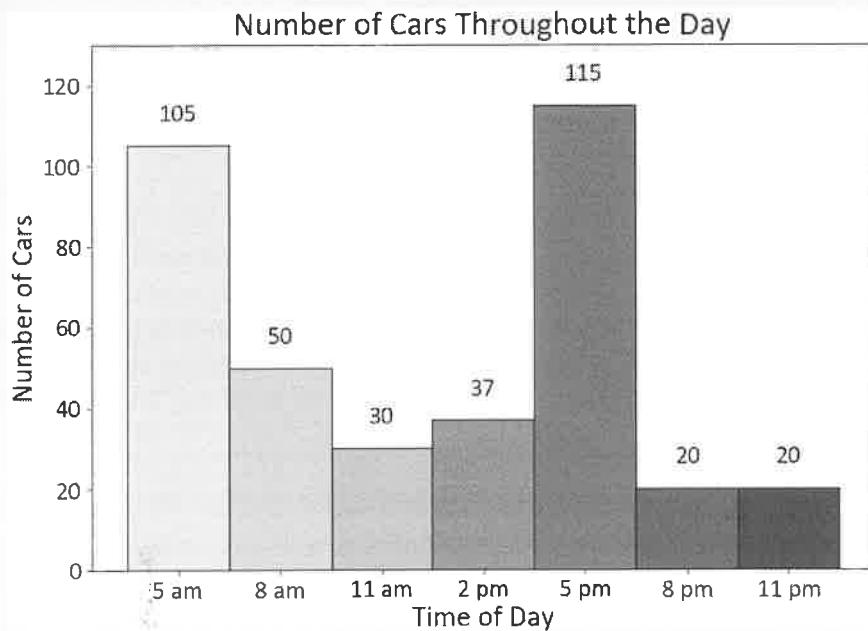


8. Using the chart below, how many more ice cream cones were sold in July than in September?

Monthly Ice Cream Cone Sales



13. The following chart shows the number of cars that traveled through a toll plaza throughout the day. How many cars passed through the toll plaza between 8:00 a.m. and 5:00 p.m.?



Probability

Probability is the likelihood that an event will take place. This likelihood is expressed as a value between 0 and 1. The closer the probability is to zero, the less likely the event is to occur; the closer the probability is to 1, the more likely it is to occur.

Probability of a Single Event

The probability of an outcome occurring is found by dividing the number of desired outcomes by the number of total possible outcomes. As with percentages, a probability is the ratio of a part to a whole, with the whole being the total number of possibilities, and the part being the number of desired results. Probabilities can be written using percentages (40%), decimals (0.4), fractions, or in words (the probability of an outcome is 2 in 5).

$$\text{probability} = \frac{\text{desired outcomes}}{\text{total possible outcomes}}$$

Practice Questions

14. A bag holds 3 blue marbles, 5 green marbles, and 7 red marbles. If you pick one marble from the bag, what is the probability it will be blue?
15. A bag contains 75 balls. If the probability is 0.6 that a ball selected from the bag will be red, how many red balls are in the bag?
16. A theater has 230 seats: 75 seats are in the orchestra, 100 seats are in the mezzanine, and 55 seats are in the balcony. If a ticket is selected at random, what is the probability that it will be for either a mezzanine or balcony seat?

Part II Answer Key

Chapter 3

1. $\sqrt{5}$ is an irrational number because it cannot be written as a fraction of two integers. It is a decimal that goes on forever without repeating.

2. $-\sqrt{64}$ can be rewritten as the negative whole number -8 , so it is an integer.

3. Subtract the real and imaginary numbers separately:

$$3 - 1 = 2$$

$$5i - (-2i) = 5i + 2i = 7i$$

4. $(-) \times (+) = (-)$

$$-10 \times 47 = -470$$

5. $(-) + (-) = (-)$

$$-65 + -32 = -97$$

6. $(-) \times (+) = (-)$

$-7 \times 4 = -28$, which is less than -7

7. $(-) \div (+) = (-)$

$$-16 \div 2.5 = -6.4$$

8. Use PEMDAS. First, complete operations within parentheses:

$$-(2)^2 - (11)$$

Second, calculate the value of exponential numbers:

$$-(4) - (11)$$

Finally, do addition and subtraction:

$$-4 - 11 = -15$$

9. First, calculate the value of exponential numbers:

$$(25) \div 5 + 4 \times 2$$

Second, calculate division and multiplication from left to right:

$$5 + 8$$

ball travels in 1 second and then converting that to feet traveled per minute. The first method is shown below:

$$1 \text{ min.} = 60 \text{ sec.}$$

$$\frac{6 \text{ in.}}{\text{sec.}} \times 60 \text{ s} = 360 \text{ in.}$$

$$1 \text{ ft.} = 12 \text{ in.}$$

$$\frac{360 \text{ in.}}{12 \text{ in.}} = 30 \text{ ft.}$$

16. 1 meter = 1000 mm

$$0.5 \text{ meters} = 500 \text{ mm}$$

17. 1 kg = 1000 g

$$\frac{38 \text{ g}}{1000 \text{ g}} = 0.038 \text{ kg}$$

18. 1 L = 1000 cm³

$$10 \text{ L} = 1000 \text{ cm}^3 \times 10$$

$$10 \text{ L} = 10,000 \text{ cm}^3$$

19. 1 cm = 10 mm

$$10 \text{ cm} - 9.6 \text{ cm} = 0.4 \text{ cm lost}$$

$$0.4 \text{ cm} = 10 \text{ mm} \times 0.4 = 4 \text{ mm were lost}$$

20. 17.07 + 2.52 = 19.59

21. 7.4 – 6.8 = 0.6 gal.

22. 25 × 14 = 350

There are 2 digits after the decimal in 0.25 and one digit after the decimal in 1.4. Therefore the product should have 3 digits after the decimal: 0.350 is the correct answer.

23. Change 0.2 to 2 by moving the decimal one space to the right. Next, move the decimal one space to the right on the dividend; 0.8 will become 8. Now, divide 8 by 2:

$$8 \div 2 = 4$$

24. First, change the divisor to a whole number: 0.25 becomes 25. Next, change the dividend to match the divisor by moving the decimal two spaces to the right, so 40 becomes 4000. Now divide:

$$4000 \div 25 = 160$$

25. 121 and 77 share a common factor of 11. So, if we divide each by 11 we can simplify the fraction:

$$\frac{121}{77} = \frac{11}{11} \times \frac{11}{7} = \frac{11}{7}$$

32. This is a fraction subtraction problem with a mixed number, so the first step is to convert the mixed number to an improper fraction:

$$2\frac{1}{3} = \frac{2 \times 3 + 1}{3} = \frac{7}{3}$$

Next, convert each fraction so they share a common denominator:

$$\begin{aligned}\frac{7}{3} \times \frac{2}{2} &= \frac{14}{6} \\ \frac{3}{2} \times \frac{3}{3} &= \frac{9}{6}\end{aligned}$$

Now, subtract the fractions by subtracting the numerators:

$$\frac{14}{6} - \frac{9}{6} = \frac{5}{6}$$

33. For this fraction addition problem, we need to find a common denominator. Notice that 2 and 4 are both factors of 16, so 16 can be the common denominator:

$$\begin{aligned}\frac{1}{2} \times \frac{8}{8} &= \frac{8}{16} \\ \frac{7}{4} \times \frac{4}{4} &= \frac{28}{16} \\ \frac{9}{16} + \frac{8}{16} + \frac{28}{16} &= \frac{45}{16}\end{aligned}$$

34. To add fractions, make sure that they have a common denominator. Since 3 is a factor of 6, 6 can be the common denominator:

$$\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$$

Now, add the numerators:

$$\frac{4}{6} + \frac{1}{6} = \frac{5}{6} \text{ of a can}$$

35. The first step here is to simplify the fraction:

$$\frac{8}{18} = \frac{4}{9}$$

Now it's clear that the fraction is a multiple of $\frac{1}{9}$, so you can easily find the decimal using a value you already know:

$$\frac{4}{9} = \frac{1}{9} \times 4 = 0.\overline{11} \times 4 = 0.\overline{44}$$

Note that it does not matter which value is placed in the numerator or denominator as long as it is the same on both sides. Now, solve for the missing quantity through cross-multiplication:

$$120 \text{ mi} \times x \text{ hr} = 3 \text{ hrs} \times 180 \text{ mi}$$

Now solve the equation:

$$x \text{ hours} = \frac{3 \text{ hrs} \times 180 \text{ mi}}{120 \text{ mi}}$$

$$x = 4.5 \text{ hrs}$$

41. Set up the equation:

$$\frac{1 \text{ acre}}{500 \text{ gal}} = \frac{x \text{ acres}}{2600 \text{ gal}}$$

Then solve for x :

$$x \text{ acres} = \frac{1 \text{ acre} \times 2600 \text{ gal}}{500 \text{ gal}}$$

$$x = \frac{26}{5} \text{ acres or } 5.2 \text{ acres}$$

42. This problem presents two equivalent ratios that can be set up in a fraction equation:

$$\frac{35}{5} = \frac{49}{x}$$

You can then cross-multiply to solve for x :

$$35x = 49 \times 5$$

$$x = 7$$

43. Set up the appropriate equation and solve; do not forget to change 15% to a decimal value:

$$\text{whole} = \frac{\text{part}}{\text{percent}} = \frac{45}{0.15} = 300$$

44. Set up the appropriate equation and solve:

$$\text{whole} = \frac{\text{part}}{\text{percent}} = \frac{15 + 30 + 20}{0.30} = 217$$

45. Set up the equation and solve:

$$\text{percent} = \frac{\text{part}}{\text{whole}} = \frac{39}{65} = 0.6 \text{ or } 60\%$$

46. You can use the information in the question to figure out what percentage of subscriptions were sold by Max and Greta:

$$\text{percent} = \frac{\text{part}}{\text{whole}} = \frac{51 + 45}{240} = \frac{96}{240} = 0.4 \text{ or } 40\%$$

- 51.** You have been asked to find the sale price, which means you need to solve for the amount of change first:

$$\text{amount of change} = \text{original amount} \times \text{percent change} = 55 \times 0.25 = 13.75$$

Using this amount, you can find the new price. Because the item is on sale, we know that it will cost less than the original price:

$$55 - 13.75 = 41.25$$

The sale price is \$41.25.

- 52.** This problem is tricky because you need to figure out what each number in the problem stands for: 24% is obviously the percent change, but what about the measurements in feet? If you multiply these values you get the area of the garden:

$$18 \text{ ft} \times 51 \text{ ft} = 918 \text{ ft}^2$$

This 918 ft^2 is the amount of change—how much area the yard lost to create the garden.

Now you can set up an equation:

$$\text{original amount} = \frac{\text{amount of change}}{\text{percent change}}$$

$$\frac{918}{0.24} = 3825$$

If the original lawn was 3825 ft^2 , and the garden is 918 ft^2 , then the remaining area is: $3825 - 918 = 2907$. The remaining lawn covers 2907 ft^2 .

- 53.** These numbers are in different formats—one is a mixed fraction and the other is just a fraction. So, the first step is to convert the mixed fraction to a fraction:

$$4\frac{3}{4} = \frac{4 \times 4}{4} + \frac{3}{4} = \frac{19}{4}$$

Once the mixed number is converted, it is easier to see that $\frac{19}{4}$ is greater than $\frac{18}{4}$.

- 54.** These numbers are already in the same format, so the decimal values just need to be compared. Remember that zeros can be added after the decimal without changing the value, so the three numbers can be rewritten as:

104.56

104.50

104.60

From this list, it is clear that 104.60 is the greatest because 0.60 is larger than 0.50 and 0.56.

- 55.** The first step is to convert the numbers into the same format—65% is the same as $\frac{65}{100}$. Next, the fractions need to be converted to have the same denominator because it is difficult to compare fractions with different denominators. Using a factor of $\frac{5}{5}$ on the second fraction will give common denominators:

$$\frac{13}{20} \times \frac{5}{5} = \frac{65}{100}. \text{ It is now easy to see that the numbers are equivalent.}$$

- 61.** First, check to see that they can be multiplied: A has 3 columns and B has 3 rows, so they can. The resulting matrix will be 2×2 . Now multiply the numbers in the first row of A by the numbers in the first column of B and add the results:

$$\begin{bmatrix} 1 & 3 & 0 \\ 6 & 2 & 4 \end{bmatrix} \times \begin{bmatrix} 5 & 3 \\ 2 & 1 \\ 4 & 7 \end{bmatrix} = \begin{bmatrix} (1 \times 5) + (3 \times 2) + (0 \times 4) & \square \\ \square & \square \end{bmatrix} = \begin{bmatrix} 11 & \square \\ \square & \square \end{bmatrix}$$

Now, multiply and add to find the 3 missing values:

$$\begin{bmatrix} 1 & 3 & 0 \\ 6 & 2 & 4 \end{bmatrix} \times \begin{bmatrix} 5 & 3 \\ 2 & 1 \\ 4 & 7 \end{bmatrix} = \begin{bmatrix} (1 \times 5) + (3 \times 2) + (0 \times 4) & (1 \times 3) + (3 \times 1) + (0 \times 7) \\ (6 \times 5) + (2 \times 2) + (4 \times 4) & (6 \times 3) + (2 \times 1) + (4 \times 7) \end{bmatrix} = \begin{bmatrix} 11 & 6 \\ 50 & 48 \end{bmatrix}$$

- 62.** Multiply each value inside the matrix by $6x$:

$$6x \begin{bmatrix} 2 & -3 \\ 6 & 4 \end{bmatrix} = \begin{bmatrix} 6x \times 2 & 6x \times (-3) \\ 6x \times 6 & 6x \times 4 \end{bmatrix} = \begin{bmatrix} 12x & -18x \\ 36x & 24x \end{bmatrix}$$

Chapter 4

- 1.** Plug in each number for the correct variable and simplify:

$$2x + 6y - 3z = 2(2) + 6(4) - 3(-3) = 4 + 24 + 9 = 37$$

- 2.** Start by grouping together like terms:

$$(5xy + 11xy) + (2yz - 5yz) + 7y$$

Now you can add together each set of like terms:

$$16xy + 7y - 3yz$$

- 3.** Multiply the coefficients and variables together:

$$3 \times 2 = 6$$

$$y^2 \times y^4 = y^6$$

$$z \times z^5 = z^6$$

Now put all the terms back together:

$$6x^4y^6z^6$$

- 4.** Multiply each term inside the parentheses by the term $2y^2$:

$$\begin{aligned} (2y^2)(y^3 + 2xy^2z + 4z) &= \\ (2y^2 \times y^3) + (2y^2 \times 2xy^2z) + (2y^2 \times 4z) &= 2y^5 + 4xy^4z + 8y^2z \end{aligned}$$

- 5.** Use the acronym *FOIL*—first, outer, inner, last—to multiply the terms:

last: $4 \times -4 = -16$

$$25x^2 - 20x + 20x - 16 = 25x^2 - 16$$

9. This is another polynomial identity, $a^2 + 2ab + b^2$. (The more you practice these problems, the faster you will recognize polynomial identities.)

$$a^2 = 100x^2, 2ab = 60x, \text{ and } b^2 = 9$$

Recall that $a^2 + 2ab + b^2 = (a + b)^2$.

Now solve for a and b :

$$a = \sqrt{100x^2} = 10x$$

$$b = \sqrt{9} = 3$$

(Double check your work by confirming that $2ab = 2 \times 10x \times 3 = 60x$)

$$(a + b)^2 = (10x + 3)^2$$

10. This equation has no parentheses, fractions, or like terms on the same side, so you can start by subtracting 12 from both sides of the equation:

$$25x + 12 = 62$$

$$(25x + 12) - 12 = 62 - 12$$

$$25x = 50$$

Now, divide by 25 to isolate the variable:

$$\frac{25x}{25} = \frac{50}{25}$$

$$x = 2$$

11. Start by distributing to get rid of the parentheses (do not forget to distribute the negative):

$$2x - 4(2x + 3) = 24$$

$$2x - 8x - 12 = 24$$

There are no fractions, so now you can join like terms:

$$2x - 8x - 12 = 24$$

$$-6x - 12 = 24$$

Now add 12 to both sides and divide by -6 .

$$-6x - 12 = 24$$

$$(-6x - 12) + 12 = 24 + 12$$

$$-6x = 36$$

$$\frac{-6x}{-6} = \frac{36}{-6}$$

$$x = -6$$

15. First, rearrange the linear equation to point-slope form:

$$y = mx + b$$

$$2y - 4x = 6$$

$$y = 2x + 3$$

Next, identify the y -intercept (b) and the slope (m):

$$b = 3, m = 2$$

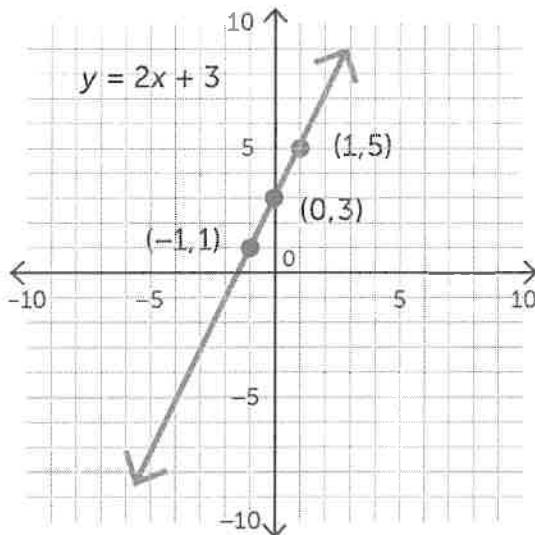
Now, plot the y -intercept $(0, b) = (0, 3)$:

Next, plug in values for x and solve for y :

$$y = 2(1) + 3 = 5 \rightarrow (1, 5)$$

$$y = 2(-1) + 3 = 1 \rightarrow (-1, 1)$$

Plot these points on the graph, and connect the points with a straight line:



16. To solve this system using substitution, first solve one equation for a single variable:

$$3y - 4 + x = 0$$

$$3y + x = 4$$

$$x = 4 - 3y$$

It may seem like there are three unknowns in this situation, but you can express j and m in terms of d :

Jesse gets \$10 less than David, so $j = d - 10$.

Mark gets \$15 less than Jesse, so $m = j - 15$.

Substitute the previous expression for j to solve for m in terms of d :

$$m = (d - 10) - 15 = d - 25$$

Now back to our original equation, substituting for j and m :

$$d + (d - 10) + (d - 25) = 100$$

$$3d - 35 = 100$$

$$3d = 135$$

$$d = 45$$

David will get \$45.

19. Start by building an equation. One of the numbers in question will be x . The three numbers are consecutive, so if x is the smallest number then the other two numbers must be $(x + 1)$ and $(x + 2)$. You know that the sum of the three numbers is 54: $x + (x + 1) + (x + 2) = 54$

Now solve for the equation to find x :

$$3x + 3 = 54$$

$$3x = 51$$

$$x = 17$$

The question asks about the middle number $(x + 1)$, so the answer is 18.

Notice that you could have picked any number to be x . If you picked the middle number as x , your equation would be $(x - 1) + x + (x + 1) = 54$. Solve for x to get 18.

20. This word problem might seem complicated at first, but as long as you keep your variables straight and translate the words into mathematical operations you can easily build an equation. The quantity you want to solve is the number of girls on the swim team, so this will be x . The number of boys on the swim team will be y .

There are 6 fewer boys than girls so $y = x - 6$.

The total number of boys and girls on the swim team is $x + y$.

42 is 8 more than half this number, so $42 = 8 + (x + y) \div 2$

Now substitute for y to solve for x :

$$42 = 8 + (x + x - 6) \div 2$$

$$34 = (2x - 6) \div 2$$

$$68 = 2x - 6$$

$$74 = 2x$$

$$x = 37$$

24. First rearrange the equation to set one side equal to 0:

$$3x^2 - 7x + 2 = 0$$

Next identify the terms a , b , and c :

$$a = 3$$

$$b = -7$$

$$c = 2$$

$$\begin{aligned}x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\x &= \frac{7 \pm \sqrt{b^2 - 4ac}}{2(3)} \\x &= \frac{7 \pm \sqrt{25}}{6} \\x &= \frac{7 \pm 5}{6}\end{aligned}$$

Since the determinant is positive, you can expect two real numbers for x . Solve for the two possible answers:

$$\begin{aligned}x &= \frac{7+5}{6} \rightarrow x = 2 \\x &= \frac{7-5}{6} \rightarrow x = -\frac{1}{3}\end{aligned}$$

25. First, find the axis of symmetry. The equation for the line of symmetry is $x = \frac{-b}{2a}$.

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

Next, plug in -2 for x to find the y coordinate of the vertex:

$$y = (-2)^2 + 4(-2) + 1 = -3$$

The vertex is $(-2, -3)$.

Now, make a table of points on either side of the vertex by plugging in numbers for x and solving for y : x :

x	$y = x^2 + 4x + 1$	(x, y)
-3	$y = (-3)^2 + 4(-3) + 1 = -2$	$(-3, -2)$
-1	$y = (-1)^2 + 4(-1) + 1 = -2$	$(-1, -2)$
-4	$y = (-4)^2 + 4(-4) + 1 = 1$	$(-4, 1)$
0	$y = 0^2 + 4(0) + 1 = 1$	$(0, 1)$

29. $64 = 2^x$

The inverse of an exponent is a log. Take the log of both sides to solve for x :

$$\log_2 64 = x$$

$$x = 6$$

30. First, estimate the shape and direction of the graph based on the value of a . Since $a > 1$, you know that $f(x)$ will approach infinity as x increases and there will be a vertical asymptote along the negative y -axis.

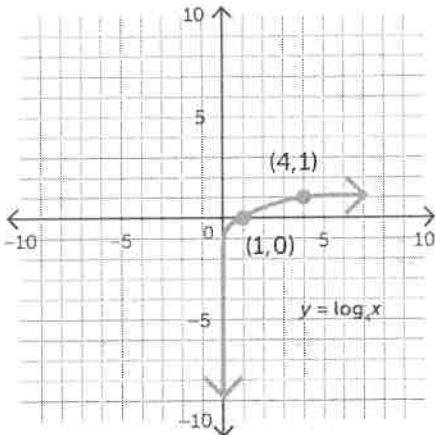
Next, plot the points $(1, 0)$ and $(a, 1)$.

Finally, it is easier to plug in a value for $f(x)$ and solve for x rather than attempting to solve for $f(x)$. Plug in one or two values for $f(x)$, plot those points and trace the graph:

$$2 = \log_4 x$$

$$4^2 = x$$

$$16 = x \rightarrow (16, 2)$$



31. Rewrite the function in exponent form

$$x = \frac{1^{f(x)}}{3}$$

$$81 = \frac{1^{f(x)}}{3}$$

The question is asking: to what power must you raise $\frac{1}{3}$ to get 81?

Recognize that $3^4 = 81$, so $\frac{1^4}{3} = \frac{1}{81}$

Switch the sign of the exponent to flip the numerator and denominator:

$$\frac{1^{-4}}{3} = \frac{81}{1}$$

$$f(81) = -4$$

Set up the second equation. Remember to isolate the absolute value before multiplying by -1 :

$$2|y + 4| = 10$$

$$|y + 4| = 5$$

$$y + 4 = -5$$

$$y = -9$$

$$y = 1 \text{ or } -9$$

37. Start by listing all of the data and defining the variable:

- total number of backpacks = 48
- cost of backpacks = \$476.00
- backpacks sold in store at price of \$18 = 17
- backpacks sold to school at a price of \$15 = $48 - 17 = 31$
- total profit = x

Now set up an equation:

$$\text{income} - \text{cost} = \text{total profit}$$

$$(306 + 465) - 476 = 295$$

The store owner made a profit of \$295.

38. Start by listing all the data and defining your variables. Note that the number of students, while given in the problem, is not needed to find the answer:

$$\text{time on 1st day} = \frac{3}{5} \text{ of an hour} = 36 \text{ min.}$$

$$\text{time on 2nd day} = \frac{1}{2}(36) = 18 \text{ min.}$$

$$\text{total time} = x$$

Now set up the equation and solve:

$$\text{total time} = \text{time on 1st day} + \text{time on 2nd day}$$

$$x = 36 + 18 = 54$$

The students had 54 minutes to work on the projects.

39. The first step is to set up a table and fill in a value for each variable:

	d	r	t
driving	d	30	t
flying	$150 - d$	60	$3 - t$

You can now set up equations for driving and flying. The first row gives the equation $d = 30t$ and the second row gives the equation $150 - d = 60(3 - t)$.

41. Start by figuring out how much of a house the siblings can each clean on their own.

Bridget can clean the house in 12 hours, so she can clean $\frac{1}{12}$ of the house in an hour. Using the same logic, Tom can clean $\frac{1}{8}$ of a house in an hour. By adding these values together, you get the fraction of the house they can clean together in an hour:

$$\frac{1}{12} + \frac{1}{8} = \frac{5}{24}$$

They can do $\frac{5}{24}$ of the job per hour.

Now set up variables and an equation to solve:

t = time spent cleaning (in hours)

h = number of houses cleaned = 2

$work = rate \times time$

$$h = \frac{5}{24}t$$

$$2 = \frac{5}{24}t$$

$$t = \frac{48}{5} = 9\frac{3}{5} \text{ hr}$$

42. In this problem you do not know the exact time, but you can still find the hourly rate as a variable:

The first hose completes the job in f hours, so it waters $\frac{1}{f}$ fields per hour. The slow hose waters the field in $1.25f$, so it waters the field in $\frac{1}{1.25f}$ hours. Together, they take 5 hours to water the field, so they water $\frac{1}{5}$ of the field per hour. Now you can set up the equations and solve:

$$\frac{1}{f} + \frac{1}{1.25f} = \frac{1}{5}$$

$$1.25f \left(\frac{1}{f} + \frac{1}{1.25f} \right) = 1.25f \left(\frac{1}{5} \right)$$

$$1.25 + 1 = 0.25f$$

$$f = 9$$

The fast hose takes 9 hours to water the field. The slow hose takes $1.25(9) = 11.25$ hours.

43. Calculate how many apples each person can pick per hour:

Ben: $\frac{500 \text{ apples}}{2 \text{ hr.}} = \frac{250 \text{ apples}}{\text{hr.}}$

Frank: $\frac{450 \text{ apples}}{3 \text{ hr.}} = \frac{150 \text{ apples}}{\text{hr.}}$

Together: $\frac{250+1 \text{ apples}}{\text{hr.}} = \frac{400 \text{ apples}}{\text{hr.}}$

Now use the formula for intercepted arc length:

$$l = 2\pi r \theta$$

$$l = 2\pi(5 \text{ cm}) 46^\circ$$

$$l = 4.0 \text{ cm}$$

6. Use the formula for chord length: chord length = $2\sqrt{r^2 - d^2}$

In this example, we are told the chord length and the radius, and we need to solve for d:

$$6 \text{ cm} = 2\sqrt{(5 \text{ cm})^2 - d^2}$$

$$3 \text{ cm} = \sqrt{(5 \text{ cm})^2 - d^2}$$

$$9 \text{ cm}^2 = 25 \text{ cm}^2 - d^2$$

$$d^2 = 16 \text{ cm}^2$$

$$d = 4 \text{ cm}$$

7. Draw out Kate's and Emily's trips to see that their routes form two triangles. The triangles have corresponding sides with lengths of 6 miles and 8 miles, and a corresponding angle in between of 150° . This fits the "SAS" rule so the triangles must be congruent. The length Kate has to ride home corresponds to the length Emily has to ride home, so Emily must ride 12 miles.

8. For parallel lines cut by a transversal, look for vertical and corresponding angles.

Angles A and D are vertical angles, so angle D must be congruent to angle A. Angle $D = 53^\circ$.

Angles D and H are corresponding angles, so angle H must be congruent to angle D. Angle $H = 53^\circ$.

9. Start by drawing a picture of Erica's route. You'll see it forms a triangle:

4 miles

One leg of the triangle is missing, but you can find its length using the Pythagorean Theorem:

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

$$3^2 + 4^2 = c^2$$

$$25 = c^2$$

$$c = 5$$

Adding all 3 sides gives the length of the whole race:

$$3 + 4 + 5 = 12 \text{ miles}$$

10. Draw a triangle with the known length and angle labeled.

The known side (the length of the ladder) is the hypotenuse of the triangle, and the unknown distance is the side opposite the angle. Therefore, you can use sine:

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

$$\sin 15^\circ(20 \text{ feet})$$

Matt's coordinates are $(-1, 1)$.

13. Draw the coordinate plane and plot the given points. If you connect these points you will see that the bottom side is 6 units long. Since it is a square, all sides must be 6 units long. Count 6 units up from the point $(4, 3)$ to find the top right corner.

The coordinates for the top right corner are $(4, 9)$.

14. Plug the values for x_1, x_2, y_1 , and y_2 into the distance formula and simplify:

$$d = \sqrt{(-5 - 3)^2 + (2 - (-6))^2} = \\ \sqrt{64 + 64} = \sqrt{64 \times 2} = 8\sqrt{2}$$

15. Plug the values for x_1, x_2, y_1 , and y_2 into the midpoint formula and simplify:

$$\text{midpoint} = \left(\frac{3 + (-5)}{2}, \frac{(-6) + 2}{2} \right) \\ = \left(\frac{-2}{2}, \frac{-4}{2} \right) = (-1, -2)$$

Chapter 6

1. Add the terms, then divide by the number of terms:

$$\text{mean} = \frac{24 + 27 + 18}{3} = 23$$

2. Set up the equation for mean with x representing the third number, then solve:

$$\text{mean} = \frac{38 + 43 + x}{3} = 45 \\ \frac{38 + 43 + x}{3} = 45 \\ 38 + 43 + x = 135 \\ x = 54$$

3. Place the terms in order, then pick the middle term:

18, 24, 27

The median is 24.

4. Place the terms in order. Because there is an even number of terms, the median will be the average of the middle 2 terms:

18, 19, 24, 27

$$\text{median} = \frac{19 + 24}{2} = 21.5$$

5. The mode is 2 because it appears the most within the set.

- 14.** Because there are 15 marbles in the bag ($3 + 5 + 7$), the total number of possible outcomes is 15. Of those outcomes, 3 would be blue marbles, which is the desired outcome. Using that information, you can set up an equation:

$$\begin{aligned} \text{probability} &= \frac{\text{desired outcomes}}{\text{total possible outcomes}} \\ &= \frac{3}{15} = \frac{1}{5} \end{aligned}$$

- 15.** Because you're solving for desired outcomes (the number of red balls), first you need to rearrange the equation:

$$\text{probability} = \frac{\text{desired outcomes}}{\text{total possible outcomes}}$$

$$\text{desired outcomes} = \text{probability} \times \text{total possible outcomes}$$

Here, choosing a red ball is the desired outcome. The total possible outcomes are represented by the 75 total balls. There are 45 red balls in the bag.

- 16.** In this problem, the desired outcome is a seat in either the mezzanine or balcony area, and the total possible outcomes are represented by the 230 total seats. So, you can write this equation:

$$\begin{aligned} \text{probability} &= \frac{\text{desired outcomes}}{\text{total possible outcomes}} \\ &= \frac{100 + 55}{230} = 0.67 \end{aligned}$$

- 17.** Because you're solving for total possible outcomes (total number of students), first you need to rearrange the equation:

$$\text{probability} = \frac{\text{desired outcomes}}{\text{total possible outcomes}}$$

In this problem, you are given a probability (7% or 0.07) and the number of desired outcomes (42). Plug these numbers into the equation to solve:

$$\text{total possible outcomes} = \frac{42}{0.07} = 600 \text{ students}$$

- 18.** This question is asking about an intersection of events. The equation for an intersection of $P(A \cap B) = P(A) \times P(B|A)$.

The first event, event A, is picking out a blue marble. Find $P(A)$:

$$P(A) = \frac{11 \text{ blue marbles}}{16 \text{ total marbles}} = \frac{11}{16}$$

The second event, event B, is picking out a red marble, now that there are 15 marbles left. Find $P(B|A) = \frac{5 \text{ red marbles}}{15 \text{ total marbles}} = \frac{5}{15} = \frac{1}{3}$

$$P(A \cap B) = P(A) \times P(B|A)$$

$$= \frac{11}{16} \times \frac{1}{3} = \frac{11}{48}$$

Practice Test #1

Reading and Writing

For each question, choose the option that BEST answers the question related to the passage and/or graphic.

Module I

1. *Demetrius used to say that there was no difference between the words and the voice of the _____ ignorant and the sounds and noises of a stomach full of superfluous wind. And it was not without reason that he said this, for he considered it to be indifferent whence the utterance of such men proceeded, whether from their mouth or their body; both being of the same substance and value.*

Which word or phrase is the MOST logical and precise option to complete the blank in the passage?

- A) bilious
- B) resentful
- C) unskilled
- D) sickly

2. *An Imperial policy must, of course, be carried out with reasonable prudence, and the principles of government which guide our relations with whatsoever races are brought under our control must be politically and economically sound and morally defensible. This is, in fact, the keystone of the Imperial arch.*

As used in the text, what does the word prudence MOST nearly mean?

- A) caution
- B) boldness
- C) cleverness
- D) ingenuity

3. *My mistress' eyes are nothing like the sun;*

Coral is far more red, than her lips red:

If snow be white, why then her breasts are dun;

If hairs be wires, black wires grow on her head.

I have seen roses damask'd, red and white,

But no such roses see I in her cheeks;

And in some perfumes is there more delight

5. Text 1

When the ideal of Society is material gain or possession, as it is largely today, the object of its special condemnation is the thief—not the rich thief, for he is already in possession and therefore respectable, but the poor thief. There is nothing to show that the poor thief is really more immoral or unsocial than the respectable money-grubber; but it is very clear that the money-grubber has been floating with the great current of Society, while the poor man has been swimming against it, and so has been worsted. Or when, as today, Society rests on private property in land, its counter-ideal is the poacher.

Text 2

Leo Tolstoy greatly admired and was heavily influenced by Proudhon, considering his “property is theft” as “an absolute truth” that would “survive as long as humanity.”

Based on the texts, how would Leo Tolstoy (Text 2) MOST likely view the statement that is being conveyed in the second sentence in Text 1?

- A) as oversimplifying the idea of property ownership to make it seem like an immoral act
- B) as showing a clear understanding of how society has arbitrarily decided that landowners are upstanding citizens despite their property ownership denying resources to others
- C) as disingenuously claiming that property ownership is a kind of thievery that society currently tolerates rather than a legitimate enterprise
- D) as equating the idea of property ownership with that of thievery in an inflammatory way that will not stand the test of time

6. A food substance necessary to plant life and growth is nitrogen. Since a vast store of nitrogen exists in the air, it would seem that plants should never lack for this food, but most plants are unable to make use of the boundless store of atmospheric nitrogen because they do not possess the power of extracting nitrogen from the air. For this reason, they depend solely upon nitrogenous compounds that are present in the soil and soluble in water. The soluble nitrogenous soil compounds are absorbed by roots and are utilized by plants for food.

Which of these actions does the text suggest would result in the healthiest plants?

- A) pumping extra nitrogen into the air
- B) supplementing nitrogenous compounds in the soil
- C) genetically engineering plants to better extract nitrogen from the air
- D) injecting nitrogen directly into the plants

10. Use the information below to answer the question which follows.

Participant Ratings of Level-Two Mattress Comfort		
Participant	Comfort Rating	Preferred Firmness Adjustment
18	2	firmer
3	1	firmer
7	4	firmer

Jackson conducted multiple surveys to determine participants' comfort level when sleeping on mattresses of the brand's second-lowest firmness level. Participants filled out surveys upon waking and reported their levels of comfort on a scale from 1 (very uncomfortable) to 5 (very comfortable), with 3 indicating neutral (neither uncomfortable nor comfortable), and to indicate whether they would prefer a firmer or a softer mattress. The table shows how three participants responded in their morning surveys. According to the table, all three would have preferred a firmer mattress, _____.

Which option MOST effectively uses data from the table to complete the statement?

- A) with participant 7 expressing the least discomfort throughout the night
- B) though seven participants expressed a high comfort level throughout the night
- C) with twenty-one participants expressing severe discomfort
- D) and participant 18 expressed the most discomfort throughout the night

11. I was telling you that as I lay a-dying, I found myself endeavoring to find fitting words to describe my sensations. At this point, however, the train of my thoughts was disturbed—and I recollect a slight reawakening of my old characteristic irritability at the interruption—by the entrance of a sister who had come from a distance to see me. I remember slightly lifting my head to speak to her, and then glancing round the room to see if all were present.

According to the text, why is the narrator irritated by the entrance of his sister?

- A) He tends to be annoyed by interruptions to his train of thought.
- B) He is doing something important and does not want to speak with her.
- C) He had hoped somebody else had come to speak with him.
- D) He was hoping not to have to deal with his sister that day.

16. *The picturesque village of Rudge-in-the-Vale dozed in the summer sunshine. Along its narrow _____ of life visible were a cat stropping its backbone against the Jubilee Watering Trough, some flies doing deep-breathing exercises on the hot windowsills, and a little group of serious thinkers who, propped up against the wall of the Carmody Arms, were waiting for that establishment to open.*

Which option completes the text so that it conforms to the conventions of Standard English?

- A) High Street the only signs
- B) High Street: the only signs
- C) High Street, the only signs
- D) High Street; the only signs

17. *For this magnificent work, the highest credit is due to the United States chief sanitary officer, Colonel Gorgas. It is well known how the American Medical Commission in Cuba proved six years ago that yellow fever is conveyed from man to man solely and entirely by a gnat common in Central America, known as Stegomyia, and further, how by carrying out measures for preventing the entrance of these gnats into dwelling-houses, and especially _____ so that they fail to obtain and carry the yellow fever germ, even if they do bite healthy men, Colonel Gorgas and his associates practically eradicated yellow fever in Cuba.*

Which option completes the text so that it conforms to the conventions of Standard English?

- A) by keeping them away, from yellow fever patients,
- B) by keeping them away (from yellow fever patients)
- C) by keeping them away—from yellow fever patients—
- D) by keeping them away from yellow fever patients

18. *A grander and severer aspect characterizes the plains of the interior of Africa. Like the wide expanse of the Pacific Ocean, ____ only in recent times that attempts have been made to explore them thoroughly.*

Which option completes the text so that it conforms to the conventions of Standard English?

- A) it was
- B) it is
- C) it had been
- D) it will be

19. *This conquest of Gaul, during which he drove the Germans back to their forests, and inaugurated a policy of conciliation and moderation which made the Gauls the faithful allies of Rome, and ____ country its most fertile and important province, furnishing able men both for the Senate and the Army, was not only a great feat of genius, but a great service—a transcendent service—to the State, which entitled Caesar to a magnificent reward. Had it been cordially rendered to him, he might have been contented with a sort of perpetual consulship, and with the éclat of being the foremost man of the Empire.*

Which option completes the text so that it conforms to the conventions of Standard English?

- A) her
- B) his
- C) their
- D) its

23. A scholar of the highest type and a fearless defender of true and honest thinking, Huxley certainly was: but the quality which gives meaning to his work, which makes it live, is a certain human quality due to the fact that Huxley was always keenly alive to the relation of science to the problems of life. _____, he was not content with the mere acquirement of knowledge; and for this reason, also, he could not quietly wait until the world should come to his way of thinking. Much of the time, therefore, which he would otherwise naturally have spent in research, he spent in contending for and in endeavoring to popularize the facts of science.

Which option completes the text with the MOST logical transition?

- A) However
- B) For this reason
- C) Even so
- D) In conclusion

24. While researching a topic, a student has taken the following notes:

- *Hemp and linen are both fabrics made from natural plant fibers.*
- *Linen is made from the cellulose fibers in the stalks of flax plants.*
- *Hemp comes from fibers in the stalks of the Cannabis sativa plant.*
- *Both fabrics are very breathable and stand up well to washing.*
- *Hemp fabric tends to be rougher than linen but is also eight times stronger due to its fiber bundles being longer.*

The student wants to emphasize the similarities between the two fabrics. Which option MOST effectively uses relevant information from the notes to accomplish this goal?

- A) Linen is made from the cellulose fibers in the stalks of flax plants, which is something that it has in common with hemp fabric.
- B) Hemp fabric tends to be rougher than linen but is also eight times stronger due to its fiber bundles being longer.
- C) Hemp and linen should be viewed as basically the same thing because both are made of cellulose fibers taken from the stalks of plants.
- D) Both plant fibers are very breathable and stand up well to washing when woven into fabric.

25. The latter had reason to dread that, if the Turks were not checked, Constantinople, their capital, would soon share the same fate as Jerusalem. _____, about the year 1073, the Greek Emperor, Manuel VII, sent to supplicate the assistance of the great Pope Gregory VII against the Turks. Till now there had prevailed a spirit of antagonism between the Greek and Latin churches, the former refusing to yield obedience to the pope of the West as the universal head of the Church.

Which option completes the text with the MOST logical transition?

- A) Accordingly
- B) Moreover
- C) However
- D) Despite this

Module II

1. *A year later I went to the parochial school, but did not stay long, for they would not have me. I was a(n) ____ at seven and an agnostic at eight, and I objected to the prayers every five minutes. I had no respect for ceremonies. They did not impress my imagination in the slightest, partly because I learned at an early age to see the hypocrisy of many good people.*

Which option completes the text with the MOST logical and precise word or phrase?

- A) skeptic
- B) altar boy
- C) pious child
- D) religious adherent

2. *It was an age of ferment. Nothing was settled, though much was opened—new worlds and new ideas. In science, Copernicus and Vesalius may be chosen as representative figures: they typify the new cosmology and the scientific emphasis on direct observation.*

As used in the text, what does the word *ferment* MOST nearly mean?

- A) agitation
- B) brewing
- C) rot
- D) growth

3. *What was it that enabled the Greeks, in the crucial test, the ultimate contingency, to turn back the Persians and maintain their independence? History says that it was the result of the battles of Marathon and Salamis, in which the Greeks were triumphant over the Persians. This is true only in a limited sense. The battle of Marathon, in 490 B.C., did not save Greece, for the Persians came back again more powerful than ever. At Thermopylæ, Leonidas and his band died vainly, for the hosts of Xerxes overran all Greece north of the isthmus of Corinth. They took Athens and burned the temples on the Acropolis. They were triumphant on the land.*

Which option BEST states the main purpose of the text?

- A) It explains why the Persians chose to conquer Greece.
- B) It states several theories about the same series of events.
- C) It introduces an idea that it then refutes.
- D) It states a theory that it then supports.

4. *As I looked on him, his countenance expressed the utmost extent of malice and treachery. I thought with a sensation of madness on my promise of creating another like to him, and trembling with passion, tore to pieces the thing on which I was engaged. The wretch saw me destroy the creature on whose future existence he depended for happiness, and with a howl of devilish despair and revenge, withdrew.*

Which option BEST states the function of the underlined sentence in the text as a whole?

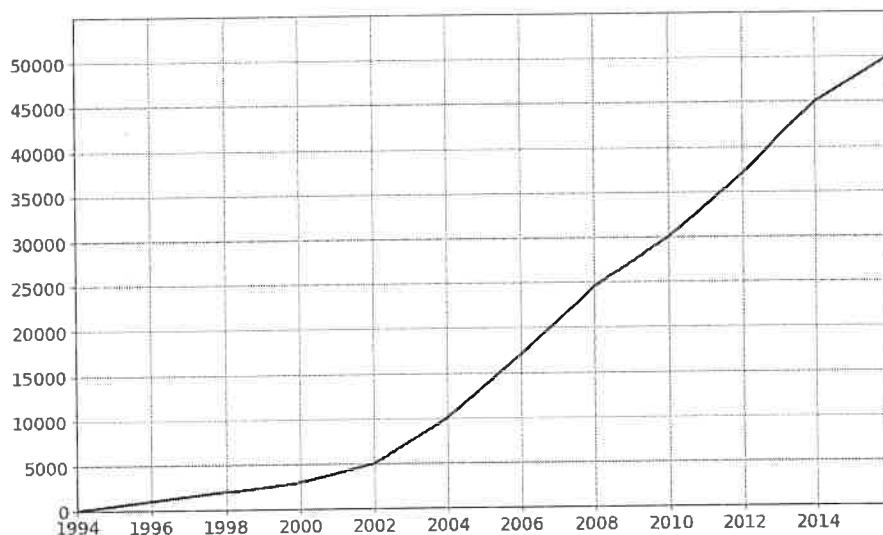
- A) It sets up the character description in the sentences that follow.
- B) It explains who the narrator is looking at in the next sentence.
- C) It provides a description of the appearance of an important character.
- D) It sets up the reason for a decision made in the next sentence.

7. *What is the size, mass, and distance of each of the planets? What satellites, like our Moon, do they possess? What are their temperatures? And those other, sporadic members of our system, comets and meteors, what are they? What are their movements? How do they originate? And the Sun itself, what is its composition, what is the source of its heat, how did it originate? Is it running down?*

Which option BEST describes the overall structure of the text?

- A) It asks its reader a series of questions to answer.
- B) It poses a series of general theoretical questions about planets and other heavenly bodies.
- C) It poses a series of practical questions about a specific group of planets and other heavenly bodies.
- D) It uses a series of questions to cast doubt upon established knowledge about planets.

8. *The graph below tracks the total number of books published by Project Gutenberg over a period of ten years. The x-axis counts the years from 1994 – 2014, and the y-axis gives the values for the total number of books. Dover believes that, in 2002, a significant cultural shift took place toward higher participation in preserving public domain works.*



Total Number of Books Published by Project Gutenberg 1994 – 2014

Which option BEST describes data from the graph to justify Dover's conclusion?

- A) The number of books published in 2008 was about 25,000, which is ten or more times the number that had been published in 2000.
- B) About 2,500 books were published in 2000 as opposed to 5,000 in 2002.
- C) About 5,000 books were published in 2002 as compared to about 10,000 in 2004.
- D) The number of books published took eight years (from 1994 – 2002) to reach 5,000, but another 5,000 books were published in the period between 2002 and 2004.

12. *Jane Eyre* is an 1847 novel by Charlotte Brontë. Brontë portrays the character of Mr. Rochester as intriguing and witty but unkind, as evidenced by his attempt to make the titular heroine jealous in Chapter 22 by pretending that he intends to marry another woman.

Which quotation from *Jane Eyre* MOST effectively illustrates the claim about Mr. Rochester?

- A) "I dreamt of Miss Ingram all the night: in a vivid morning dream I saw her closing the gates of Thornfield against me and pointing me out another road; and Mr. Rochester looked on with his arms folded—smiling sardonically, as it seemed, at both her and me."
- B) "I had heard from Mrs. Fairfax in the interim of my absence: The party at the hall was dispersed; Mr. Rochester had left for London three weeks ago, but he was then expected to return in a fortnight. Mrs. Fairfax surmised that he was gone to make arrangements for his wedding, as he had talked of purchasing a new carriage: she said the idea of his marrying Miss Ingram still seemed strange to her; but from what everybody said, and from what she had herself seen, she could no longer doubt that the event would shortly take place."
- C) "A true Janian reply! Good angels be my guard! She comes from the other world—from the abode of people who are dead; and tells me so when she meets me alone here in the gloaming! If I dared, I'd touch you, to see if you are substance or shadow, you elf!—but I'd as soon offer to take hold of a blue ignis fatuus light in a marsh. Truant! truant!" he added, when he had paused an instant. "Absent from me a whole month, and forgetting me quite, I'll be sworn!"
- D) "You must see the carriage, Jane, and tell me if you don't think it will suit Mrs. Rochester exactly; and whether she won't look like Queen Boadicea, leaning back against those purple cushions. I wish, Jane, I were a trifle better adapted to match with her externally. Tell me now, fairy as you are—can't you give me a charm, or a philter, or something of that sort, to make me a handsome man?"

13. *The Essay on Criticism* is, however, more than an example of the interrelation of literature and politics in the eighteenth century; and it is more than a step on the way to its author's immortalizing in lead. It presents, albeit not very imaginatively, a statement of many of the literary theories and attitudes of the Augustan period. However brief and incomplete, the remarks about the language of poetry and upon the effects of certain literary passages are _____.

Which option MOST logically completes the text?

- A) uncreative and lazy attempts to exercise a type of practical criticism
- B) of interest as imperfect exercises in a type of practical criticism
- C) the least interesting possible use of the period's literary theories
- D) nothing that presents any value for study

14. Not so is it with a second foreign element, which silently dropped into the soil of Universities, like the grain of mustard seed in the parable; and, like that grain, grew into a tree, in whose branches a whole aviary of fowls took shelter. That element is the element of Endowment. It differed from the preceding, in _____ original design to serve as a prop to the young plant, not to be a parasite upon it.

Which option completes the text so that it conforms to the conventions of Standard English?

- A) its
- B) it's
- C) their
- D) there

19. Ambroise Paré was born in the village of Bourg-Hersent, near Laval, in Maine, France, about 1510. He was trained as a barber-surgeon at a time when a barber-surgeon was inferior to a surgeon and the professions of surgeon and physician were kept apart by the law of the Church that forbade a physician to shed blood. Under ___ he served his apprenticeship is unknown, but by 1533 he was in Paris, where he received an appointment as house surgeon at the Hotel Dieu.

Which option completes the text so that it conforms to the conventions of Standard English?

- A) what
- B) who
- C) which
- D) whom

20. A miracle alone could have made Baxter a poet; the cold, clear light of reason "paled the ineffectual fires" of his imagination; all things presented themselves to his vision "with hard outlines, colorless, and with no surrounding atmosphere." That he did, ____, write verses, so creditable as to justify a judicious modern critic in their citation and approval, can perhaps be accounted for only as one of the phenomena of that subtle and transforming influence to which even his stern nature was unconsciously yielding. Baxter was in love.

Which option completes the text with the MOST logical transition?

- A) because of this
- B) nevertheless
- C) consequently
- D) for this reason

21. All we know is the fact that this planet moves in a certain order, and at a fixed rate, and that the speed is of itself sufficient to rend the hardest rocks; yet the delicate down which rests so lightly upon the flower is undisturbed. It is, _____, evident that matter is endued with powers, by which mass is bound to mass, and atom to atom; these powers are not the results of any of the motions which we have examined, but, acting in antagonism to them, they sustain our globe in its present form.

Which option completes the text with the MOST logical transition?

- A) therefore
- B) initially
- C) by comparison
- D) by contrast

22. While researching a topic, a student has taken the following notes:

- The dugong and three species of manatee are the four living species of the order Sirenia.
- Neither dugongs nor manatees have hind limbs or dorsal fins.
- Manatees have paddle-shaped tails, while dugongs have whale-like, fluked tails.
- Manatees usually feed at or near the water's surface and have short snouts.
- Dugongs have longer, trunk-like snouts and eat seagrasses from the sea floor.

25. On his father's side he was an English country squire, but foreign residence and the Neapolitan Court had largely affected the family, in addition to that flavor of cosmopolitan culture which belongs to the more highly placed Englishmen of the Roman Communion. On his mother's side he was a member of one of the oldest and greatest families in Germany, which was only not princely. The Dalbergs, _____, had intermarried with an Italian family, the Brignoli.

Which option completes the text with the MOST logical transition?

- A) as a result
- B) in consequence
- C) however
- D) moreover

26. While researching a topic, a student has taken the following notes:

- *George Washington Carver was an American agricultural scientist and inventor.*
- *He promoted farming methods that prevented soil depletion from repeated cotton plantings.*
- *He also promoted alternative crops to cotton, including peanuts and sweet potatoes, which farmers could use as food sources.*
- *He was among the most prominent Black scientists of the early 1900s.*
- *He came up with more than 300 uses of peanuts to encourage people to plant them.*

The student wants to encourage their peers to view George Washington Carver as more than "that peanut guy." Which option MOST effectively uses relevant information from the notes to accomplish this goal?

- A) George Washington Carver came up with more than 300 uses of peanuts to encourage people to plant them instead of cotton on their farms.
- B) American agricultural scientist and inventor George Washington Carver came up with more than 300 uses of peanuts and promoted farming methods that prevented soil depletion from repeated cotton plantings.
- C) Carver's work in preventing soil depletion from repeated cotton plantings also extended to promoting alternative crops, such as peanuts and sweet potatoes, that farmers could use as food sources.
- D) Although he is currently known best for identifying more than 300 uses of peanuts, George Washington Carver was among the most prominent Black scientists of the early 1900s.

27. While researching a topic, a student has taken the following notes:

- *John Lopez is an American sculptor who makes life-size hybrid metal sculptures using discarded farm equipment and bronze.*
- *He made 12 life-size presidential monuments for display in The City of Presidents attraction in Rapid City, South Dakota.*
- *The presidents Lopez sculpted include Presidents Kennedy, Carter, Grant, and Garfield.*
- *He made a life-size metal buffalo called Dakotah, which is on display at the Dakotah Steak House and Restaurant.*
- *He lives in South Dakota.*

Practice Test #1

Math

For questions 1 – 16, work the problem and choose the most correct answer. For questions 17 – 22, work the problem and enter the correct answer in the space provided. You may use a calculator, but remember: some questions may be more efficiently answered through reasoning rather than the use of a calculator.

Module I

1. What is the axis of symmetry for the given parabola?

$$y = -2(x + 3)^2 + 5$$

- A) $y = 3$
- B) $x = -3$
- C) $y = -3$
- D) $x = 3$

2. Which of the following is equivalent to $z^3(z + 2)^2 - 4z^3 + 2$?

- A) 2
- B) $z^5 + 4z^4 + 4z^3 + 2$
- C) $z^6 + 4z^3 + 2$
- D) $z^5 + 4z^4 + 2$

3. Which of the following is an equation of the line that passes through the points $(4, -3)$ and $(-2, 9)$ in the xy -plane?

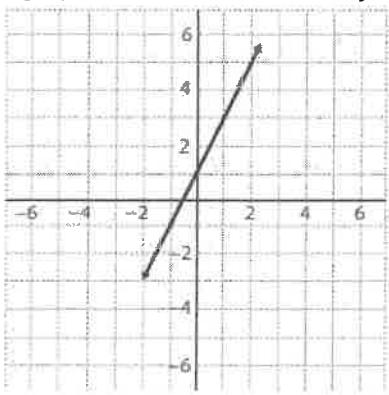
- A) $y = -2x + 5$
- B) $y = -\frac{1}{2}x - 1$
- C) $y = \frac{1}{2}x - 5$
- D) $y = 2x - 11$

4. What is the domain of the inequality $\left|\frac{x}{8}\right| \geq 1$?

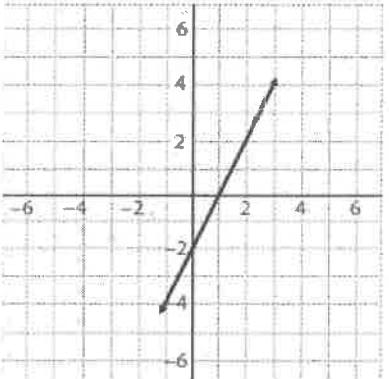
- A) $(-\infty, \infty)$
- B) $[8, \infty)$
- C) $(-\infty, -8]$
- D) $(-\infty, -8] \cup [8, \infty)$

9. Which graph shows the solution to $y = 2x + 1$?

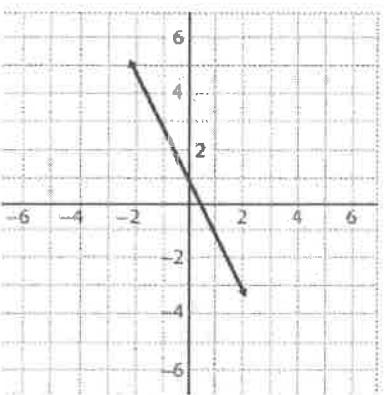
A)



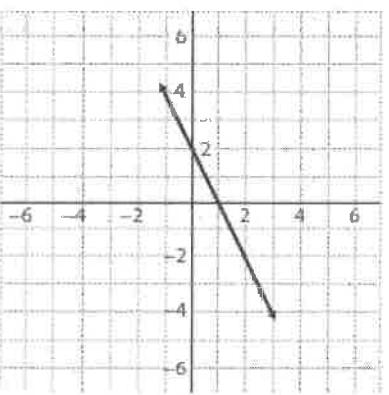
B)



C)



D)



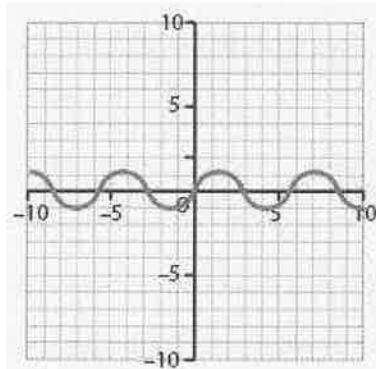
13. Which of the following defines y as a function of x ?

I. $y^2 + x = 3$

II.

x	y
0	4
1	5
2	8
3	13
4	20

III. $y = \sin(\theta)$



- A) II only
- B) I and II only
- C) II and III only
- D) I, II, III only

14. Which of the following is the vertical asymptote of the given function?

$$f(x) = \frac{x+4}{-2x-6}$$

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

Module II

For questions 1 – 16, work the problem and choose the most correct answer. For questions 17 – 22, work the problem and enter the correct answer in the space provided. You may use a calculator, but remember: some questions may be more efficiently answered through reasoning rather than the use of a calculator.

1. If a student answers 42 out of 48 questions correctly on a quiz, what percentage of questions did she answer correctly?

- A) 82.5%
- B) 85%
- C) 87.5%
- D) 90%

2. The population of a town was 7,250 in 2014 and 7,375 in 2015. What was the percent increase from 2014 to 2015 to the nearest tenth of a percent?

- A) 1.5%
- B) 1.6%
- C) 1.7%
- D) 1.8%

3. Which of the following is a solution to the inequality $2x + y \leq -10$?

- A) (0, 0)
- B) (10, 2)
- C) (10, 10)
- D) (-10, -10)

4. What are the roots of the equation $y = 16 \times 3 - 48 \times 2$?

- A) $\left\{ \frac{(3+i\sqrt{5})}{2}, \frac{3-i\sqrt{5}}{2} \right\}$
- B) {0, 3, -3}
- C) {0, 3i, -3i}
- D) {0, 3}

5. Bryce has 34 coins worth a total of \$6.25. If all the coins are dimes or quarters, how many of EACH coin does Bryce have?

- A) 9 dimes and 15 quarters
- B) 10 dimes and 24 quarters
- C) 15 dimes and 19 quarters
- D) 19 dimes and 15 quarters

6. An ice chest contains 24 sodas, some regular and some diet. The ratio of diet soda to regular soda is 1:3. How many regular sodas are there in the ice chest?

- A) 1
- B) 4
- C) 18
- D) 24

12. A person earning a salary between \$75,000 and \$100,000 per year will pay \$10,620 in taxes plus 20% of any amount over \$75,000. What would a person earning \$80,000 per year pay in taxes?

- A) \$10,620
- B) \$11,620
- C) \$12,120
- D) \$12,744

13. A square-based pyramid has a height of 10 cm. If the length of the side of the square is 6 cm, what is the surface area of the pyramid?

- A) 36 cm
- B) $3\sqrt{109}$ cm
- C) 100 cm
- D) 161.3 cm²

14. A bike store is having a 30% off sale, and one of the bikes is on sale for \$385. What was the original price of this bike?

- A) \$253.00
- B) \$450.00
- C) \$500.50
- D) \$550.00

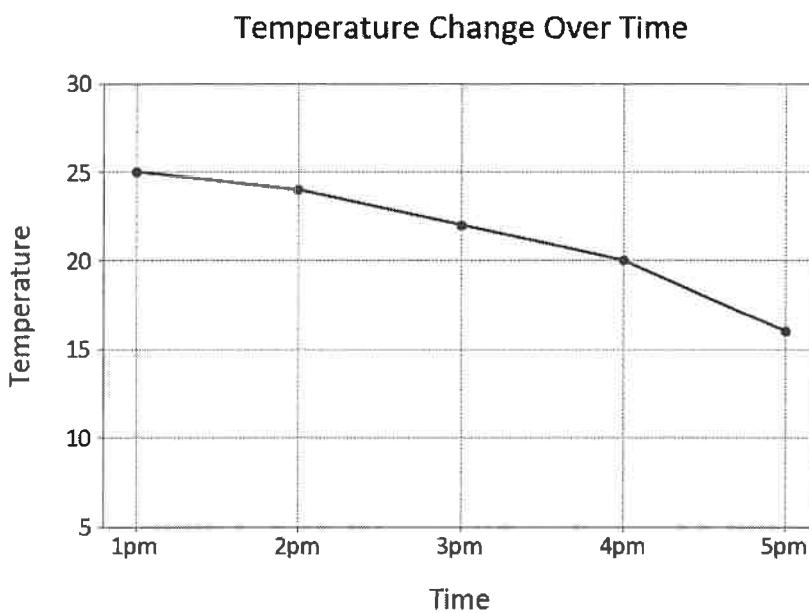
15. Tiles are \$12.51 per square yard. What will it cost to cover the floor of a room with tiles if the room is 10 feet wide and 12 feet long?

- A) \$166.80
- B) \$178.70
- C) \$184.60
- D) \$190.90

16. Jane earns \$15 per hour babysitting. If she starts with \$275 in her bank account, which equation represents how many hours (h) she will have to babysit for her account to reach \$400?

- A) $400 = 275 + 15h$
- B) $400 = 15h$
- C) $400 = \frac{15}{h} + 275$
- D) $400 = -275 - 15h$

-
21. The graph below shows the change in temperature from 12:00 p.m. to 6:00 p.m. At what time does the temperature begin to change the most?



22. Fifty shares of a financial stock and 10 shares of an auto stock are valued at \$1,300. If 10 shares of the financial stock and 10 shares of the auto stock are valued at \$500, what is the value of 50 shares of the auto stock?

Options A and C both declare—with varying degrees of directness—that criticism should not involve critique, which makes no sense. Option B’s fear of ruffling feathers is not reflected anywhere in the text.

9. C: Option C explains how Mrs. Bennet decides that keeping Jane near potential suitor Mr. Bingley at Netherfield is more important than Jane recovering from her cold. Mrs. Bennet is only aware of (and taking credit for) the rain in option A, and option B details Mrs. Bennet receiving the note that informs her of Jane’s illness and departing for Netherfield with her two youngest daughters to check on her eldest. Option D shows Mrs. Bennet advocating very strongly for Jane to be seen as desirable, but it is not her reaction to being told that Jane is sick.

10. A: Participant 7 gave the highest comfort rating, making option A the best choice. Options B and C treat the numbers assigned to participants as numbers of participants. Option D wrongly states that participant 18 expressed the most discomfort, when the lowest rating actually came from Participant 3.

11. A: Option A correctly observes the narrator’s “old characteristic irritability” at having his thoughts interrupted. Option B would only be correct if the narrator had noted that he was doing something important, but this is not found in the passage. Options C and D state that the narrator does not want to speak with his sister and would rather speak to someone else respectively, neither of which are implied by the passage.

12. C: Option C most clearly shows that the haunt performers enjoy providing a fun experience for visitors, which is directly opposed to enjoying causing others distress. Options A and B could just as easily have been said by a person who does enjoy others’ distress as by someone who does not, and option D does not relate to enjoyment of any aspect of visitors’ reactions.

13. B: Option B is the best fit for the statement in the second sentence—that the problem with the litter was that it might break down and allow Dauger to be seen. Option A requires an assumption that the public will interfere with Dauger’s incarceration if he is seen, which is not indicated by the text. As Dauger is the prisoner, options C and D are both incorrect.

14. B: Option B correctly uses the possessive *their*. Option A uses the place signifier *there*; Option C refers to the contraction of *they are*; and Option D uses the article *the*, which does not perform any needed function in this sentence.

15. A: Option A makes this sentence structure parallel through the use of the word *of* for both parts of this comparison. Options B, C, and D all fail to include this parallelism, with options C and D also changing the meaning of the statement by saying that the character is talking for—and to—the school, respectively.

16. C: Option C properly uses a comma to separate the introductory phrase from what comes after it. Option A omits needed punctuation, Option B’s use of a colon would require the sentence to elaborate on the introductory phrase, and Option D’s semicolon is incorrect because the introductory phrase does not form a complete sentence on its own.

17. D: Unlike options A, B, and C, option D does not wrongly set off the essential element of the yellow fever patients from the rest of the sentence.

18. B: Option B continues the use of the present tense established by the previous sentence. Options A and C incorrectly lapse into past tense, and option D switches to future tense.

19. C: Option C uses the pronoun *their*, which matches the plural antecedent of the Gauls. Option A would be the proper pronoun for a singular woman, while Option B would be the pronoun used for a singular man. Option D uses *its*, which should be used for objects, not a group of people.

Module II

1. A: Since a skeptic is someone who has doubts, option A best matches the discussion in the rest of the passage about the narrator's lack of patience or respect for religious ceremony. Options B, C, and D all describe someone who shows devotion to religion.

2. A: Option A is the best match for the passage's description of a time in which "nothing was settled." Options B and C may fit for similar physical processes to fermentation in foods or beverages, but the passage does not reference either. Option D likewise is something that may occur in the physical process of fermentation but is not apt for the description of social ferment.

3. C: Option C correctly describes how the passage shares that the reigning theory is that these battles turned the tide for Greece before refuting that theory with the fact that these were not entirely successful for the Greeks. The passage does not ascribe motives to the Persians as required for Option A to be correct, and it neither states several theories, as in Option B, nor supports a stated theory, as in Option D.

4. D: Option D is correct in noting that this sentence describes the character as malicious, setting up the narrator's horror at the idea of creating another like him. The character's appearance is not described in the passage, making options A and C incorrect, and the sentence does not explain who the character is (option D).

5. B: Option B is correct. Text 1's author considers certain animal decisions as if they were made by human children, and Text 2 tells a joke from the perspective of a St. Bernard-border collie mix. Option A would require Text 1 to describe the practice of personification as childish rather than merely noting that a child had done it. Option C would require a religious reason for the personification of the canine narrator of Text 2, and option D would require said canine narrator to not exist.

6. D: Option D accurately describes the neighbors' doubts as to the truthfulness of the girl's story, which they "made insinuations" about. Option A states its own opinion on whether the girl is telling the truth; however, the passage does not state such an opinion. Option B would only be correct if the neighbors all believe the girl. For Option C to be correct, all the neighbors would have to have visited her the way the narrator's acquaintance did.

7. C: Option C is correct in identifying these questions as being about the mass and composition of a specific group of planets and heavenly bodies. For Option A to be correct, the passage would need to indicate that it expects the reader to answer these questions. Option B would require the questions to be less specific to these planets and their physical qualities. Option D would require the questions to be of a theoretical nature and challenge the *status quo*, while they are simply asking about physical qualities of these planets.

8. D: Option D best uses information from the graph to show that the rate of growth post-2002 is substantially higher than that of years prior. Option A makes it clear that the number of published books has risen over the years, but it does not describe how this changed after 2002. Option B only refers to a span of two years, ending in 2002. Option C only gives two figures for pre- and post-2002 and provides no information as to the relative rate of growth before and after.

9. C: Option C best states the idea behind the passage's discussion of new medical discoveries curing diseases of which Dr. Butts was never even aware. Option A states a negative opinion of Dr. Butts as a physician, of which we have no indication in the passage. Option B says that the College of Physicians was organized into a board of orthodoxy, but this was only offered as a hypothetical in the passage.

because he was driven by reason and not, as the last sentence of the passage states, because he was in love.

21. A: Option A reflects that the first sentence provides the reasoning for the conclusion drawn by the second sentence. Option B would suggest that the statement in the second sentence is only true at first, which is not indicated in the passage. Options C and D require a comparison to be made and a contrast to be drawn, respectively, and no such differences are shown in the text.

22. D: Option D uses only notes about the species' differences to describe their eating habits. Option A only states a fact about dugongs and does not explain how this feature presents differently in manatees. Options B and C place more emphasis on the species' similarities than their differences.

23. B: Option B recognizes that this sentence makes a statement that alters readers' perceptions of what came before: this is what these supernaturalists explain, but they do not seem to agree with each other about much of it. Options A, C, and D all require this sentence to state something that logically follows because of the previous information.

24. A: Option A combines the notes on McKinley's feminism and her fairytale retellings to explain that she writes these stories because of her views on the general selection of fantasy heroines. Options B and C simply mention that she writes these feminist retellings while emphasizing the awards she has won, with option C incorrectly stating that these were both for fairytale retellings. Option D gives no indication that she writes fairytale retellings at all.

25. D: Option D reflects that this is additional information being given about the Dalbergs. Options A and B would mean that the Dalbergs intermarried with the Brignoli family because of what the sentence before said about the subject's genealogy. Option C would require them doing this to contradict the facts given in the previous sentence.

26. C: Option C places the most emphasis on Carver's work to prevent soil depletion, only listing peanuts as one of the crops that he encouraged farmers to plant. Options A, B, and C all emphasize the 300 uses of peanuts, with option C initially seeming like it will share something more worthwhile but then only referring to Carver as a prominent agricultural scientist.

27. C: Option C emphasizes the sculptures specifically stated to be on display in South Dakota and notes that this is the sculptor's home state. Options A, B, and D only refer to Lopez as being from South Dakota or spending time there, without placing enough emphasis on how much of his work is on display in his home state.

$$2y = -3x + 10$$

$$y = -\frac{3}{2}x + 5$$

6. D: Solve each equation for y and find the equation with a power of 1.

$$\sqrt[3]{y} = x \rightarrow y = x^3$$

$$\sqrt[3]{x} = y \rightarrow y = \sqrt[3]{x}$$

$$\sqrt[3]{y} = x^2 \rightarrow y = x^6$$

$$y = \sqrt[3]{x^3} \rightarrow y = x$$

7. A: Justin's profit will be his income minus his expenses. He will earn \$40 for each lawn, or $40m$. He pays \$35 in expenses each week, or $35w$:

$$\text{profit} = 40m - 35w$$

8. B: Factor the trinomial and set each factor equal to 0.

$$2n^2 + 2n - 12 = 0$$

$$2(n^2 + n - 6) = 0$$

$$2(n + 3)(n - 2) = 0$$

$$n = -3 \text{ and } n = 2$$

9. A: The line $y = 2x + 1$ will have a slope of 2 and y -intercept of 1. The lines shown in graphs C and D have negative slopes. The line in graph B has a y -intercept of -2. Alternatively, use a table to find some coordinates, and identify the graph that contains those coordinates:

x	y
0	1
1	3
2	5

10. A: Since the cube's volume is 27, each side length is equal to $\sqrt[3]{27} = 3$. The long diagonal distance from one of the cube's vertices to its opposite vertex will provide the sphere's diameter:

$$d = \sqrt{3^2 + 3^2 + 3^2} = \sqrt{27} = 5.2$$

Half of this length is the radius, which is 2.6 meters.

11. C: Use the equation for tangent:

$$\tan 50^\circ = \frac{x}{300}$$

$$x = 300(\tan 50^\circ)$$

12. A: The domain is the possible values of x from left to right. Here, the domain starts at -4, inclusive, and stops at -1, exclusive. It starts again at 0, inclusive, and goes to 3, inclusive. The two line segments

Thus, $2n + 2n + 2n = 96$, which can be simplified into $6n = 96$. After both sides are divided by 6, it can be determined that $n = 16$.

Module II

1. C: Use the formula for percentages:

$$\begin{aligned} \text{percent} &= \frac{\text{part}}{\text{whole}} \\ &= \frac{42}{48} \\ &= 0.875 = 87.5\% \end{aligned}$$

2. C: Use the formula for percent change:

$$\begin{aligned} \text{percent change} &= \frac{\text{amount of change}}{\text{original amount}} \\ &= \frac{7,375 - 7,250}{7,250} = 0.017 = 1.7\% \end{aligned}$$

3. D: Plug in each set of values and determine if the inequality is true:

$$\begin{aligned} 2(0) + 0 &\leq -10 \text{ FALSE} \\ 2(10) + 2 &\leq -10 \text{ FALSE} \\ 2(10) + 10 &\leq -10 \text{ FALSE} \\ 2(-10) + (-10) &\leq -10 \text{ TRUE} \end{aligned}$$

4. D: Factor the equation and set each factor equal to 0:

$$\begin{aligned} y &= 16 \times 3 - 48 \times 2 \\ 16 \times 2(x - 3) &= 0 \\ x &= 0 \text{ and } x = 3 \end{aligned}$$

5. C: Set up a system of equations where d equals the number of dimes and q equals number of quarters.

$$\begin{aligned} d + q &= 34 \\ 0.1d + 0.25q &= 6.25 \\ 0.1d + 0.25(34 - d) &= 6.25 \\ d &= 15 \\ q &= 34 - 15 = 19 \end{aligned}$$

6. C: One way to find the answer is to draw a picture:

Put 24 cans into groups of 4. One out of every 4 cans is diet (light gray), so there is 1 light gray can for every 3 dark gray cans. That leaves 18 dark gray cans (regular soda).

10. D: Assign variables and write the ratios as fractions. Then, cross multiply to solve for the number of apples and oranges sold:

$$x = \text{apples}$$

$$\frac{\text{apples}}{\text{bananas}} = \frac{3}{2} = \frac{x}{20}$$

$$60 = 2$$

$$x = 30 \text{ apples}$$

$$y = \text{oranges}$$

$$\frac{\text{oranges}}{\text{bananas}} = \frac{1}{2} = \frac{y}{20}$$

$$2y = 20$$

$$y = 10 \text{ oranges}$$

To find the total, add the number of apples, oranges, and bananas together:

$$30 + 20 + 10 = 60 \text{ pieces of fruit}$$

11. B: Calculate the discriminant:

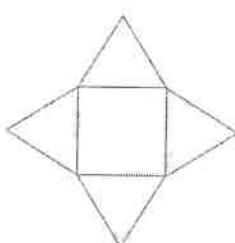
$$B^2 - 4AC = 22 - 4(1)(4) = -12$$

The discriminant is negative and $A \neq C$, so it is an ellipse.

12. B: Add the base amount and the tax on the extra percentage of the person's income:

$$10,620 + 0.2(80,000 - 75,000) = \$11,620$$

13. D: The surface area will be the area of the square base plus the area of the four triangles:



First, find the area of the square ($A = s^2 \rightarrow 6^2 = 36$).

Then, to find the area of the triangles, first find the pyramid's slant height:

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

$$l^2 = 100 + 9$$

$$l = \sqrt{109}$$

19. 80

Write a formula to find the answer:

$$p = \text{number of pages written by Chris}$$

$$2p = \text{number of pages written by Kim}$$

$$p + 2p = 240$$

$$p = 80$$

Chris wrote 80 pages.

20. ≈ 13.59

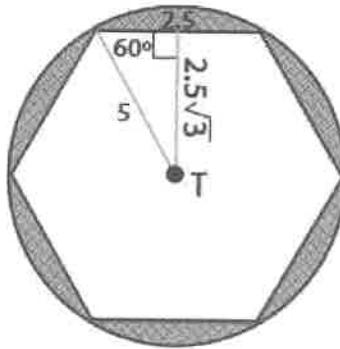
The area of the shaded portion will be the area of the circle minus the area of the hexagon. Use the radius to find the area of the circle:

$$AC = \pi r^2$$

$$= \pi(5)^2$$

$$= 25\pi$$

To find the area of the hexagon, draw a right triangle from the vertex, and use special right triangles to find the hexagon's apothem. Then, use the apothem to calculate the area.



$$a = 2.5\sqrt{3}$$

$$A_H = \frac{ap}{2}$$

$$= \frac{(2.5\sqrt{3})(30)}{2}$$

$$= 64.95$$

Subtract the area of the hexagon from the circle to find the area of the shaded region.

$$= AC - AH$$

$$= 25\pi - 2.5\sqrt{3}$$

$$\approx 13.59$$

21. 4:00 p.m.

Practice Test #2

Reading and Writing

Module I

1. "Many a man," says De Quincey, "can trace his ___ to a murder, of which, perhaps, he thought little enough at the time." This remark applies with peculiar force to Philip II of Spain, to his secretary, Antonio Perez, to the steward of Perez, to his page, and to a number of professional ruffians. All of these, from the King to his own scullion, were concerned in the slaying of Juan de Escovedo, secretary of Philip's famous natural brother, Don John of Austria. All of them, in different degrees, had bitter reason to regret a deed which, at the moment, seemed a commonplace political incident.

Which option completes the text with the MOST logical and precise word or phrase?

- A) source of power
- B) salvation
- C) ruin
- D) creation

2. When I was well grown, at last, I was sold and taken away, and I never saw her again. She was broken-hearted, and so was I, and we cried; but she comforted me as well as she could, and said we were sent into this world for a wise and good purpose, and must do our duties without repining, take our life as we might find it, live it for the best good of others, and never mind about the results; they were not our affair.

As used in the text, what does the word *repining* MOST nearly mean?

- A) fretting
- B) finding a purpose
- C) forgetting
- D) losing

3. *Lol in the orient when the gracious light*

*Lifts up his burning head, each under eye
Doth homage to his new-appearing sight,
Serving with looks his sacred majesty;
And having climb'd the steep-up heavenly hill,
Resembling strong youth in his middle age,
Yet mortal looks adore his beauty still,*

6. *The theory of relativity has justly excited a great amount of public attention. But, for all its importance, it has not been the topic which has chiefly _____ the recent interest of physicists.*

Which option completes the text with the MOST logical and precise word or phrase?

- A) eschewed
- B) disturbed
- C) absorbed
- D) avoided

7. *She mounted a box and watched the battle, her hands clenched, her eyes blazing, her heart sick; for her Cecil was getting the worst of it. He looked as sturdy as a little oak, and he planted his blows scientifically; but his antagonist was twice his size, lean and wiry, and full of nervous fire. Moreover, the surrounding influences were all for the American: Cecil was not only English, but he had snubbed these boys of Mrs. Hayne's boarding-house for three consecutive weeks. Vengeance had been in the air for some time.*

Which option BEST describes the overall structure of the text?

- A) It presents the narrative of a schoolyard fight.
- B) It begins with a description of fighting and progresses to a reflection on the concept.
- C) It begins with a description of Cecil and ends with an explanation of the reason for the fight he is currently in.
- D) It details the thoughts that the protagonist is having about Cecil and the fight he is in.

8. *That is to say, as I understand, that moods and tastes and fashions change; people fancy now this and now that; but what is unpretentious and what is true is always beautiful and good, and nothing else is so. This is not saying that fantastic and monstrous and artificial things do not please; everybody knows that they do please immensely for a time, and then, after the lapse of a much longer time, they have the charm of the rococo.*

Which option BEST states the main idea of the text?

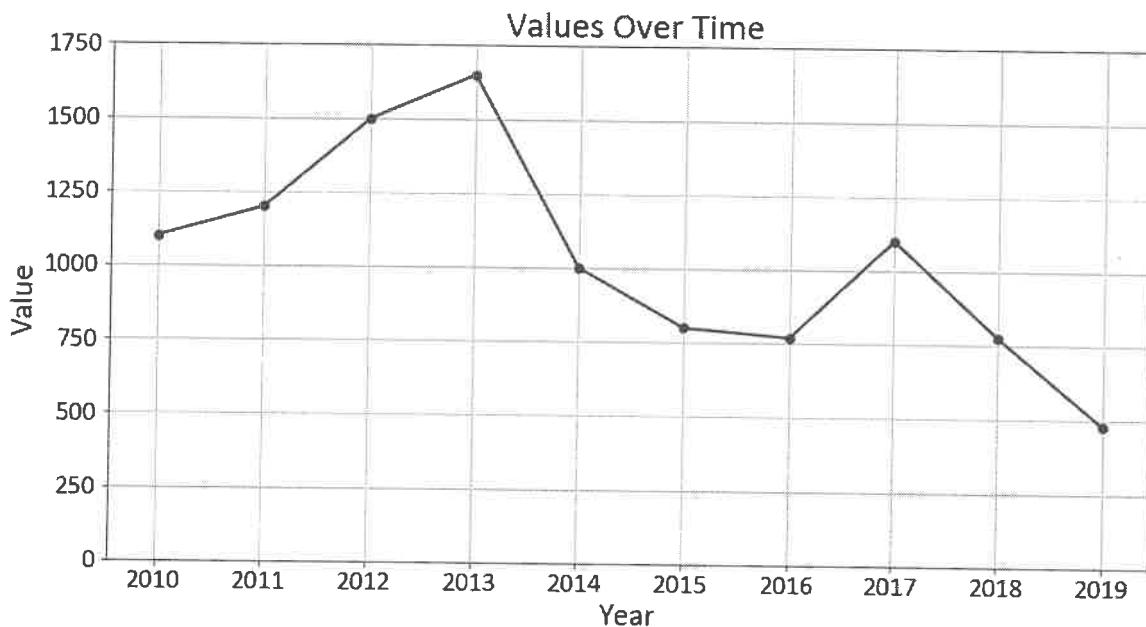
- A) Rococo art shares a certain charm with the beauty of what is unpretentious.
- B) That which is straightforward and honest will always be good, unaffected by changes in fashion.
- C) The moods and tastes of people shift over time, but that which no longer pleases will eventually regain its charm.
- D) The only thing that remains certain in fashion is that tastes will change.

9. *Whether to follow the order of time or the order of subjects was a question which presented itself; and, as neither alternative promised satisfactory results, I eventually decided to compromise –to follow partly the one order and partly the other. The first volume is made up of essays in which the idea of evolution, general or special, is dominant. In the second volume, essays dealing with philosophical questions, with abstract and concrete science, and with aesthetics, are brought together; but though all of them are tacitly evolutionary, _____.*

Which option MOST logically completes the text?

- A) their evolutionism is an incidental rather than a necessary trait
- B) their evolutionism is their only essential trait
- C) none of them are as evolutionary as they seem
- D) none of them include discussion of aesthetics

11. Homes Sold in Coral City 2010 – 2019



This graph shows the number of homes sold per year in Coral City, Utah, from 2010 – 2019. The x-axis shows the years during this range, and the y-axis counts the number of homes sold. According to an analyst, although the number of houses purchased each year has varied significantly over the period shown, the number overall has fallen since 2010.

Which option MOST effectively uses data from the graph to justify the underlined claim?

- A) The greatest annual number of homes sold during the period shown is about 1,000 in 2017.
- B) The smallest annual number of homes sold during the period shown is about 1,600 in 2013.
- C) About 1,000 homes were sold in 2010 and about 500 in 2019.
- D) About 1,000 homes were sold in 2010 and about 1,600 in 2013.

12. Does the public for such a theatre exist? I think so. The number of playgoers is very large, and although _____, a very large proportion has grown weary of the ordinary drama—a fact shown by the recent failure of plays which not many years ago would have been successful.

Which option MOST logically completes the text?

- A) only a comparatively small proportion goes out of its way to patronize the noncommercial drama
- B) a large portion goes out of its way to patronize the noncommercial drama
- C) none of these playgoers go out of their way to patronize the noncommercial drama
- D) there are more playgoers than cricket players

13. An independent research group is conducting an experiment on adults with an underdeveloped pons, a part of the brain developed during the first six months of life. These adults have a heightened fight/flight reflex due to dysfunction in the pons. The researchers have hypothesized that these adults can lessen the developmental gap by engaging in “tummy time” the way that an infant would. The researchers have assigned daily “tummy time” to an experimental group of people with an

17. Heat plays an important part in the splitting of rocks and in the formation of debris. Rocks in exposed places ___ greatly affected by changes in temperature, and in regions where the changes in temperature are sudden, severe, and frequent, the rocks are not able to withstand the strain of expansion and contraction, and as a result crack and split.

Which option completes the text so that it conforms to the conventions of Standard English?

- A) were
- B) are
- C) have been
- D) used to be

18. She gave me plenty of food, put good clothes upon me, and told me to go and play with her own ___ remained but a short time at Sau-ge-nong.

Which option completes the text so that it conforms to the conventions of Standard English?

- A) sons. We
- B) sons? We
- C) sons: We
- D) sons, we

19. It was a matter of chance that I should have rented a house in one of the strangest communities in North America. It was on that slender riotous island which extends itself due east of _____ other natural curiosities, two unusual formations of land.

Which option completes the text so that it conforms to the conventions of Standard English?

- A) New York and where there are among
- B) New York—and where there are—among
- C) New York, and where there are—among
- D) New York—and where there are, among

20. "It was already sufficiently difficult," says Arago, "to imagine what could be the kind of change in the constitution of the globe which could act during one hundred and fifty-three years in gradually transferring the direction of the magnetic needle from due north to 23° west of north. We see that it is now necessary to explain, _____, how it has happened that this gradual change has ceased and has given place to a return towards the preceding state of the globe."

Which option completes the text with the MOST logical transition?

- A) despite this
- B) nevertheless
- C) however
- D) moreover

24. While researching a topic, a student has taken the following notes:

- In Cold Blood: A True Account of a Multiple Murder and Its Consequences is a 1966 book by Truman Capote.
- The work was inspired by a 300-word article that ran in the New York Times in November 1959 about the unexplained murder of the Clutter family in rural Holcomb, Kansas.
- Capote spent the next few years becoming acquainted with anyone involved in the investigation as well as most of the residents of the area.
- Capote claimed to have tested at “over 90 percent” accuracy in recalling verbatim conversations, and instead of taking notes during interviews, he relied on his memory to write down quotes afterward.
- Various Kansas residents who spoke to Capote have claimed that he mischaracterized or misquoted them in his book.

The student wants to draw attention to the flaws in Capote’s approach to this project. Which option MOST effectively uses relevant information from the notes to accomplish this goal?

- A) While various Kansas residents who spoke to Capote claimed that he mischaracterizes or misquotes them in his book, the work directly resulted in the capture and execution of the killers.
- B) The original 300-word article that ran in the *New York Times* in November 1959 about the unexplained murder of the Clutter family in rural Holcomb, Kansas, did not receive the kind of sensational attention that Capote’s book did.
- C) If Capote was truly “over 90 percent” accurate in his recall of verbatim conversations, perhaps the remaining percentage accounts for residents’ claims that the quotes he wrote down by memory were inaccurate.
- D) Capote tested at “over 90 percent” accuracy in recalling verbatim conversations and spent several years becoming acquainted with anyone involved in the investigation as well as most residents of the area.

25. *It will also have been made clear that hundreds of such engravings, more or less fragmentary, are known. Some are very skillful works of art, others of a much inferior quality. Many, _____, show an astonishing familiarity with the animal drawn and a sureness of drawing which is not surpassed by the work of modern artists (see Chapter III).*

Which option completes the text with the MOST logical transition?

- A) in consequence
- B) as a result
- C) to a point
- D) however

26. While researching a topic, a student has taken the following notes:

- Maria Callas was an American-born soprano who received her musical education in Greece starting at 13 years old.
- She sang repertoire ranging from classical opera seria to bel canto operas like those of Donizetti, Bellini, and Rossini.
- She was known as La Divina (“The Divine One”) for her musical and dramatic talents.

Module II

1. I am very conscious of the manifold _____ of these volumes. They are the work, not of a professed student, but of one who only plays at scholarship in the rare intervals of a busy administrative life.

Which option completes the text with the MOST logical and precise word or phrase?

- A) iterations
- B) accomplishments
- C) imperfections
- D) protrusions

2. Many anecdotes are current in Lamar County, illustrating the primitive methods of pedagogy as pursued by Allen Burrow. It is said that the elder Graves, who had several sons as pupils, withdrew the hopeful scions of the Graves household from the school for the reason that after six months' tuition, he having incidentally enrolled the whole contingent in a spelling bee, they all insisted on spelling every monosyllable ending with a consonant by adding an extra one, as d-o-g-g, dog; b-u-g-g, bug.

As used in the text, what does the word *pedagogy* MOST nearly mean?

- A) teaching
- B) writing
- C) science
- D) logic

3. However this may be, the main point is that sufficient knowledge has now been acquired of vital phenomena, to justify the assertion that the notion that there is anything exceptional about these phenomena, receives not a particle of support from any known fact. On the contrary, there is a vast and an increasing mass of evidence that birth and death, health and disease, are as much parts of the ordinary stream of events as the rising and setting of the sun, or the changes of the moon; and that the living body is a mechanism, the proper working of which we term health; its disturbance, disease; its stoppage, death.

Which option BEST states the main purpose of the text?

- A) to demand respect for the idea that there are concepts that science cannot explain
- B) to question the assertion that there is no supernatural explanation for the processes of human life
- C) to explain the reason that human health should be studied in the same way as the changes of the moon
- D) to argue that there is no support for a supernatural explanation of the processes of human life

4. The facts of the matter are simply these: Some years ago I became seriously ill, grew worse day by day, and was pronounced dying, and finally dead. Dead I apparently was, and dead I remained to all intents and purposes for the greater part of two days, after which, to the intense and utter astonishment of my friends and of the physicians, I exhibited symptoms of returning vitality, and in the course of a week or two was convalescent.

7. *Fog of the color known as pea-soup—in reality amber mixed with lemon-peel and delicately tinted with smut—pervaded the genial shades of Kensington Gardens and cast a halo of breathless romance over many a "long, unlovely street" and many a towering pile of crudely hideous flats in the regions round about. It sneaked down chimneys, stalked insolently through front doors, regardless of locks, curtains, and screens; it wandered noiselessly about houses, penetrating even to my lady's chamber; it permeated cosy drawing-rooms and snug dining-rooms with gloom like that of an ancestral ghost, or an unforgettable sorrow, or—the haunting horror of unpaid bills.*

Which option BEST describes the overall structure of the text?

- A) It uses the movement of fog to propel a dynamic description of the places and objects the fog touches.
- B) It sketches an image of fog in the night, followed by an image of the interior of a lady's house.
- C) It presents alternating descriptions of Kensington Gardens and the run-down houses in a less savory part of town.
- D) It tells the story of a sentient fog character making its way in the world.

8.

Participants' Responses about AI Performance When Used for Different Purposes			
Purpose	Mildly or Very Bad (%)	Neutral (%)	Mildly or Very Good (%)
Screenwriting	89	2	9
Visual art creation	76	3	21
Navigation	13	3	84

The Channel Ten News team sent correspondents to poll members of the public to find out how effective they felt AI was or would be at performing various tasks. The table shows the participants' opinions of how well AI would perform when used for three purposes. The strongest point of similarity between the participants' responses _____.

Which option MOST effectively uses data from the table to complete the example?

- A) when asked about navigation and screenwriting was how many people thought AI made a mess of things
- B) regardless of the purpose they were being asked about was that neutral opinions of AI performance were exceedingly rare
- C) when asked about screenwriting and visual art creation was how overwhelmingly negative the responses were, with 86 percent feeling that AI should not be involved with visual art creation
- D) was how favorably they viewed AI overall

12. A group of psychology graduate students are conducting an experiment to determine the impact of the expressiveness of hiring managers' faces during job interviews on the stress levels of applicants. The student research team recruited several participants to experience a mock job interview, either with a team member who would engage in lively conversation or a member who would remain deliberately stone-faced and give one-word responses to questions whenever possible. They then asked participants about their stress levels before and after the interview. The team hypothesized that the participants would be significantly more stressed in the second scenario.

Which quotation from a participant who interacted with a stone-faced interviewer would BEST support the graduate students' hypothesis?

- A) "I am just always stressed about job interviews, no matter what."
- B) "I liked that the interviewer wasn't trying so hard to be nice for once. He looked like he wanted to be there as little as I imagine they always do."
- C) "It was unnerving the way the interviewer just stared at me and didn't laugh at any of my jokes. I'm normally not this stressed after a job interview, but I'm still sweating."
- D) "It was annoying how the interviewer didn't add anything to the conversation."

13. Although I am quite ready to admit that these points involve great and unsolved difficulties, I am unable to agree with Nicholson's conclusions. In the first place, his calculations rest upon a particular application to non-circular orbits of the principle of constancy of angular momentum for each electron, which it does not seem possible to justify either on the quantum theory or on the ordinary mechanics,

Which option MOST logically completes the text?

- A) but is the only logical conclusion given the evidence Nicholson has cited
- B) and which has no direct connection with the assumptions used in my papers
- C) so Nicholson's conclusions make sense on that count
- D) which does not pose an issue when it comes to my agreement with the aforementioned conclusions

14. And now, dear Margaret, do I not deserve to accomplish some great _____ might have been passed in ease and luxury, but I preferred glory to every enticement that wealth placed in my path.

Which option completes the text so that it conforms to the conventions of Standard English?

- A) purpose. My life
- B) purpose? My life
- C) purpose: My life
- D) purpose; my life

15. In spite of a temperamental leaning to anarchism, I am persuaded that an industrial world cannot maintain itself against internal disruptive forces without a great deal more organization than we have at present. It is not the amount of organization, but _____, that cause our troubles.

Which option completes the text so that it conforms to the conventions of Standard English?

- A) one's kind and one's purposes
- B) his kinds and his purposes
- C) their kind and their purposes
- D) its kind and its purposes

20. Other objections, also, were incidentally alluded to by medieval writers. _____, it was said, the supreme question in all matters of life is the question of conduct, and it was not apparent in what manner poetry conduces to action. Poetry has no practical use; it rather enervates men than urges them to the call of duty; and above all, there are more profitable occupations in which the righteous man may be engaged.

Which option completes the text with the MOST logical transition?

- A) However
- B) By contrast
- C) For comparison's sake
- D) For example

21. Pure carbonic acid gas is the heaviest of all the gases. That which is sent out of the lungs is not pure, because the whole of the air taken into the lungs at the previous inspiration has not been deprived of its oxygen, and the nitrogen is returned. _____ the breath sent out of the lungs may be said to consist of air, with a large proportion of carbonic acid gas.

Which option completes the text with the MOST logical transition?

- A) Therefore,
- B) Nevertheless,
- C) Previously,
- D) In addition,

22. While researching a topic, a student has taken the following notes:

- *The Iwo Jima rail, a subspecies of the white-browed crake, was a semi-amphibious bird native to the island of Iwo Jima.*
- *It was dark brown with a black mottled back and a white belly.*
- *The bird was generally about six inches long.*
- *Forest clearance for sugarcane farming is thought to have contributed to the extinction of the bird.*
- *The last specimen of it was collected in 1911, and its last reported sightings were in 1924.*

The student wants to describe the appearance of the Iwo Jima rail. Which option MOST effectively uses relevant information from the notes to accomplish this goal?

- A) The Iwo Jima rail was a subspecies of the white-browed crake.
- B) It typically measured about six inches in length and had a dark brown coloration with black mottles on its back and a white belly.
- C) Forest clearance for sugarcane farming is thought to have contributed to the extinction of the bird.
- D) The last specimen of the Iwo Jima rail was collected in 1911, and its last reported sightings were in 1924.

25. Bedford feared that these gentlemen might seize Gerberoy and make it tenable, so he dispatched one of his captains, the earl of Arundel, to intercept them. Arundel was approaching Gerberoy without having discovered any signs of the enemy; and there was apparently nothing to apprehend from a ruinous old stronghold which could not contain half as many men as he had at his back. _____ like a prudent general he sent forward Sir Ralph Standish with a hundred men to reconnoiter.

Which option completes the text with the MOST logical transition?

- A) Accordingly,
- B) Nevertheless,
- C) Therefore,
- D) Due to this,

26. While researching a topic, a student has taken the following notes:

- *Salvador Dalí was a Spanish surrealist artist known chiefly for his bizarre imagery and eccentric behavior.*
- *He was born in Figueres, Catalonia, Spain, and he received his fine arts education in Madrid.*
- *He joined the Surrealist group in 1929 and was soon one of its greatest exponents.*
- *His best-known work is The Persistence of Memory, with its famous surreal imagery of melting clocks.*
- *He finished painting The Persistence of Memory in August 1931.*
- *He lived in the United States from 1940 to 1948 and achieved commercial success while there.*

The student wants to focus on *The Persistence of Memory*. Which option MOST effectively uses relevant information from the notes to accomplish this goal?

- A) Salvador Dalí, a Spanish surrealist artist known chiefly for his bizarre imagery and eccentric behavior, finished painting *The Persistence of Memory* in August 1931.
- B) While his best-known work is *The Persistence of Memory* (1931), with its famous surreal imagery of melting clocks, it was not until his move to America in 1940 that Salvador Dalí achieved commercial success.
- C) Salvador Dalí completed his best-known work in 1931—*The Persistence of Memory*—famous for its surreal imagery of melting clocks.
- D) Salvador Dalí joined the Surrealist group in 1929 and was soon one of its greatest exponents, eventually drawing serious attention to the movement with his famous painting *The Persistence of Memory*, known for its famous surreal imagery of melting clocks.

Practice Test #2

Math

For questions 1 – 16, work the problem and choose the most correct answer. For questions 17 – 22, work the problem and enter the correct answer in the space provided. You may use a calculator, but remember: some questions may be more efficiently answered through reasoning rather than the use of a calculator.

Module I

1. What is 5% of 0.5×880 ?

- A) 44
- B) 88
- C) 22
- D) 11

2. Which equation has the same solution as the given equation?

$$15x - 5 = 100$$

- A) $5x - 1 = 20$
- B) $3x - 1 = 20$
- C) $2x - 5 = 20$
- D) $2x + 5 = 20$

3. The solution to the given system of equations is (x, y) . What is the value of x ?

$$y = 2x$$

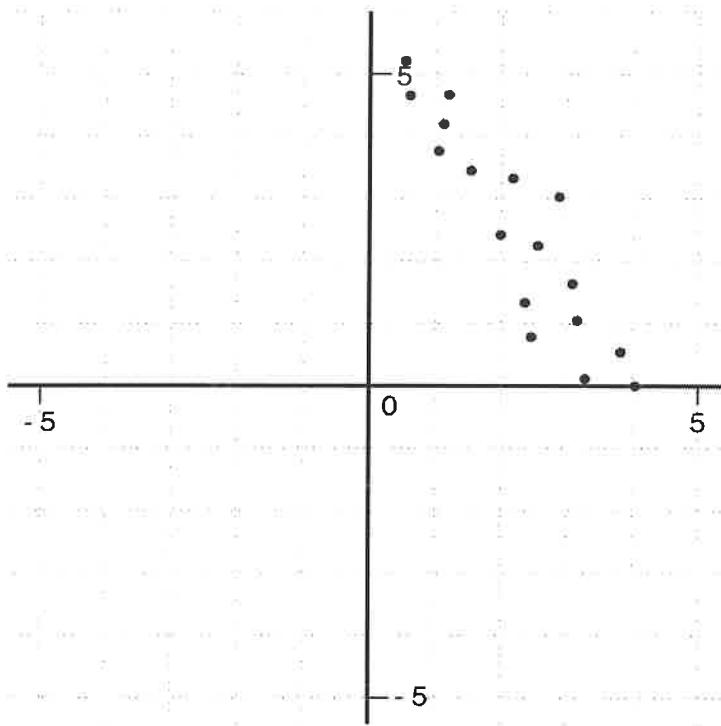
$$6x - 2y = 12$$

- A) 8
- B) 4
- C) 2
- D) 6

4. Eli sold \$84 worth of merchandise. His store consists of some items worth \$4 and other items worth \$12. Which equation represents this situation, where x represents the number of \$4 items and y represents the number of \$12 items?

- A) $12x + 4y = 84$
- B) $4x + 12y = 84$
- C) $12x - 4y = 84$
- D) $4x - 12y = 84$

7. Which of the following equations is the MOST appropriate linear model for the data shown in the scatter plot?



- A) $y = -1.6x + 5.48$
 B) $y = -1.6x - 5.48$
 C) $y = 1.6x + 5.48$
 D) $y = 1.6x - 5.48$
8. Circle A has a radius of $2n$ and Circle B has a radius of $124n$, in which n is a positive constant. The area of Circle B is how many times larger than the area of Circle A?
- A) 15,376
 B) 1,922
 C) 961
 D) 3,844
9. A large national park has an area of 234 square miles. What is the area, in square yards, of the national park? (1 mile = 1,760 yards)
- A) 411,840 miles
 B) 724,838,400 miles
 C) 362,419,200 miles
 D) 595,760,000 miles
10. The measure of angle P is $2\pi \div 4$ radians. The measure of angle J is $4\pi \div 16$ radians greater than the measure of angle P . What is the measure of angle J , in degrees?
- A) 46 degrees
 B) 89 degrees
 C) 135 degrees
 D) 156 degrees

15. A random drawing for a radio contest has 52 entrants, with 2 names for each letter of the alphabet. If the radio host pulls 2 names, what is the probability that both of those names start with the first 7 letters of the alphabet?

- A) $\frac{1}{7}$
- B) $\frac{2}{16}$
- C) $\frac{2}{7}$
- D) $\frac{7}{52}$

16. The function m is defined by $m(x) = 2x^2 - 7$. For which value of x is $m(x) = 121$?

- A) 12
- B) 7
- C) 6
- D) 8

17. A circle in the xy -plane has a diameter with endpoints $(3, 4)$ and $(2, 7)$. An equation of this circle is $(x - 4)^2 + (y - 6)^2 = r^2$, where r is a positive constant. What is the value of r ?

18. Kevin is going to purchase a car. The sticker price of the car is \$15,000. Gas, oil changes, and maintenance will cost Kevin \$900 per year. Kevin wants to upgrade his car, but he cannot spend more than \$18,250 this year. He writes an inequality to describe the situation as $15,000 + 900y + z \leq 18,250$. What is the largest number that can define the value of z in Kevin's first year of car ownership?

19. The solution to the given system of equations is (x, y) . What is the value of y ?

$$x = 4y$$

$$6x - 2y = 66$$

20. A country is measuring its population growth. In 2010, there were 3,500,000 people. Due to a high birth rate, the country's population is projected to double at a constant rate by 2030 and continue at the same rate. How many million people will this country likely have in 2060?

21. Tom is purchasing a new wardrobe and is drawing a line graph to represent how much money he is able to spend on shirts and pants, depending on how many of each that he buys. Each shirt (x) costs \$10 and each pair of pants (y) costs \$20. He has a budget of \$180. What is the slope of the line?

22. For line J , the table shows three values of x and their corresponding values of y . Line P is the result of translating line J up 6 units in the xy -plane. At which point on the x -axis would line P cross it?

x	y
16	122
22	146
30	178

5. Which expression is equivalent to $(4x^2 + 8x) - (-5x^2 + 2x)$?

- A) $9x^2 + 6x$
- B) $-x^2 + 6x$
- C) $9x^2 + 10x$
- D) $-20x^2 + 6x$

6. Which ordered pair (x, y) fits into the system of equations below?

$$x + 21 = 31$$

$$(2x + 4)^2 = 4y$$

- A) (2, 12)
- B) (24, 288)
- C) (10, 24)
- D) (10, 144)

7. A list of 13 data values is shown:

1, 3, 2, 5, 4, 6, 7, 2, 8, 8, 12, 5, 2

What is the mean of this data?

- A) 2
- B) 3
- C) 4
- D) 5

8. What is the MINIMUM value of the given function?

$$q(x) = x^3 + 23$$

- A) 1
- B) 23
- C) 24
- D) 552

9. Each year, Henry contributes to his retirement fund. The value of the fund increases by approximately 8% of its worth during that year. Which of the following functions BEST models how the value of the investment changes over time?

- A) increasing linear
- B) decreasing linear
- C) increasing exponential
- D) decreasing exponential

10. The population of Illinois decreased from 12,830,632 in 2010 to 12,812,508 in 2020. This is approximately a 1.26% decrease in population. If the 2020 population is t times the 2010 population, what is the value of t ?

- A) 1.0126
- B) 0.9874
- C) 1.0244
- D) 0.9926

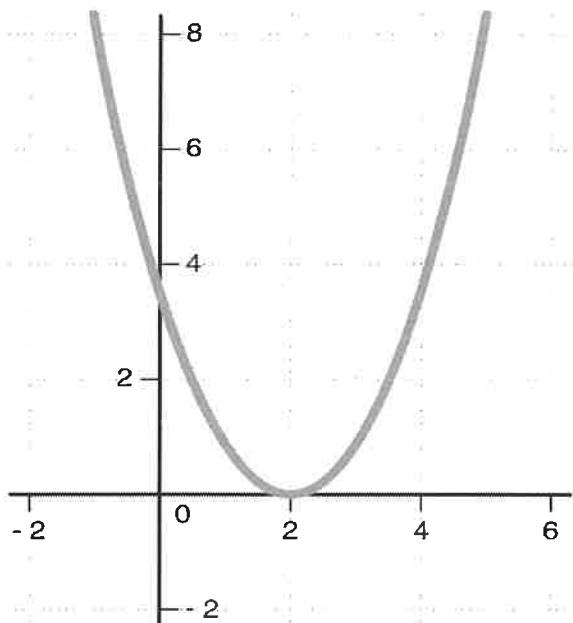
16. The function t is defined by $t(o) = 21o^3$. What is the value of o when $t(o)$ is equal to 1,344?

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

17. What is the solution to the given equation?

$$12x - 32 = 256$$

18. The x -intercept of the graph shown is $(x, 0)$. What is the value of x ?



19. The function k is defined by $k(x) = 0.4x + 5$. Which number represents the y -intercept in the function?

20. If $|2x + 8| = 126$, what is the positive value of $x - 2$?

21. Johnathan is buying tickets to a baseball game for his friends. Each ticket to the game costs \$25. The ticket website charges a \$30 one-time purchasing fee. He also wants to purchase one \$5 hot dog for each of his friends while at the game. Johnathan has \$180 that he is able to spend on the outing. How many people, *including himself*, can Johnathan afford to bring to the game?

22. $2x^2 + 24x + c = 0$

In the given equation, c is a constant. The equation has no real solutions if $c > n$. What is the LEAST possible value of n ?

9. A: Option A is the only option that properly follows as a contradiction and fits the idea of the balance between philosophies being discussed. Option B is not a contradiction at all, begging the question of why the “but” statement would be used. Option C does not fit with the idea that all the essays are tacitly, or by implication, evolutionary—this indicates that they are evolutionary enough to show it without the fact being stated outright. Earlier in the sentence, the author directly states that aesthetics are involved in the essays, making option D incorrect.

10. D: Option D shows Lockwood clearly recognizing that Heathcliff does not want to invite him in but thinking that Heathcliff’s unhappiness being endearing to him is a good enough reason to impose on him anyway. Option A only shows Lockwood talking and gives no indication of how Heathcliff feels about the interaction. Option B only shows Heathcliff speaking, with no evidence of Lockwood’s silliness. Option C shows Lockwood being oblivious about why someone would have chosen to live in a “misanthropist’s Heaven” in the first place, but it does not refer to a specific interaction between the man and his unhappy landlord.

11. C: Option C shows that the number of homes sold has fallen overall during the period from 2010 – 2019 by comparing the numbers in those two years. Options A and B only share one number each, which gives no indication of whether the number has risen or fallen overall. Option D only compares data from the first three years shown on the graph, which cannot tell us what happened by the end of 2019.

12. A: Option A supports the fact that building an audience for such plays requires support, and that there is a portion of the public that the passage’s author can point to as a source of said support. If Option B were true, the author would not need to make an argument that there is an audience for these plays. If Option C were true, the author would have no leg to stand on, as there would be no audience for them. Option D is a non sequitur in a passage that does not reference cricket.

13. B: Option B notes a decrease in the participants’ heightened fight/flight reflex in the experimental group, which would be the result the researchers had hypothesized. Option A would mean that the intervention does nothing. Option C would mean that the intervention is actively harmful because it increased an already heightened fight/flight reflex in participants. Option D would also mean that the intervention is harmful, because only those who did not do the daily “tummy time” showed improvement.

14. C: Option C uses parallel structure in the repeated “the X thing is X-est” phrases. Options A, B, and D all fail to preserve the parallelism used in the first two phrases.

15. A: In Option A, the nonessential phrase *through contrasts in luminosity* is set off from the rest of the sentence. Options B and C fail to set the phrase off from the rest of the sentence, and option D creates a grammatically incorrect division of phrases with an unnecessary semicolon.

16. D: Option D correctly uses a semicolon to separate a multi-phrase item in the list from the others. Option A lacks necessary punctuation; option B uses an em dash when the next item in the list is separated from the last by a semicolon; and option C uses a comma where a semicolon is required for clarity.

17. B: Option B uses present tense, which matches the rest of the verbs in these two sentences. Options A, C, and D all switch into past tense.

18. A: Option A divides the two sentences properly with a period. Option B would require the first sentence to be phrased like a question, which it is not. Option C would require the second sentence to

Module II

- 1. C:** Option C matches best with the humility with which the writer admits to a lack of credentials in the following sentence. Option A would be declaring that there are multiple versions of this work, which the reader has been given no reason to expect. Option B would be praising the work rather than stating a caveat. Option D would mean there were pieces physically sticking out of the work.
- 2. A:** Option A fits most logically with the discussion in the passage of how students are taught in Lamar County. Options B, C, and D are all subjects that would be covered in school, but only option A matches the discussion of how schooling itself is conducted.
- 3. D:** Option D best sums up the passage's purpose in declaring that "the living body is a mechanism." Options A and B would make the opposite argument, and option C would require more emphasis to be placed on the importance of studying these vital processes than on the fact that they are mundane and able to be scientifically explained.
- 4. B:** Option B is correct because this sentence gives the "facts of the matter" of the narrator's death, which the previous sentence indicates will come next. Option A would mean that the first sentence is already discussing the narrator's death and the second sentence is providing more information about it. There is no subject change for option C, and the sentence does nothing to make the idea of the narrator dying and coming back to life less far-fetched, as in option D.
- 5. D:** Option D fits best with the author of Text 1's statement that mysticism could become "a mischievous faculty" if unregulated, which is possible if the concept itself is viewed as detached from the concepts of right and wrong. Option A would mean that the author of Text 1 believes that mysticism is a set of rules rather than a concept that should have rules applied to it. Options B and C would require the author of Text 1 to think that the author of Text 2 is making defamatory statements about mysticism rather than defining one of its doctrines.
- 6. C:** Option C is correct in identifying this as the name the man used in prison. Option A would mean that the man was running a scam he in prison. Option B would mean that the man worked a job at the prison. Option D would mean that the man made a friend in prison.
- 7. A:** Option A is most accurate to the many places and objects the passage describes as being touched by the fog. In option B, the fog would only be a focus in the first part of the passage, and in option C, there would need to be competing descriptions of pleasant and unpleasant sights throughout. We are given no indication that this fog is sentient, as is stated in option D.
- 8. B:** Option B correctly identifies the consistent trend against neutrality as evidenced by the very low percentages in that column of the table. Option A would require the participants to have negative feelings overall toward AI use in navigation, which is not what the table shows. Option C gives an incorrect percentage for how many respondents feel negatively toward AI use in visual art. Option D would only be correct if the responses were consistent in how favorably they viewed AI across all three different uses, which is not the case.
- 9. C:** Option C's emphasis on the book's contribution to the teaching of the subject matches best with the passage's previous statement about the company being glad that it can offer this new book to schools. Option A says that the book is cost prohibitive, and the idea of the book being hard to get is at odds with the passage's talk of making this kind of resource "integral to elementary education." Option B asserting that this book is the only one that can make this claim is at odds with it being "one of the

22. B: Option B combines the two notes about the bird's appearance to effectively describe it. Options A, C, and D all give different facts about the bird.

23. A: Option A places the young man's actions chronologically before those of the one in the previous sentence, which makes the most sense with the description of the man having seen the war party's approach rather than having heard the gunshot. Option B would require this man to have met with the war party's approach as a result of the warning, which makes no sense. Option C would require the man to have deliberately been surprised by the war party in response to hearing the warning, which would also make no sense. Option D calls the two men similar, but they had opposite responses to the approaching threat.

24. D: Option D gives full explanations of all three parts without redefining terms the audience is known to be familiar with. Options A and B both fail to explain the three types, with option B also defining a term the audience already knows. Option C only explains the Exiles.

25. B: Option B fits best with the general sending these men despite there being no sign of the enemy. Options A, B, and C only work if sending men to reconnoiter was the expected outcome of seeing no sign of the enemy.

26. C: Option C focuses exclusively on the painting. Options A, B, and C all split focus and emphasize something other than *The Persistence of Memory* painting.

27. C: Option C effectively uses both notes about similarities between Scout's family and Lee's. Option A mentions the two facts about Lee's family that were similar to Scout's family, but it does not mention the corresponding facts about Scout's family. Options B and D share unrelated facts.

13. A: Since x is multiplied by the number of aisles in the store and y is multiplied by the number of display cases in the store, multiplying the number of products per aisle and the number of products per display case by the total number of aisles and display cases would yield 4,556 total products. Thus, the value of y represents the number of products per display case in the store.

14. B: Although there is one data value represented by 4 that occurs 9 times, more than any others, there are two data values represented by 5 that have a combined frequency of 10.

15. A: Since each letter of the alphabet is represented by 2 names in the drawing, the first 7 letters of the alphabet are represented by 14 entrants. The probability of both names starting with the first 7 letters of the alphabet is $\frac{2}{14}$, which is $\frac{1}{7}$ in simplified form.

16. D: By plugging in each choice for x and utilizing the trial-and-error method, the order of operations can determine that $2(8^2) - 7 = 121$. Therefore, the value of x when $m(x) = 121$ is 8.

17. Using the equation provided, it can be determined that the point at the center of the circle is represented by coordinates (4, 6). The endpoints are provided. The value of r can be found by plugging the coordinates of the circle's center and one endpoint into the distance formula, which is represented by $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$. By computing for $\sqrt{(4 - 3)^2 + (6 - 4)^2}$, which is simplified into $\sqrt{1^2 + 2^2}$, it can be determined that **r is equivalent to 3**.

b The inequality in this situation is represented by the fixed cost of the car (\$15,000); the fixed cost of gas; oil changes; and maintenance (\$900 multiplied by the number of years, y); and the cost of upgrades (z). These fixed costs and variables have to be less than or equal to \$18,250, which is Kevin's maximum budget. Since Kevin has only owned the car for one year, he has only spent \$15,900 thus far. In order to find the maximum value of z , subtract \$15,900 from \$18,250. This yields **\$2,350** left over that Kevin is able to spend on upgrades.

19. The system can be solved for y using the method of substitution. Since the first equation already isolated the value of x , it can be plugged into the second equation to find y . The second equation becomes $(6 \times 4y) - 2y = 66$, which can be simplified to $22y = 66$. Once both sides are divided by 22, it can be said that $y = 3$.

20. Since the country's population doubles every 20 years at a constant rate, it can also be estimated that the population increases by 50% every 10 years. Multiplying 3,500,000 by 2 shows that the population in 2030 will be 7,000,000. Multiplying 7,000,000 by 2 demonstrates that the population in 2050 will be 14,000,000. Since the objective is to find the population only 10 years after 2050 instead of 20, multiplying 14,000,000 by 1.5 will yield a likely total population of **21,000,000 people** in 2060.

21. Since pants are on the y -axis, the y -intercept can be found by identifying the maximum number of pants that Tom can purchase (9). Since each shirt is half the cost of each pair of pants, and each shirt purchased removes half of Tom's ability to purchase a single pair of pants, the **slope of the line is -0.5**.

22. First, the slope of line J must be found: $(145 - 122) \div (22 - 16)$ yields a slope of 4. The line's slope equation is $y = 4x + b$. By using the line's slope and plugging in an (x, y) coordinate into slope-intercept form ($y = mx + b$), the equation $122 = (4 \times 16) + b$ can be created. Simplifying and solving shows that $b = 58$. Substituting the value of b back into the line's slope equation yields $y = 4x + 58$. Since line P is translated 6 units up from line J , its equation is represented by $y = 4x + 64$. When substituting 0 for y , the equation yields $0 = 4x + 64$. When solving for x , the equation yields a value of -16. Therefore, line **P crosses the x-axis at -16**.

sphere's radius into the equation as $v = (4 \div 3)\pi(14)^3$. The volume of the sphere is 11,494.04 feet (rounded to 11,494). To determine the size disparity between the two shapes, subtract 11,494 from 17,576 to yield a difference of 6,082 feet.

16. B: To solve the equation algebraically, begin by dividing both sides by 21 to yield $64 = o^3$, and then find the cubed root of both sides to yield $4 = o$. Thus, the value of o when $t(o) = 1,344$ is 4.

17. First, isolate the variable by adding 32 to each side, which yields $12x = 288$. Then, divide both sides by 12 to yield $x = 24$.

18. Because the midpoint of the parabola touches down at grid coordinate $(2, 0)$, the value of x is 2.

19. Because the function k 's equation is in slope-intercept form, it can be determined that the y -intercept (b in the equation) has a value of 5.

20. First, both the positive and negative values of the absolute value equation must be found: $2x + 8 = 126$ and $-2x - 8 = 126$ can be computed to find values of 59 and -67 , respectively. Then, use both numbers to find the values of $x - 2$. $59 - 2 = 57$ and $-67 - 2 = -69$. The sum of these two numbers will produce the positive value of $x - 2$, which is -12 .

21. Since each attendee will have one ticket and one hot dog, the total price per person is \$30. The total amount of people that can attend the game is represented by the equation $30x + 30 = 180$. Subtract 30 from each side of the equation, leaving $30x = 150$. Divide each side by 30 to yield $x = 5$. Thus, including himself, Johnathan can bring 5 people to the baseball game.

22. First, identify which numbers correspond to which variables in the quadratic equation. In this instance, $a = 2$, $b = 24$, and c is still unknown. Use the discriminant equation for imaginary numbers $b^2 - 4ac < 0$ to find the maximum number that n can be while still being less than the value of c . By plugging in the values previously mentioned into the discriminant equation, $24^2 - 4 \times (2) \times (c) < 0$ yields $576 - 8c < 0$. Subtracting 576 from both sides results in $-8c < -576$. When dividing both sides by -8 , the less-than sign is reversed and the equation yields $c > 72$. Therefore, the least possible value of n is 72.