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Digital SAT® Preview



WHAT TO EXPECT + TIPS AND STRATEGIES

- Overview of the digital exam for parents and students
- Practice modules for reading, writing, and math with answer explanations
- Access to an informative video on future standardized testing

Brian W. Stewart, M.Ed.

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The Digital SAT

Starting in spring 2023 for international test-takers and spring 2024 for U.S. test-takers, the SAT is scheduled to shift to a digital format. The new digital SAT will have two Evidence-Based Reading & Writing modules (sections) and two Math modules. The test will be **adaptive**—the second modules of both Reading/Writing and Math will change in difficulty based on how students do on the first modules of each type. Students who perform better on the first modules will have more challenging questions in the second modules, whereas students who do not perform as well on the first will have easier questions in the second. Here is a summary of the new Digital SAT format:

Digital SAT Format

SAT Module	Format
Reading & Writing One	32 Minutes, 27 Questions, Standard Difficulty
Reading & Writing Two	32 Minutes, 27 Questions, Adaptive Difficulty (easier or harder questions depending on how you did on the first Reading/Writing section)
Break—10 Minutes	
Math One	35 Minutes, 22 Questions, Standard Difficulty

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SAT Module	Format
Math Two	35 Minutes, 22 Questions, Adaptive Difficulty (easier or harder questions depending on how you did on the first Math section)

International students who take the SAT prior to 2023 and U.S. students who take the SAT prior to 2024 will continue to take the SAT in its current paper-based form. The digital SAT will be offered in proctored testing environments—schools and testing centers. It will not be given at home. If you are unsure about whether you should try the paper-based SAT prior to this switch, carefully consider the similarities and differences between the current SAT and the new digital SAT:

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Test Length

Current SAT	Digital SAT
• Over 3 hours long, including breaks and administration • 65 minutes for Reading • 35 minutes for Writing & Language • 25 minutes for Non-Calculator Math • 55 minutes for Calculator Math	• A little over 2 hours long; assesses the same skills as the longer SAT by using an adaptive format. • Note that the test is adaptive by section, not by question. • Less time needed for test administration because students can download the testing app ahead of time.

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Test Format

Current SAT	Digital SAT
• One test form is used for all students on a particular test day. • Paper test booklets are provided with Scantron answer sheets. • Students can go back to questions within a section before time is called. • Students should bring their own watches and calculators—these are not provided. • Students can write on the test booklet. • Experimental questions (ones that don't count toward the score), if given, are in a section after the scored portion of the test.	• Different test questions are adapted for different students. • Test is taken on laptops that students provide or test centers make available. • Students can still go back and review questions (questions can be flagged). • Countdown clock and calculator are built into the program, although students can still bring a watch and calculator if they would like. • Students can write on provided scrap paper. • A few experimental questions are incorporated into each test section.

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Test Dates

Current SAT	Digital SAT
• Seven national test dates in the United States • Five international test dates • Whole-school test days	• Seven national test dates in the United States • Seven international test dates • Schools can test different groups of students on different days.

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Scoring

Current SAT	Digital SAT
• Evidence-Based Reading & Writing is scored from 200 to 800. • Math is scored from 200 to 800. • Total score is between 400 and 1,600. • Many schools now "superscore" the SAT, taking the best score from each section over multiple test attempts. • Usually takes 2–4 weeks for students to receive test scores.	• Section scoring and total scoring is identical to the current SAT—both individual sections are scored out of 800 points and the total score out of 1,600 points. • Many schools will likely continue to superscore test results. • Scores will likely be available in only a few days.

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Reading and Writing

Current SAT	Digital SAT
• Reading passages are 500–750 words long and contain 10–11 questions each. • Reading genres include fiction, social science, historical documents, and natural science. • Writing & Language passages are about 450 words long and contain 11 questions each.	• Reading & Writing passages are no longer than 150 words. Each passage has just one question accompanying it. • A greater variety of reading genres be represented. Along with the current SAT reading genres, the test will also include humanities, drama, and poetry excerpts.

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Math

Current SAT	Digital SAT
• Includes Non-Calculator and Calculator sections. • Formula sheet is provided at the beginning of the test section. • Students need to bring their own calculators.	• Calculators are permitted throughout the test. • Formula sheets and digital calculators are available in the program. • Word problems are typically more concise than in the current paper version.

Based on the above information, if you feel you might prefer the current SAT, be sure to take it before the end of 2022 (international test-takers) or the end of 2023 (U.S. test-takers). Colleges will accept the results of both the current SAT and the digital SAT. Also, keep in mind that the ACT is not planning to make any major changes to its exam at this time. If you prefer a paper-based format of the SAT, you should be sure to attempt the ACT as well.

Why Is the College Board Making This Change to the SAT?

- **Adaptive tests have a long track record of success.** The GRE and GMAT, both of which are used for graduate school admissions, are computer-based adaptive assessments. These tests are shorter than they would otherwise be because they efficiently adjust the difficulty of the questions based on student performance.

- **Students have become more comfortable with computer-based assessments.** With so many students learning remotely over the

past couple of years, digital learning has become far more common.

- **The digital test should be easier to administer.** Testing centers will not have to secure test booklets, and schools will not have to take nearly as much time out of the day to administer the SAT.

- **Digital testing should improve security.** Because students will be given different test questions, it will be far more difficult to cheat. It will also be far less likely that a test security breach will lead to score cancellations—this will be particularly helpful for international test-takers.

Will the Digital SAT Be Easier or More Difficult Than the Current SAT?

In some ways, the digital SAT may seem easier than the current SAT. On the one hand, the overall digital test will be shorter, calculators will be available throughout the Math sections, and the Reading passages will be far more condensed. On the other hand, some of the digital questions and passages will be a grade level more difficult than those found on the current SAT, and because there are fewer questions, each one will have more of an impact on your score. On balance, the difficulty of the two tests should be roughly the same.

How Is the SAT Used in College Admissions?

Check out this new YouTube video to help determine how you should use testing in the college admissions process.

10 Suggestions to Help You Do Your Best

1. **Keep using existing preparation materials.** The digital SAT will still test your fundamental skills in reading, grammar, and math. Get ready for

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the test by working through all the review and practice sessions in the Barron's SAT book. For additional practice, use the free resources available on the College Board website (https://www.khanacademy.org/SAT).

2. **Take your time.** For most students, the digital SAT will be a relatively easy test to complete in the allotted time—the time constraints will be more generous than on the current SAT, with more time allotted to each question. Do not rush through the test questions and make careless errors; instead, focus on fully understanding the questions and setting up your work.

3. **On shorter reading comprehension passages, try reading the question before reading the passage.** On the current SAT, Reading test questions pertain to a long passage; most students find it helpful to read the passage in its entirety before examining the questions. However, because the digital SAT will feature many shorter passages with just one accompanying question, it may be advantageous to read the question before reading the associated passage. That way, you will have a more focused idea of what to look for when reading.

4. **Don't try to guess how you did.** Since the digital SAT is adaptive, the later sections will change in difficulty depending on your performance on earlier sections. It will do no good to try to evaluate how much more difficult the later questions are—you will waste time and energy that could be spent on figuring out the problems in front of you. Do your best to stay in the moment and not think back about how you might have performed on earlier sections.

5. **Come back to questions if needed.** Within a testing module, you will be able to go back to earlier questions to try them again. If you find yourself struggling with a question without making any progress, consider flagging the question and revisiting it after you have had more time to think about it. Also, if certain general categories of questions are easier for you (for instance, like English grammar), do those sets of questions first and then come back to the more difficult questions within the same section.

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6. **Use scrap paper.** Scrap paper will be especially useful on the Math sections—you can write out your work instead of trying to do everything on a calculator. Do not try to do every step of a problem in your head; using scrap paper will ensure that you do not make careless errors and can more easily visualize the steps toward a solution.

7. **Practice with the testing application ahead of time.** You will be able to download the software that you will use on the actual digital SAT. You can practice with this program on your own computer or on one at a library or school. Familiarize yourself with the software interface—the timer, the calculator, the question-flagging feature, and the adaptive question style. Do not wait for the day of the test to use the digital SAT software for the first time.

8. **Use your PSAT results to help you prepare for the SAT.** For students in the United States, the PSAT/NMSQT will be offered as a digital test in fall 2023. Taking the PSAT will be a great way to familiarize yourself with the digital format. Moreover, you should be able to access the test questions and correct answers in December of 2023. Review the questions you missed on the PSAT to help you do your best on the SAT.

9. **Use your own approved device.** Students who do not have their own computers will have computers provided on test day. However, if you have an approved laptop or device that you can use on the SAT, practice with it and bring it with you to the test. You will perform at your best if you are thoroughly familiar with the computer you will be using.

10. **Do not give up.** With fewer questions on the digital SAT, each question has a larger impact on your score. Given the adaptive nature of the digital SAT, the questions you will be given on the later modules are designed to be a difficulty level appropriate for you. Be sure to give every question your very best effort—do not allow yourself to become frustrated and guess too quickly.

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When Will We Learn More?

- **Fall 2022:** Full-length practice tests will be available through the College Board. Students will be able to practice with the digital, adaptive format.

- **Spring 2023:** International students will take the digital SAT for the first time. Once students have taken the actual proctored test for the first time, there will be more information about the overall test-taking experience.

- **Fall 2023:** U.S. students will take the digital PSAT for the first time.

- **Spring 2024:** The digital SAT will fully replace the current paper-based SAT in the United States.

As new developments about the digital SAT arise, please go to BWS Education Consulting for the latest information. —Brian W. Stewart

Now, check out a full-length practice SAT. You can try this timed or untimed. Good luck!

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SAT Test Overview

This SAT Practice Test is made up of a Reading & Writing section and a Math section.

Section 1: Reading & Writing (54 Questions)

There are two 27-question modules in the Reading & Writing section.

Section 2: Math (44 Questions)

There are two 22-question modules in the Math section.

Modules

The modules in each section are timed separately. You can review your answers in each module before the time expires. When the time reaches zero, you will automatically move on to the next section. You are unable to return to a completed module once you've moved on.

Directions

At the beginning of each section, there are directions for answering the questions.

Section 1: Reading & Writing

Directions: You will be tested on a variety of important reading and writing skills. Each question has one or more passages, possibly including a graph or table. Carefully read each passage and question and choose the best answer to the question based on the passage(s).

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Every question in this section is multiple-choice, with four possible answers. Each question has only one best answer.

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Reading & Writing Module 1: 32 Minutes, 27 Questions

1. According to the United States Department of Labor, the 2021 median pay for veterinarians was approximately $100,000 annually, with the top 10 percent _____ more than $165,000.

Which choice completes the text with the most logical and precise word or phrase?

A) using
B) discovering
C) earning
D) writing

2. Employing slightly subtler brushstrokes than most of his counterparts, the artist focused his labors on capturing the tranquil, shore-side recreations of bourgeois vacationers. Around this time, it was becoming fashionable among the middle class to possess commemorative depictions of the places one had traveled, and he managed to fill this niche masterfully.

As used in the text, what does the word “fashionable” most nearly mean?

A) Tailored
B) Popular
C) Leisurely
D) Economical

3. Although some invasive species do cause tremendous and irreparable damage to their ecosystems, environments are not static; they change, develop, and adapt to transitions, whether these be natural or manmade. We must learn to be more discriminating in our eradication of invasive plants from those areas where they have become an integral part of the greater ecosystem.

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As used in the text, what does the word “discriminating” most nearly mean?

A) Biased
B) Intolerant
C) Tasteful
D) Selective

4. Parthenogenesis is not limited to lizards and sharks but is common in insects, crayfish, flatworms, snails, snakes, and even some birds. The exception is mammals. Although parthenogenesis can be artificially induced in a science laboratory, it has never been known to have occurred in mammals naturally.

Which choice best states the function of the underlined sentence in the text as a whole?

A) To transition to a clarification
B) To define an unfamiliar term
C) To give ethical reasoning
D) To analyze an economic impact

5. *The text is from Booker T. Washington’s 1901 autobiography.*

I was born a slave on a plantation in Franklin County, Virginia. I am not quite sure of the exact place or exact date of my birth, but at any rate I suspect I must have been born somewhere and at some time. As nearly as I have been able to learn, I was born near a cross-roads post-office called Hale’s Ford, and the year was 1858 or 1859. I do not know the month or the day. The earliest impressions I can now recall are of the plantation and the slave quarters—the latter being the part of the plantation where the slaves had their cabins.

Washington’s primary purpose in the text above is most likely

A) to lament his increased senility.
B) to express his identity.
C) to critique his familial relations.
D) to underscore his rootlessness.

6. Though not the first to utilize encryption, Roman emperor Julius Caesar is perhaps the most notable early adopter. A man of many secrets, Caesar would send messages to his generals in which the letters of the alphabet had been shifted a set number of places (A became D, B became E, and so forth). The recipient of the message would be alerted to the cipher in advance and would thus decode the message upon delivery. The Caesar Shift was simplistic by today's standards, but in an era in which very few could read in the first place, the encryption was effective.

The text most strongly suggests that the encryption used by Julius Caesar was successful in large part due to

A) its mathematical complexity.
B) a lack of widespread literacy at the time.
C) its ancient historical roots.
D) its incapacity to be physically intercepted.

7. **Text 1**

Many historians find that general trends tend to repeat themselves if you look far enough back through the records of humanity. It truly can be said that there is nothing new under the sun. Perhaps this is simply a function of how long humans have been around, but perhaps it also says something about just how similar all humans are, even across thousands of years.

Text 2

Studying fashion history is a lot like listening to remixes of your favorite songs. As you examine textiles from around the world and through time,

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you'll constantly see that most "new"fashions are just old ideas remade. And so, women's high-waisted shirts from the early 2000s weren't anything new or different: they were simply 18th-century empire-style gowns remixed for a new generation.

What best describes the relationship between the two texts?

A) Text 2 provides a specific example to illustrate the broad claim made in Text 1.
B) Text 2 presents arguments that are generally opposed to the primary position made in Text 1.
C) Text 1 emphasizes a modern approach to the study of history, whereas Text 2 is more antiquated.
D) Text 1 addresses the major objection to the study of history that is raised by Text 2.

8. FedEx and UPS now provide online tracking of packages for the consumer. It is interesting to log on and see the journey that a purchase has traveled to go from source to destination. Each time an arrival and a departure are scanned, that item must be picked up by an employee, placed on a moving belt to take to a sortation system, and then placed on another vehicle for its next leg in the sojourn. Holiday seasons put these logistics systems to a severe test each year, and companies in the business of logistics are constantly investing in new ways to handle the information and the items as they flow through the pipelines. Billions of dollars have been invested in these types of service industries, and the activity behind the scenes is something to behold.

The author's attitude toward the process of logistical distribution can best be described as

A) skeptical.
B) positive.
C) neutral.

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D) bellicose.

9. *The text is from Anatole France's 1912 novel* The Gods Will Have Blood.

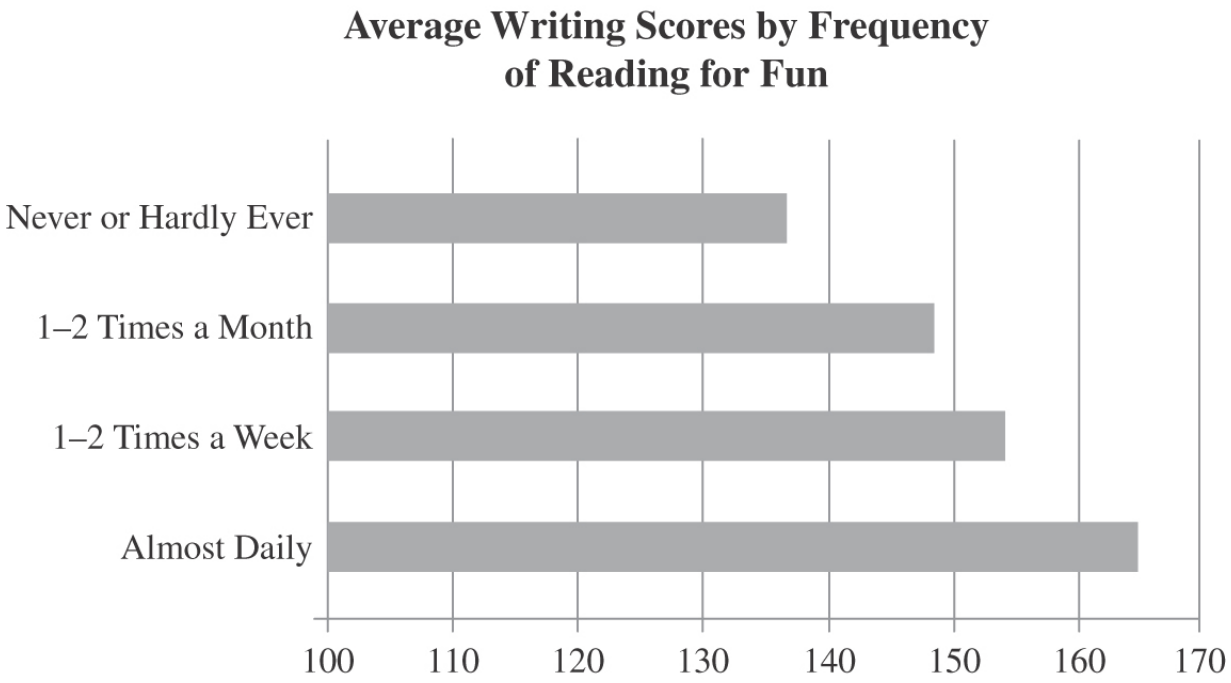
Those who make a trade out of foretelling the future rarely grow rich. Their attempts to deceive are too easily found out and arouse detestation. And yet it would be necessary to detest them much, much more if they foretold the future correctly. For a man's life would become intolerable, if he knew what was going to happen to him. He would be made aware of future evils, and would suffer their agonies in advance, while he would get no joy of present blessings since he would know how they would end. Ignorance is the necessary condition of human happiness, and it must be admitted that on the whole mankind observes that condition well. We are almost entirely ignorant of ourselves, absolutely of others. In ignorance, we find our bliss, in illusions, our happiness.

The main idea conveyed in the above monologue can best be summarized as

A) let bygones be bygones.
B) the truth will set you free.
C) focus on the moment.
D) do unto others as you would have them do unto you.

10.

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Note: Writing scores range from 0 to 300, and students were surveyed nationwide. Source: U.S. Department of Education, National Center for Education Statistics

Those who read for fun more often have higher writing scores—in fact, those who read daily for fun outperform those who never or hardly ever read by approximately _____ points on national writing tests.

Which choice most effectively uses data from the chart to complete the example?

A) 10
B) 30
C) 60
D) 120

11. "Mabel Osborne" is a 1915 poem by Edgar Lee Masters in which the narrator expresses her sorrow at being ignored by other people. Which quotation from "Mabel Osborne" most effectively illustrates that claim?

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A) “But you do not ask for water. / You cannot speak!”
B) “Everyone knows that you are dying of thirst, / Yet they do not bring water!”
C) “And I, who had happiness to share, / And longed to share your happiness;”
D) “I who loved you, Spoon River, / And craved your love,”

12. Bacteriostatic antibiotics are often prescribed to patients who have an intact immune system that can assist in killing the microorganism causing the infection. Allowing the innate immune system to do some of the work decreases the length of time the patient needs to be on the antibiotic, which can help eliminate some of the unwanted side effects. In contrast, bactericidal drugs are prescribed when the patient may be immunocompromised (i.e., the natural immune system is not functioning properly) and cannot fight off the infection. Depending on the severity and type of infection, a doctor may select a narrow- or broad-spectrum bactericidal drug.

It is reasonable to conclude from the text that a bacteriostatic medicine and a bactericidal medicine would be optimally used on patients in which of the following respective situations?

A) Relatively healthy, relatively ill
B) Generally unhealthy, generally healthy
C) Internally sick, externally sick
D) Physically ill, mentally ill

13. A new approach was required before color photography could emerge as a truly viable artistic and documentary medium. Such an approach was theorized just ten years later. While Hill’s and Becquerel’s labors had emphasized the search for a novel, chameleonic compound to assume any spectral wavelength shown upon it, Scottish physicist James Clerk Maxwell used as his model the color sensitivity of the human eye.

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The text suggests that Maxwell was able to make a scientific breakthrough in photographic technology by shifting his focus from

A) chemistry to biology.
B) anthropology to astronomy.
C) physics to mathematics.
D) artistry to geometry.

14. Halley's Comet falls into a category called Great Comets, which are those that become bright enough during their passage near Earth to be observed by the naked eye. Predicting whether a comet will be "Great" has proven a challenging task even for the most talented astronomers and astrophysicists. The comet must pass through a relatively small expanse of space near enough to the sun to reflect a large amount of light but remain close enough to Earth for the light to reach and penetrate our atmosphere. Moreover, it is thought that a Great Comet must possess a large and active nucleus, though the exact physics of comet nuclei— which consist of dust, ice, and perhaps particulate minerals—are still poorly understood. Even so, comets meeting these criteria have on occasion failed to achieve "greatness."

According to the text, which characteristic of a comet is most essential to its being categorized as a "Great Comet"?

A) Whether it has a significant proportion of dust and ice in its core
B) Whether it has an orbital eccentricity greater than zero
C) Whether humans can observe it without a telescope
D) Whether it contributes to meteor activity visible by astronomers

15. Occupational therapists work with many clients on any given day. If routine daily activities occupy _____ schedules, occupational therapists can provide treatments.

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

A) their clients'
B) they're clients
C) there client's
D) their clients

16. Among many discoveries, the Voyager 2 spacecraft _____volcanic activity— the first time another astronomical body was found to have this Earth-like characteristic.

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

A) found that Io a moon of Jupiter has
B) found that Io, a moon of Jupiter has
C) found that Io, a moon of Jupiter, has
D) found that Io a moon, of Jupiter has

17. A few years ago, a research team at Fermi Lab known as the DZero Collaboration announced observations of matter-antimatter asymmetries on a scale never seen before. Prior to the DZero study, baryon asymmetry and similar CP violations _____in laboratory settings only in much smaller—and thus, less helpful—orders of magnitude.

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

A) has been observed
B) have been observed
C) had been observed
D) is being observed

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18. Tim, while appropriately interested in diagnosing and treating _____ problems with their teeth and gums, demonstrated real passion for repairing teeth and aiding in cosmetic dental concerns.

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

A) patients
B) patient's
C) patients'
D) those of patients

19. Allergens, pollution, bacteria, and sunlight—these are just some of the foreign objects that _____

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

A) on a basis that is daily are attacking the human body.
B) attacking the bodies of humans on a daily basis.
C) attack the human body on a daily basis.
D) attacks humans each and every day.

20. Additionally, there is a boat passing _____ a calm sea, which is an ancient depiction symbolizing the passage of life to death.

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

A) to
B) over
C) and journeying throughout
D) sequencing

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21. Not long after the Pinkertons surrendered, Pennsylvania governor Robert Pattison authorized the militia to advance and placed the town of Homestead under martial law. In the days that followed, steel production at the plant resumed, with strikebreakers living on the _____ too dangerous for them to cross the picket.

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

A) mills grounds: it was still
B) mills' grounds—it was still
C) mill's grounds, it was still
D) mill's grounds; it was still

22. Sociologically, sports unite us far more than they divide us. Take, _____ Americans and football. Regardless of where you're from, what you believe, or what team you like, when it's football season you can connect with other people, even strangers, through this unifying agent.

Which choice completes the text with the most logical transition?

A) though,
B) on the other hand,
C) still,
D) for example,

23. In addition to improving one's intellectual abilities, the habit of reading has an occupational and financial payoff. Sixty-three percent of employers rate reading comprehension as being very important. There is a strong correlation between poor reading skills and unemployment, lower wages, and fewer opportunities for advancement.

The author is considering removing the underlined sentence from the text. Should it be kept or removed?

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A) Kept, because it provides specific details in support of the previous sentence.
B) Kept, because it elaborates on salary details that result from avid reading.
C) Removed, because it repeats information already expressed in the passage.
D) Removed, because it provides far more detail than necessary to make the argument.

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

- The Heliocentric Model has the Earth and other planets revolving around the sun.
- Ancient Greek philosopher Aristotle was a proponent of the Heliocentric Model.
- The Geocentric Model has the sun and other planetary bodies revolving around the Earth.
- Ancient Greek philosopher Ptolemy was a proponent of the Geocentric Model.
- The Heliocentric Model eventually became dominant after Copernicus demonstrated that it better utilized mathematics to explain astronomical observations.

The student wants to emphasize a similarity between the Heliocentric and Geocentric theories. Which choice most effectively uses relevant information to accomplish this goal?

A) The Heliocentric and Geocentric models are both widely accepted by scientists today.
B) Both the Heliocentric and Geocentric models incorporate rotational movement.
C) The Geocentric and Heliocentric models were both widely known by the citizens of ancient Greece.

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D) Aristotle and Copernicus were both eminent scientists who lived in ancient Greece.

25. Birth order isn't a one-size-fits-all theory; there are many loopholes and exceptions. People can change, if they want to, through hard work. _____ it can be helpful to understand the factors that influence personalities, and birth order helps a little.

Which choice completes the text with the most logical transition?

A) Nevertheless,
B) As a result,
C) Due to this,
D) Continuing,

26. That entire summer, I pounded baseballs. Swing and *ping*, swing and *ping*, swing, and *ping*—_____ the interminable blunt-force trauma of tens of thousands of baseballs had misshapen my Louisville Slugger into something resembling more of a deformed soda can.

Which of the following completes the text with the most specific expression of the great extent to which the narrator played and practiced baseball that summer?

A) sixty games and ninety batting practice sessions later,
B) after quite a few games and extensive time working in the practice area,
C) spending nearly ten times as much time playing and practicing as would be expected,
D) trying my hardest to bat a .325 average,

27. If the United States were to shift to a majority vote system, the way presidential candidates campaign for office would fundamentally change. Right now, candidates have little reason to bother campaigning in states that typically go strongly for one political party. There is little logic in a

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Republican trying to win New York, or a Democrat trying to win Texas. Instead, candidates focus their energies on “swing states,” like Florida and Ohio, that are relatively balanced along party lines. Floridians and Ohioans currently receive far more candidate visits and attention than New Yorkers or Texans. _____ This would ensure that all U.S. citizens have an equal voice not just in theory but in reality.

Which sentence, if inserted in the underlined portion, would best strengthen the argument of the paragraph by transitioning between the previous and the following sentences?

A) Ohio has a smaller population relative to Texas, although Ohio does have a greater population density than Texas.
B) If the Electoral College were abolished in favor of a majority vote system, candidates would have a much stronger incentive to campaign nationwide.
C) It is inherently unjust that candidates want to spend their time campaigning in places where they will inevitably emerge victorious while ignoring states with undecided voters.
D) Nationwide polls indicate that the average voters in states from high to low electoral college representation uniformly agree that the time has come for a seismic shift in the political landscape.

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Reading & Writing Module 2: 32 Minutes, 27 Questions

1. The Citizeness Gamelin put the soup on the table, said the *Benedicite*, seated her son and her guest, and began to eat standing up, declining the chair which Brotteaux offered her next to him, since, she said, she knew what courtesy required of her.

As used in the text, what does the word "declining" most nearly mean?

A) Repulsing
B) Decreasing
C) Turning down
D) Plummeting

2. The stove and the oven remain to this day our most-used cooking technologies, and innovations in the field of heating elements have frequently ameliorated the mechanism without much change to the principal design. The commercialization of natural gas in late 19thcentury England eventually gave cooks the ability to precisely _____ their cooking flame, as well as the convenience of instantaneous ignition. To this day, gas ranges are preferred by many professional chefs.

Which choice completes the text with the most logical and precise word or phrase?

A) Annihilate
B) Satisfy
C) Craft
D) Manipulate

3. *The following text is from Nathaniel Hawthorne's 1852 novel* The Blithedale Romance.

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"Nothing," answered I; "nothing, that I know of, unless to make pretty verses, and play a part, with Zenobia and the rest of the amateurs, in our pastoral. It seems but an unsubstantial sort of business, as viewed through a mist of fever. But, dear Hollingsworth, your own vocation is evidently to be a priest, and to spend your days and nights in helping your fellow-creatures to draw peaceful dying breaths."

As used in the text, what does the word "draw" most nearly mean?

A) Inhale
B) Provoke
C) Infer
D) Sketch

4. *The following text is from Upton Sinclair's 1906 novel* The Jungle.
The work which Jurgis was to do here was very simple, and it took him but a few minutes to learn it. He was provided with a stiff besom, such as is used by street sweepers, and it was his place to follow down the line the man who drew out the smoking entrails from the carcass of the steer; this mass was to be swept into a trap, which was then closed, so that no one might slip into it.

Which choice best states the main purpose of the text?

A) To analyze a character's motivations
B) To evaluate social conditions in the present-day United States
C) To describe a character's professional tasks
D) To consider a likely objection by the reader

5. Spanning more than 1,500 miles, the border between Canada and the United States has been called the longest undefended international boundary in the world. This is true to some extent, in that neither the United States nor Canada maintains a military presence at the border. But as anyone who has crossed from one side of Niagara Falls to the other knows,

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civilian law enforcement is present and accounted for at checkpoints on both sides of the boundary, where entrants are monitored and customs laws administered. Partly because of our cultural similarities and partly because of the remarkable amiability of our diplomatic relations over the past 150 years, it can sometimes seem almost as though the distinction between Canada and the United States is more of policy than of practice.

Which choice best states the function of the underlined sentence in the text as a whole?

A) To analyze the economic consequences of international borders on global commerce
B) To explain the details of the security screenings that people who cross the U.S.-Canadian border must undergo
C) To give evidence of the continual border hostility that the United States and Canada have had since the war of 1812
D) To clarify that although the United States and Canada have friendly relations, they are still clearly two different countries

6. Ernest Hemingway speaks of the artistry of another culture's profanity with admiration in his celebrated novel, *For Whom the Bell Tolls*, wherein the narrator bears witness as obscenities and insults build to a high formalism and eventually collapse upon themselves, leaving the profanities implied rather than stated.

The phenomenon described in the text is most like

A) an aqueduct that is constructed in ancient times only to crumble as the centuries pass.
B) the development of architectural technology enabling ever higher construction.
C) the prohibition of subversive political meetings by an authoritarian dictator.

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D) the evolution of painting from realistic portraiture to abstract expressionism.

7. *Text 1 and Text 2 are adapted from different sections of the 1949 Geneva Conventions.*

Text 1

In addition to the provisions which shall be implemented in peacetime, the present Convention shall apply to all cases of declared war or of any other armed conflict which may arise between two or more of the High Contracting Parties, even if the state of war is not recognized by one of them.

Text 2

Prisoners of war are in the hands of the enemy Power, but not of the individuals or military units who have captured them. Irrespective of the individual responsibilities that may exist, the Detaining Power is responsible for the treatment given them.

The tones of both Text 1 and Text 2 can best be described as

A) casual and relaxed.
B) analytical and indecisive.
C) formal and authoritative.
D) melancholy and spontaneous.

8. **Text 1**

Melaleuca trees were brought to the Florida Everglades from Australia; developers thought these trees would help dry up vast swampy areas, enabling residential and commercial construction. Unfortunately, the trees

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spread widely and covered up large swaths of the Everglades, displacing native plants. Florida has had to spend a great deal of money to remove these invasive trees.

Text 2

Though common protocol would dictate that an invasive species like honeysuckle be removed from areas where it becomes dominant, these new findings demonstrate that such action would likely strike a significant blow to native bird populations. What's more, areas that today are abundant in honeysuckle typically host 30 to 40 percent more birds than these same regions did thirty years ago, indicating a long-term change for the better.

The author of Text 2 would most likely agree with which statement about Text 1?

A) While invasive species may cause damage, not all invasive species should be considered harmful.
B) Melaleuca trees demonstrate the importance of uniformly removing invasive species from the environment.
C) Honeysuckle plants and melaleuca plants show the need for a consistent approach to invasive species management.
D) So long as invasive plants are not transported across oceans, they are unlikely to be harmful.

9. *The text is from Benjamin Franklin's 1771 autobiography.*

Having emerged from the poverty and obscurity in which I was born and bred, to a state of affluence and some degree of reputation in the world, and having gone so far through life with a considerable share of felicity, the conducing means I made use of, which with the blessing of God so well succeeded, my posterity may like to know, as they may find some of them suitable to their own situations, and therefore fit to be imitated.

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That felicity, when I reflected on it, has induced me sometimes to say, that were it offered to my choice, I should have no objection to a repetition of the same life from its beginning, only asking the advantages authors have in a second edition to correct some faults of the first.

It is reasonable to conclude from the text that Franklin's personal financial situation

A) was as strong later in his life as it was when he was young.
B) worsened as he advanced in years.
C) had a random pattern of booms and busts over his life.
D) improved greatly over his lifetime.

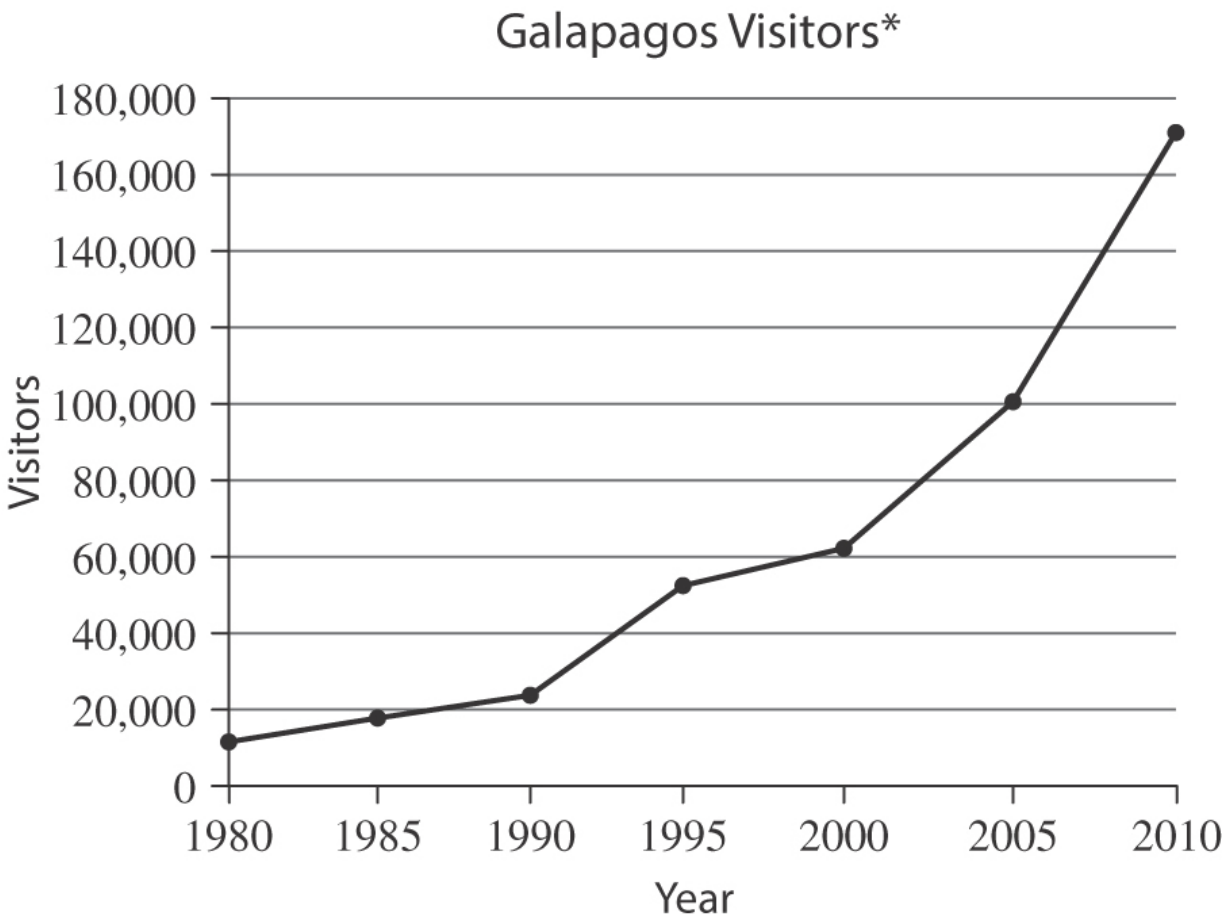
10. In the sense of Ferdinand Saussure's theory of semiotics, one might suggest that the use of literal profanity—as opposed to figurative, which only possesses social sway based on its proximity to the literal—garners part of its power by being the closest available union of signifier and signified in subjects that, as a culture, we tend to avoid in polite and formal conversations. That is, the word is rude, because the thing itself—in a general context—is also considered rude.

One can reasonably conclude that Ferdinand Saussure believes that a major factor that gives profanity its power is

A) the real-life things it represents.
B) its representation of conflict between symbolism and clarity.
C) the rarity with which its ideas are encountered.
D) its use by the socially dominant classes.

11.

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The Galapagos Islands have been isolated from human habitation until relatively recently.

**http://www.galapagos.org/conservation/tourism-growth/*

A scientist makes this statement: "Take a walk through the woods almost anywhere in the temperate U.S. and you'll probably come across clusters of honeysuckle, dandelions, bobbing water lilies and dense patches of ivy. Despite their pervasiveness, none of these plants developed here naturally, but were introduced by human activity."

Based on the quotation and the statement, what would the scientist say would be the most likely consequence of tourism with respect to invasive plants in the Galapagos between 1980 and 2010?

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A) Due to an increase in humanity's awareness of the Galapagos, it is more likely that a desire for environmental stewardship of the islands will grow.
B) Due to an increase in economic activity as a result of tourism, the inhabitants of the Galapagos will have more money with which to combat unwanted plant species.
C) Due to an increase in human contact, it is more likely that nonnative organisms will be introduced by accident.
D) Due to an increase in hotel construction as a consequence of tourism, intentional cultivation of invasive species will grow.

12. A historian argues that the primary advantage of the Fraktur variety of blackletter font was that it balanced elegance with functionalism. Which quotation from the historian's essay most effectively illustrates this claim?

A) Though far less calligraphic than textualis, Fraktur is nonetheless more intricate than Schwabacher, and combines the soft readability of the latter with the bold regality of the former.
B) Antiqua's subversion of blackletter began gradually, appearing primarily in scientific texts (which valued readability over appearance).
C) By far the most familiar blackletter style, Fraktur originated at the end of the 15th century through a commission of the Holy Roman Emperor Maximilian I.
D) The revolutionary scale of his innovation firmly established blackletter —particularly the Schwabacher and Fraktur varieties—as the preferred script for printed texts throughout Europe.

13. They are a common fixture in household kitchens across the United States, but remarkably few of us who use them have any real idea of how our microwave ovens work. Contrary to most other food-heating appliances —the toaster, the convection oven, and the stove, for instance— the microwave itself has no internal heating element: flame, coil, or otherwise. Instead, the microwave oven uses the principle of dipole rotation to _____.

Which choice most logically completes the text?

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A) create a healthy alternative to highly processed foods
B) give consumers an affordable alternative to restaurant meals
C) generate heat from the molecules within the food itself
D) provide structural support to the walls of the appliance

14. Asymmetric encryption relies on multiple advanced mathematical computations like discrete logarithms or the multiplication of 100-digit prime numbers. The specific mathematical details are far too complex for our purposes here, but the important concept is that asymmetric encryption functions by both a *public key* (shared to the world) and a *private key* (known only to the owner).

It can be reasonably concluded that the intended audience for the text is

A) historical scholars.
B) mathematicians.
C) a general audience.
D) code-breakers.

15. *The following text is from Kate Chopin's 1899 novel* The Awakening.

After Mrs. Pontellier had danced twice with her husband, once with Robert, and once with Monsieur Ratignolle, who was thin and tall and swayed like a reed in the wind when he danced, she went out on the gallery and seated herself on the low windowsill, where she commanded a view of all that went on in the hall and could look out toward the Gulf. There was a soft effulgence in the east. The moon was coming up, and its mystic shimmer was casting a million lights across the distant, restless water.

"Would you like to hear Mademoiselle Reisz play?" asked Robert, coming out on the porch where she was. Of course Edna would like to hear Mademoiselle Reisz play; but she feared it would be useless to entreat her.

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Edna's initial response to the possibility of hearing Mademoiselle Reisz play indicates that Edna is

A) wholly apathetic.
B) eager, but doubtful that Reisz would oblige.
C) repulsed by the suggestion.
D) disinterested, as she is currently occupied by something else.

16. My German host mom spoke English _____ for eight months before I convinced her to switch to German.

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

A) to me
B) at me
C) to I
D) at I

17. The innate immune system _____ of two major barriers: the skin and the natural flora (i.e., naturally occurring bacteria).

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

A) consist
B) consists
C) consisting
D) to consist

18. He understood firsthand how being ashamed of your dental health can _____ your whole demeanor.

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

A) effect
B) effects
C) affects
D) affect

19. Reading also stimulates the _____ consider what it would have been like to be at some historical event, or to form a picture of what one could accomplish in life.

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

A) imagination to identify with a hero in a story, to
B) imagination: to identify with a hero in a story, to
C) imagination; to identify with a hero in a story, to
D) imagination, to identify with a hero in a story to

20. I don't think anyone would call me a world traveler. I have only been overseas twice. Everywhere I have traveled there _____ a trend—the ever-present difficulty of learning the new language.

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

A) has been
B) have been
C) will have been
D) be

21. From the parental conflicts on a little-league team _____ international exchanges from a World Cup, sports and sociology go hand in hand.

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

A) to
B) when
C) from
D) in

22. Now, more than ever, science is beginning to understand the deleterious effects of prolonged stress, _____.

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

A) including—but far from limited to, hypertension, obesity, and heart disease
B) including—but far from limited to hypertension, obesity, and heart disease
C) including—but far from limited to; hypertension, obesity, and heart disease
D) including—but far from limited to—hypertension, obesity, and heart disease

23. Firstborn children are leaders. They spend their early years getting lots of attention from their parents, and then they grow up being responsible for their younger siblings. These are the people who are perfectionists.

The author is considering removing the underlined portion of the sentence. Should it be kept or removed?

A) Kept, because it gives statistical evidence.
B) Kept, because it provides a helpful elaboration.
C) Removed, because it is irrelevant to the topic of the sentence.
D) Removed, because it interrupts the author's line of reasoning.

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24. Reading is an enriching activity well worth making part of one's regular habits. Starting from an early age, children who read for pleasure encounter many new words and concepts that expand their minds. _____ images are frequently used in society today, words, unlike images, require using one's mind to understand them, ponder their meaning, and consider whether they are communicating something true or false.

Which choice completes the text with the most logical transition?

A) Although
B) Since
C) Because
D) In addition,

25. While researching a topic, a student has made the following notes:

- Miles Davis was a famous jazz musician who was born in 1926 in Illinois and died in 1991 in California.
- Davis studied for a time at the Julliard School, a music conservatory in New York City.
- Davis is best known for his trumpet playing.
- Louis Armstrong was also a famous jazz musician, who was born in 1901 in Louisiana and died in 1971 in New York.
- Armstrong learned much of his musical skill, including reading music, by playing on riverboats.
- Armstrong is well known for both trumpet playing and vocal skill.

The student wants to emphasize a difference between the two musicians. Which choice most effectively uses relevant information to accomplish this goal?

A) Davis and Armstrong both were excellent trumpet players.
B) Davis and Armstrong were both born in the United States.

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C) Armstrong's education was less formal than Davis's.
D) Davis was born several years earlier than Armstrong.

26. We must ask ourselves as a society, what is it that we most value? _____ If the former, we should shift away from an obsession with manned space flight and invest resources in robotic exploration.

Which choice, inserted in the underlined portion, would best connect the preceding and following sentences?

A) Do we seek out knowledge and wisdom, or are we only concerned with chest-thumping and braggadocio?
B) Are we interested in exploring the moon, nearby planets, and even faraway star systems?
C) Do we only want to save money so that we can use it for domestic research programs to fight disease here on earth?
D) Are we focused on making the world a better place for our children, or do we want to leave them a legacy of environmental devastation?

27. At odds with the Standard Model of physics, collision and radiation studies of antimatter have consistently confounded scientists' efforts to reconcile the baryon asymmetry, and the known universe appears to be dominated by up to 0.01 times more matter than antimatter. _____ such a discrepancy could soon prove to be a silver bullet for both the Standard Model and General Relativity, whose tenets are entrenched in our understanding of everything from the interaction of subatomic particles to the Big Bang Theory of cosmology.

Which insertion for the underlined portion provides the most logical connection between the previous sentence and the current sentence?

A) Since this is such an influential quantity,
B) Though it may initially seem insignificant,
C) Given the paucity of scientific consensus,

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D) Assuming that scientists are willing to disregard their instrumentation,

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Section 2: Math

- All expressions and variables use real numbers.
- All figures are drawn to scale.
- Every figure lies in a plane.
- The domain of given functions is the set of all real numbers for which the corresponding value of the function is real.

For **multiple-choice questions**, solve the problem and pick the correct answer from the provided choices. Each multiple-choice question has only one correct answer.

For **student-produced response questions,** solve each problem and enter your answer following these guidelines:

- If you find **more than one correct answer,** enter just one answer.
- You can enter up to 5 characters for a **positive** answer and up to 6 characters (this includes the negative sign) for a **negative** answer.
- If your answer is a **fraction** that does not fit in the given space, enter the decimal equivalent instead.
- If your answer is a **decimal** that does not fit in the given space, enter it by stopping at or rounding up at the fourth digit.
- If your answer is a **mixed number** (like $4\frac{1}{2}$), enter it as an improper fraction (9/2) or its decimal equivalent (4.5).
- Do not enter **symbols** like commas, dollar signs, or percentage signs.

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Examples

Answer	Acceptable Entries	Unacceptable Entries That Will Receive Zero Credit
4.5	4.5 4.50 9/2	41/2 4 1/2
$\frac{8}{9}$	8/9 .8888 .8889 0.888 0.889	0.88 .88 0.88 0.89
$-\frac{1}{9}$	–1/9 –.1111 –0.111	–.11 –0.11

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Math Module 1: 35 Minutes, 22 Questions

QUESTION 1

$\frac{m^{\frac{5}{2}}}{m^{\frac{1}{2}}}$ = ?

(A) m
(B) m^2
(C) m^4
(D) $m^{\frac{1}{5}}$

QUESTION 2

A recipe that will yield 6 cupcakes calls for 4 eggs, 3 cups of flour, and 6 cups of sugar. If someone wishes to make 15 cupcakes, how many cups of flour should he or she use?

(A) 6
(B) 7.5
(C) 12.5
(D) 13

QUESTION 3

Solve for x in the equation below:
$7 + 2(x - 3) = -3(x + 1) - 4$

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

(B) -1

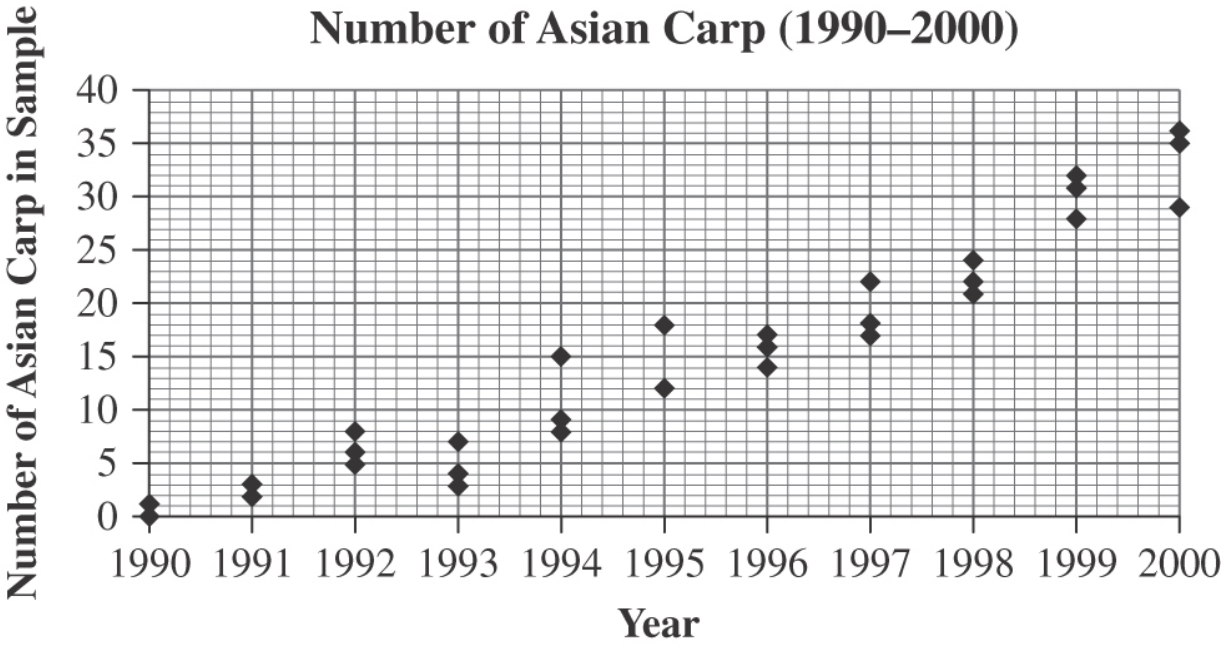
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(C) $-\frac{8}{3}$

(D) 3

QUESTION 4

The Asian carp has experienced a rapid growth by displacing other fish in the Mississippi River. A researcher gathered three yearly samples from a 500-meter length of the Upper Mississippi River to determine the population trend of the fish over a decade.



What is the approximate slope of the best-fit line of the data in the graph, expressed as change in carp per year?

(A) 3.3

(B) 4.8

(C) 5.7

(D) 7.6

QUESTION 5

$4x^n + x^{4n} =$

(A) $5x5n$

(B) $x^n(4 + x^{3n})$

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(C) $5x^{4n2}$
(D) $4x^n(1 + x^{3n})$

QUESTION 6

If the diameter of a circle is 10 centimeters, what is the circumference of the circle in centimeters?

Grid-In: _____

QUESTION 7

What are the possible values of b in the system of equations below?

$b = 2a + 1$
$b + 2 =$

(A) –3, –7
(B) –1, 7
(C) 3, –1
(D) 3, 7

QUESTION 8

Marcus completely filled his truck's 14-gallon gas tank. The computer at the gas pump indicates that Marcus spent $34 in this transaction; the price per gallon was $3. How many gallons of gas did Marcus have in his tank before he started to fill it?

Grid-In: _____

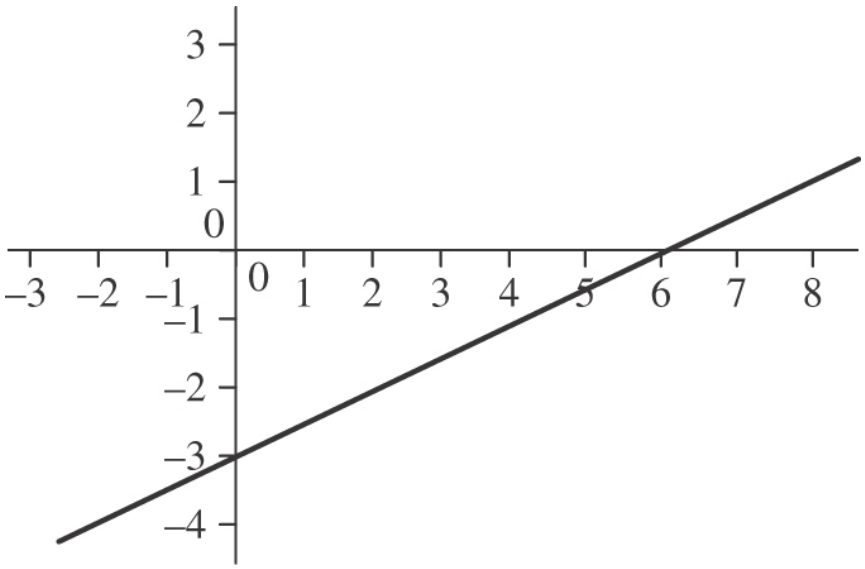
QUESTION 9

How many real solution(s) does this system of equations have?

$y = 2x - 5$
$y = 2x^2 + 4$

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

QUESTION 10



Which equation expresses the relationship between x and y shown in the graph above?

(A) $y = \frac{1}{2}x - 3$
(B) $y = 3x - 3$
(C) $y = 2x + 6$
(D) $y = -\frac{2}{3}x + 6$

QUESTION 11

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Bob deposits x dollars into his savings account on January 1, 2015, and the account grows at a constant annual rate of 3%, compounded annually. Assuming that Bob makes no deposits or withdrawals and that there are no account fees or other charges, what will be the amount of dollars in his account on January 1, 2017?

(A) $0.06x$
(B) $1.06x$
(C) $1.0609x$
(D) $1.092727x$

QUESTION 12

$2(a - 4b)(3 + b^3) = ?$

(A) $2ab^3 - 24b$
(B) $2ab + 6a - 4b^2 - 12b$
(C) $2ab^3 + 4a - 6b^4 - 24b$
(D) $2ab^3 + 6a - 8b^4 - 24b$

QUESTION 13

A lamp business uses the following equations to express supply and demand as a function of price and quantity for its lamps:

Supply: Price = 30 – Quantity
Demand: Price = 10 + 3 × Quantity

How many lamps does the business need to sell in order for the supply of lamps to equal the demand for lamps exactly—i.e., for the supply and demand to be at equilibrium?

Grid-In: _____

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QUESTION 14

14. The volume of a particular cylinder is x cubic inches. If the height of the cylinder is tripled while the radius of the cylinder remains the same, what will the new volume of the cylinder be in terms of x?

(A) $2x$
(B) $3x$
(C) $4x$
(D) $5x$

QUESTION 15

College football programs are permitted to pay a maximum of 1 head coach, 9 assistant coaches, and 2 graduate assistant coaches. If ABC University wishes to have at least 1 coach for every 4 players, which of the following systems of inequalities expresses the total number of coaches, C, and total number of players, P, possible?

(A) $C = 12$ and $P \leq 4C$
(B) $C \leq 12$ and $P \leq 4C$
(C) $C \leq 10$ and $P \leq 3C$
(D) $C = 1$ and $P \leq 4$

QUESTION 16

Given that x and n are numbers greater than 1, which of the following expressions would have the greatest overall increase in y values between x values from 2 to 100?

(A) $y = nx + 3$
(B) $y = -nx + 3$
(C) $y = x^n + 3$

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(D) $y = x^{-n} + 3$

QUESTION 17

If $f(x) = 7x + 3$ and $g(x) = 2x^2$, what is the value of $f(g(1))$?

Grid-In: _____

QUESTION 18

The approximate relationship between Kelvin (K) and degrees Celsius (C) is given by this equation:

K = 273 + C

The freezing point of water is 0 degrees Celsius, and the boiling point of water is 100 degrees Celsius. What are the approximate freezing and boiling points of water in Kelvin?

(A) Freezing: 0; boiling: 100
(B) Freezing: –273; boiling: –173
(C) Freezing: 273; boiling: 373
(D) Freezing: 473; boiling: 573

QUESTION 19

What is the value of the smallest side in a right triangle with a hypotenuse of 8 and angles of 30 and 60 degrees?

Grid-In: _____

QUESTION 20

n	Pattern

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1	1
2	1 + 3
3	1 + 3 + 5
4	1 + 3 + 5 + 7
5	1 + 3 + 5 + 7 + 9

The table above gives the values of a sum of the first n numbers, starting with 1. Which of the following is a correct statement about n?
(A) The product of n and its corresponding sum decreases as n increases.
(B) The difference between each additional value of n and the previous value of n is increasing exponentially.
(C) The sum of the first n odd numbers equals the square of n.
(D) The sum of the first n numbers is comprised solely of prime numbers.

QUESTION 21

If a circle has the equation $(x - 4)^2 + (y - 3)^2 = 36$, what is the shortest straight-line distance from the center of the circle to the origin?

Grid-In: _____

QUESTION 22

John is taking a rowboat both up and down a 16-kilometer length of a river. A constant current of 1 kilometer per hour makes his trip downstream faster than his trip upstream because he is moving with the current downstream and fighting against the current when traveling upstream. If a round-trip journey took him a total of 4 hours, and if he rowed at a constant pace the

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whole time, what is the rate in kilometers per hour, to the nearest tenth, at which John is rowing independent of the current?

(A) 7.3
(B) 8.1
(C) 8.9
(D) 9.7

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Math Module 2: 35 Minutes, 22 Questions

QUESTION 1

A function never intersects the y-axis. Which of the following could be an equation of the function?

(A) $y = 2x - 5$
(B) $y = 4$
(C) $x = 36$
(D) $y = x$

QUESTION 2

Andrew's sports car has a speedometer that shows a maximum value of 180 miles per hour. Given that there are approximately 1.61 kilometers in one mile, what would be the maximum value of his speedometer (to the nearest whole number) if it were listed in kilometers per hour?

(A) 112 km/hour
(B) 208 km/hour
(C) 290 km/hour
(D) 314 km/hour

QUESTION 3

If $\frac{1}{4}a + \frac{1}{3}b = 2$, what is the value of $3a + 4b$?

(A) 4
(B) 18
(C) 24

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(D) 36

QUESTION 4

If n represents m percent of x, how could the value of n be calculated?

(A) $n = \frac{mx}{100}$
(B) $n = 0.1mx$
(C) $n = \frac{100}{mx}$
(D) $n = 100mx$

QUESTION 5

A high school is evaluating two different DJs for its prom—DJ A and DJ B. The first one, DJ A, has a $300 rental fee and charges $150 per hour. The second one, DJ B, has a $200 rental fee and charges $175 per hour. After how many hours of performing will the cost for both DJs be the same?

Grid-In: _____

QUESTION 6

$(x^2 + 3x^2)^3 = ?$

(A) $3x^{12x}$
(B) $27x^5$
(C) $28x^6$
(D) $64x^6$

QUESTION 7

A pastry chef has a recipe that calls for 3 tablespoons of vanilla extract for a cake. The chef has misplaced his tablespoon and has only a teaspoon

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available—there are 3 teaspoons for each tablespoon. If the chef is making a total of two cakes, how many teaspoons of vanilla extract should he use?

(A) 3
(B) 6
(C) 12
(D) 18

QUESTION 8

Solve for x in the equation below:

$$4x - y = \frac{1}{2}x - y + 7$$

Grid-In: _____

QUESTION 9

A librarian works at a constant pace, simultaneously shelving exactly 200 books in an hour and exactly 20 movies in an hour, and shelving only books and movies. If the librarian works for a total of T hours, which expression shows the total number of items (books and movies) that the librarian shelves during that time?

(A) $220T$
(B) $20T + 200$
(C) $220T + 440$
(D) $200T - 20$

QUESTION 10

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A right triangle has a hypotenuse of 20 inches and another side length of 16 inches. What is the length of the third side of the right triangle in inches?

Grid-In: _____

QUESTION 11

The following equations could all have the constant k equal zero and have a defined solution EXCEPT

(A) $kx = 0$
(B) $3 = k - x$
(C) $4k + x = 7$
(D) $\frac{2}{k} = x$

QUESTION 12

A new spaceship tourism company wishes to design a spacecraft that will allow its passengers to reenter Earth's atmosphere comfortably without losing consciousness. The physicians with whom the company consulted advised the company employees that healthy humans can survive up to $9g$ of force and lose consciousness at $5g$ of force. Which expression gives the range of g-force values, g, that the company's engineers should ensure the spacecraft can provide during reentry?

(A) $g < 5$
(B) $g > 5$
(C) $5 < g < 9$
(D) $g > 9$

QUESTION 13

A company has four different stores at four different locations throughout a large city. The company gathered data on the initial prices, sale prices, and

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respective quantities sold of a particular item.

Store	Price Before Sale	Quantity Sold Before Sale	Sale Price	Quantity Sold During Sale
Store A	$12.50	350	$11.00	400
Store B	$13.25	260	$10.00	520
Store C	$11.75	550	$9.50	625
Store D	$14.00	220	$10.25	460

Look at how many of the particular item Stores A and B sold at the presale price. What is the arithmetic mean of this set of values to the nearest tenth?

(A) 8.1
(B) 9.7
(C) 10.5
(D) 12.8

QUESTION 14

Which of the following equations properly expresses the functional relationship given by this expression?

"Take an input variable and divide it by 4; then subtract 5 from the result."

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(A) $f(x)=\frac{x-5}{4}$
(B) $f(x)=\frac{x}{4}-5$
(C) $f(x)=5-\frac{x}{4}$
(D) $f(x)=\frac{5-x}{4}$

QUESTION 15

If an amusement park worker measures three riders as being 48 inches, 56 inches, and 40 inches tall and the margin of error of each of the worker's measurements is ±2 inches, what is the possible range of the sum of the riders' actual heights in inches?

(A) $48 \leq$ total height ≤ 144
(B) $42 \leq$ total height ≤ 150
(C) $138 \leq$ total height ≤ 150
(D) $158 \leq$ total height ≤ 180

QUESTION 16

In the equation below, F stands for gravitational force, m_1 and m_2 stand for the masses of two different objects, G is a constant, and d stands for the distance between the two objects. (Note that mass and distance must have positive values.)

$$F=\frac{G\times m_1\times m_2}{d^2}$$

What would most minimize the gravitational force between objects 1 and 2?

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(A) Minimize d
(B) Maximize m_1 and m_2
(C) Minimize $m_1 \times m_2$ and maximize d
(D) Maximize d, m_1, and m_2

QUESTION 17

A cube has edges with a length of 2 inches. What is the surface area of the cube in square inches?

Grid-In: _____

QUESTION 18

The final velocity of a given object is expressed by the following formula:

$$\text{Final velocity} = \text{Initial velocity} + \text{Acceleration} \times \text{Time}$$

If a ball has an initial velocity of 4 m/s and a constant acceleration of 6 m/s^2, which inequality shows the range of times, T, that will cause the final velocity to have a value of at least 22 m/s?

(A) $T \geq 3$ seconds
(B) $T \geq 8$ seconds
(C) 3 seconds $\leq T \leq 5$ seconds
(D) 6 seconds $\leq T \leq 22$ seconds

QUESTION 19

A particular black hole has a density of 1.0×10^6 kg/m^3. A physicist is conducting a thought experiment in which she would like to approximate

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how much she would weigh if she had the density of a black hole rather than her current weight of 150 pounds, assuming her volume remained the same. Given that her overall body density is approximately 990 kg/m^3 and that there are approximately 2.2 pounds in a kilogram, approximately how many pounds would she weigh in her thought experiment?

(A) 2,178
(B) 151,500
(C) 990,000,000
(D) 2,178,000,000

QUESTION 20

Consider the following system of equations with variables A and B and constant integers X and Y:

$A + 2B = 4$
$XA + YB = 4X$

By what number must the sum of X and Y be divisible in order for the two equations to have infinitely many solutions?

Grid-In: _____

QUESTION 21

Pam is going to watch a movie on her television at home. She is going to watch the movie as it was shown in movie theaters, in its original aspect ratio of 1.85:1 (length:height). Her television has an aspect ratio of 4:3 and a length of 48 inches. If the movie takes up the entire length of her television screen, how many inches of screen height, to the nearest whole inch, will NOT be used on her TV screen to show the movie?

(A) 10

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(B) 16
(C) 22
(D) 44

QUESTION 22

If $-16 - 6x + x^2 = x^2 - abx - 8b$, where a and b are constants, what is the value of a?

(A) –6
(B) –2
(C) 3
(D) 5

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Practice Test Solutions

Reading Module 1 Solutions

1. **C.** The sentence is providing statistics on how much money veterinarians can make, so earning is the most appropriate word. The other options do not describe how much someone's salary would be.

2. **B.** "Fashionable" refers to the popularity of travelers placing paintings of their travel destinations in their homes. "Tailored" implies a level of customization that is not present in these works, "leisurely" refers more to the scenes of the paintings, and "economical" could apply to the practice of saving money by using more general scenes than customized ones; but the focus in these lines is on the increased interest in this practice.

3. **D.** Although "discriminating" typically has a negative connotation that people associate with prejudice, in this context, the author is asserting that we need to be more careful and "selective" in deciding which invasive plants we keep and which ones we exterminate. Choices A and B can apply to discriminating in other contexts, and Choice C would only apply to being "discriminating" when it comes to the quality of art, food, music, etc.

4. **A.** The first part of the text makes a broad statement of parthenogenesis. The underlined sentence outlines an important exception to this, mammals, and transitions into a clarification about how parthenogenesis does not occur naturally in mammals. It is not B, because this short sentence does not give a definition. It is not C or D, because the focus is on science, not ethics and economics.

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5. **D.** The vocabulary of the choices is perhaps the most difficult part of this question. "To underscore his rootlessness" is another way of saying *to emphasize the uncertainty of his background.* Choice D is the correct answer, as Washington is emphasizing that he really has very little idea about how he came into this world. Washington is not *complaining about his dementia,* as in Choice A, and Choice B is flawed in that he is uncertain of his "identity." Choice C is flawed in that Washington is not critical of his family; rather, he is critical of the system of slavery that led to the instability/absence of his familial relations.

6. **B.** The text states that "The Caesar Shift was simplistic by today's standards, but in an era in which very few could read in the first place, the encryption was effective." So, because the ability to read (i.e., literacy) was not widespread, this encryption method was effective. There is no indication that the cipher was mathematically complex, making Choice A incorrect. While it had ancient historical roots from centuries before the present day, the author does not indicate that this had a direct influence on its effectiveness, making Choice C incorrect. Finally, Choice D is incorrect because the text implies that even with physical interception, the messages would still be safe because of the lack of literacy.

7. **A.** Text 1 makes a broad claim about history tending to repeat itself, and text 2 uses the specific example of fashion history to make this point. It is not B, because the arguments are not opposed to one another. It is not C, because while Text 2 refers to older events, its approach is not necessarily antiquated. It is not D, because Text 2 does not raise an objection.

8. **B.** The author mentions that logistics are "interesting" and that the process is "something to behold." Overall, the author's tone is therefore warm. She is appreciative and has a "positive" opinion of the concept, as seen in Choice B. The author is not "skeptical:" she does not have doubts about logistics. It is not Choice C, as the author *does* take an opinion on the matter. "Bellicose" means *warlike.* Choice D, then, is not a viable option.

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9. **C.** The narrator discusses the futility of spending time trying to predict the future. Additionally, he discusses how knowing the future would take away one's enjoyment in the present. Hence, he would advise people to "focus on the moment." Choice A means to be forgiving, Choice B advocates seeking knowledge, and choice D advocates reciprocal kindness.

10. **B.** Analyze the chart for this question. We are comparing the writing scores of those who read for fun "almost daily" with the scores of those who read "never or hardly ever." The difference in points between these two groups is approximately 30.

11. **B.** This quotation most directly illustrates the sorrow at being ignored by other people, since even though the narrator is dying of thirst, no one brings her water. The other options do not effectively show the sorrow at being ignored by other people.

12. **A.** The text states that "bacteriostatic antibiotics are often prescribed to patients who have an intact immune system." If a person's immune system is intact, it is fair to assume that that person is "relatively healthy," as described in Choice A. Choices B, C, and D all state that bacteriostatic antibiotics are used on people in various states of poor health, which is not the case.

13. **A.** The text reports how Hill's and Becquerel's chemistry-based approach toward color photography was not as promising, while reporting that Maxwell *was* able to make progress by focusing biologically on how the human eye perceives colors. The other options do not accurately describe this transition.

14. **C.** The text defines a Great Comet as one that is bright enough to be observed by people on Earth with the naked eye. While the other options may be attributes of a Great Comet, they are not necessary ones.

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15. **A.** *Their* shows possession by the occupational therapists, and *clients'* shows that the time belongs to the plural "clients". *They're* is the same as "they are," and *there* refers to a place.

16. **C.** The commas correctly surround the clarification of what Io is. This is known as an "appositive," which is when an interchangeable name for what comes before is surrounded with commas. For example: "My oldest daughter, the Prime Minster, is well respected." The other options do not provide sufficient pauses.

17. **C.** This is an event that takes place *prior* to another event in the past, so "had" is needed. Choices A and B are in the past perfect tense, and choice D is in the present tense.

18. **C.** A possessive is required that will express the idea of *the problems of patients,* where *patients* is plural. Choice A isn't possessive. Choice D incorrectly uses both "those of" and "problems," which are illogical when combined. Choice B incorrectly expresses the problems of *one* patient. Choice C is the best answer.

19. **C.** The subject is "foreign objects" which is a plural noun that requires a plural verb. Eliminate Choice A, as "basis that is daily" is an awkward way of saying *daily basis.* Eliminate Choice D for having a singular verb, "attacks." Eliminate Choice B, as "that attacking" is inappropriate; "that attack," as seen in Choice C, is preferable.

20. **B.** A boat would be best described as passing "over" the sea, since it would travel along the sea's surface. One would not pass "to" or "sequence" the sea, making A and D incorrect. And C is too wordy.

21. **D.** The mill is singular, and it possesses the grounds. Also, we need to have a clear separation between the two complete sentences, which the semicolon, but not a comma, can provide. Choice A provides no possession,

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Choice B would be for plural mills, and choice C would cause a comma splice.

22. **D.** "Take, for example, . . ." or "take, for instance, . . ." are common English phrases. Moreover, Americans and football function as an example of how sports can "unite us far more than they divide us." Either of these two thought processes would have led you to the correct answer, Choice D.

23. **A.** The underlined sentence directly builds on the claim in the previous sentence by using specific numerical evidence. Thus, it must be "kept, because it provides specific details in support of the previous sentence." Deleting it sacrifices helpful information. It has nothing to do with "salary details."

24. **B.** Both the Geocentric and Heliocentric models involve "revolving" of astronomical bodies, meaning they both incorporate rotational movement. It is not A, because the notes indicate that the Heliocentric theory became dominant. It is not C, because there is no evidence in the notes to suggest that citizens in ancient Greece widely knew these theories. It is not D, because the nationality of Copernicus is not mentioned in the notes.

25. **A.** It really is best to read this sentence along with the previous *two* sentences. This sentence *contrasts* with the previous idea of the paragraph that "birth order isn't a one-size-fits-all theory." Essentially, this sentence says, *That may be true,* but *it is still useful.* The best substitute for *but* is "nevertheless." The other three choices fail to provide the contrasting relationship that the sentence requires.

26. **A.** The important part of the question stem regards specificity about how much baseball the narrator played. Choice A quantifies the amount of baseball played, which makes it the most specific option. Neither Choice B nor Choice C tells *exactly* how much baseball the narrator played, which contrasts with the requirement for specificity. Choice D is irrelevant to the question's requirements.

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27. **B.** The previous sentence explains that voters in swing states receive far more attention than voters in states that are more uniformly one party. Choice B would therefore connect to the concluding sentence that points out that a majority-vote system would ensure that voters everywhere would have an equal say. Choice A focuses on irrelevant population density, choice C describes the opposite of what is done, and choice D does not provide a logical transition from the previous.

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Reading Module 2 Solutions

1. **C.** Gamelin politely refuses to sit in the chair that is offered to her, so she is best described as "turning down" the chair. "Repulsing" is too negative, and "decreasing" and "plummeting" generally relate to amounts of things.

2. **D.** The idea expressed here is that natural gas gave cooks the ability to "control" or "manipulate" their cooking flames. It is not A, because to "annihilate" is to "destroy" something. It is not B or C, because "satisfy" and "craft" do not mean "control."

3. **A.** The sentence refers to drawing breaths, so "inhale" is the best choice. Breathing is not directly associated with provoking, inferring, or sketching.

4. **C.** The text describes Jurgis's job description. These lines "describe a character's professional tasks." We see nothing of personal motivation, as in Choice A. The selection is from over a century ago, making Choice B incorrect. These lines have nothing to do with the objection of the reader, as seen in Choice D.

5. **D.** The sentences prior to this indicate that there is not much of a border between the United States and Canada, given how undefended it is. These lines clarify that the two countries are, in fact, very much independent of one another. Choice A would require more information about other countries' borders to provide such an analysis. Choice B is incorrect because there is no detail provided about the security screening process. And choice C is incorrect because the essay does not support the idea that there has been continued border hostility between the two countries since the War of 1812.

6. **D.** The text refers to a process in which words become less and less literal. The evolution of painting from realism to abstraction would be a

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similar shift away from literal or obvious meaning to a meaning that is implied. Choice A is about gradual decay of human constructions due to time, choice B is about the development of technology, and choice C is about stopping free expression.

7. **C.** The text is an excerpt from an official legal document. Its tone is "formal" and business-like, as the matter at hand is of such gravity. It is also "authoritative": the text is mandating that the international community must follow these new guidelines. Choice A is the opposite of the actual tone, which is formal instead of relaxed. Choice B is flawed in that there is nothing indecisive about the document; it is saying *this is how it will be going forward, and that's the end of the discussion.* "Melancholy" implies a sadness that the document lacks, and "spontaneous" makes it sound as if these decisions were made hastily and on the spur of the moment, whereas the reality was probably that these statutes were formulated over intense and lengthy deliberation. Eliminate Choice D accordingly.

8. **A.** Text 2 presents evidence showing that an invasive plant, honeysuckle, can have a positive impact on the environment; this goes against the general suggestion about the negative impact of invasive plants from Text 1. It is not Choice B or C, because Text 2 does not suggest a consistent approach to the treatment of invasive plants. It is not Choice D, because the texts do not detail transportation recommendations about invasive plants.

9. **D.** In the beginning of the text, Franklin describes being born into poverty and then achieving affluence. He entered the world poor but obtained wealth through his endeavors. This is most consistent with Choice D. Choices B and C imply at least some sort of financial hardship in adulthood, which was not the case. Choice A is flawed in that Franklin was not born wealthy.

10. **A.** This is best seen when the author clarifies that "the word is rude, because the thing itself. . . is also considered rude." In other words, profane words derive much of their power by standing for profane things. It is not B, because there is not conflict between these ideas discussed. And it is not

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C or D, because profane ideas are encountered frequently by a variety of social classes.

11. **C.** The text indicates that some nonnative plants are introduced to new environments through human contact. With an increase in human visitation, the Galapagos Islands will likely experience more accidental introduction of plants. It is not A, because the text does not suggest that an increase in human interaction leads to an overall improvement in conservation efforts. It is not B, because there is no information to support the notion that an increase in tourism will result in enough money to outweigh the negative consequences of increased human activity. And it is not D, because the text does not support the notion that humans will consistently seek to purposefully introduce invasive species to new environments.

12. **A.** This option shows "elegance" by stating that Fraktur is "intricate" and has "regality;" it also shows functionalism by mentioning "readability." It is not B, C, or D, because these choices focus on the timeline of the font's development.

13. **C.** The text indicates that microwaves are different from other food-heating appliances because they do not have an internal heating element. Stating that the microwave generates heat from the molecules in the food would logically complete this text, showing how microwaves can successfully heat food without having an internal heating element. The other options do not focus on the heating of food.

14. **C.** The excerpt states that "the specific mathematical details are far too complex for our purposes here," which most strongly suggests that this text is intended for a general audience, since specific background knowledge is not required. Choices A, B, and D all would necessitate a much more sophisticated explanation to satisfy the intellectual needs of these groups.

15. **B.** In the second paragraph, the following interaction occurs: "'Would you like to hear Mademoiselle Reisz play?' asked Robert, coming out on

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the porch where she was. Of course Edna would like to hear Mademoiselle Reisz play; but she feared it would be useless to entreat her." Edna, then, is "eager, but doubtful that Reisz would oblige" by playing for her, as Choice B indicates. Choices A and C are too extreme, and Choice D conveys emotional neutrality, which is not supported by the text.

16. **A.** The first decision is whether it is more appropriate to "speak to" someone or to "speak at" someone. As the first option is more effectively used, eliminate Choices B and D. Evaluate Choices A and C; it is more appropriate to "speak to me" (as the one spoken to is an indirect object) than it is to "speak to I." Choice A is the correct answer.

17. **B.** The subject is "system," a singular subject requiring a singular verb of "consists." Eliminate Choice A for using a plural verb. Eliminate Choice C, which uses a gerund, ultimately leading to a sentence fragment. Choice D uses an infinitive verb, and conjugation is required for a full sentence.

18. **D.** After the verb "can," an infinitive verb is required. Eliminate Choices B and C because they are conjugated verbs. "Effect" is rarely used as a verb, but when it is, it means *to bring about.* "Affect" means *to influence.* The sentence is much more logical with *influence*, so "affect" is the correct answer.

19. **B.** The independent clause is "Reading also stimulates the imagination." The sentence best functions by using a colon and then listing the various ways it stimulates the imagination. Choice B does this perfectly. Choice A is a run-on sentence. Choice C incorrectly uses a semicolon; there must be a full sentence on both sides of the semicolon, but there isn't a full sentence after the semicolon here. Choice D incorrectly attaches a list to the independent clause.

20. **A.** The subject and verb must agree. In this case, the subject is "trend," which is a singular noun that will require a corresponding verb. Eliminate Choices B and D for being plural verbs. Choice C incorrectly uses future

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perfect tense, whereas present is the desired tense. “There has been a trend” is the best answer.

21. **A.** A common linguistic pattern in English is “from (something or somewhere) . . . to (something else or somewhere else).” Unfortunately, there is no rule behind this per se. It is simply one of the many instances where familiarity with the pattern from common practice is a prerequisite. Choice A is the correct answer.

22. **D.** “But far from limited to” is a *parenthetical phrase*; remove it and the sentence still functions effectively. Parenthetical phrases can be surrounded with two commas or two dashes. Choice A is close, but it breaks parallelism by using a dash and then a comma instead of the same punctuation mark twice, as required.

23. **B.** Ultimately, if we were to delete the underlined portion, we would be removing information that was both relevant and productive. It provides a “helpful elaboration” in this sentence, and it contributes informative value to the text. Choice B is the correct answer.

24. **A.** A contrasting transition is required here. Essentially, the sentence is *images are used often in society, but words require more cognitive processing*. “Although” is the only option to achieve that contrast. Choices B and C express cause and effect, while Choice D is acceptable when the text is listing multiple things along the same thought process.

25. **C.** Armstrong learned on riverboats, while Davis attended Julliard, a music conservatory. Therefore, Davis had a more formal education than did Armstrong. It is not A or B, because these are both similarities. It is not D. because Davis was born later than Armstrong.

26. **A.** The following sentence particularly clarifies which choice makes the most sense, since the “former” would be referring to “knowledge and wisdom”—a sensible rationale for changing to robotic exploration, since

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such exploration would increase our knowledge but wouldn't give humans bragging rights as the first to land on another planet. Choices B and C only present one option instead of two, and choice D does not give an option that is the focus of the context that follows.

27. **B.** The numerical amount of 0.01 times does not initially seem like a very large number, so choice B gives a helpful introductory connection in the current sentence. Choice A would state that this is a larger quantity than it is; Choice C is incorrect because "paucity" means "a lack of," which would contradict the well-founded scientific observations mentioned; and Choice D would involve scientists ignoring their observations.

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Math Module 1 Solutions

SOLUTION 1

(B) $\frac{m^{\frac{5}{2}}}{m^{\frac{1}{2}}}$ → Factor out an $m^{\frac{1}{2}}$ on the top → $\frac{m^{\frac{1}{2}}m^{2}}{m^{\frac{1}{2}}}$ Cancel the $m^{\frac{1}{2}}$ from the top and bottom → m^{2}

SOLUTION 2

(B) Set up a proportion to solve for the unknown number of cups of flour. Use the ratio 6 cupcakes to 3 cups of flour → $3/6 = 15/x$→ $x = 7.5$

SOLUTION 3

(A) Start by distributing the 2 through the parentheses on the left and the 3 through the parentheses on the right:

$$7 + 2(x - 3) = -3(x + 1) - 4$$
$$7 + 2x - 6 = -3x - 3 - 4$$

Simplify and solve for *x:*

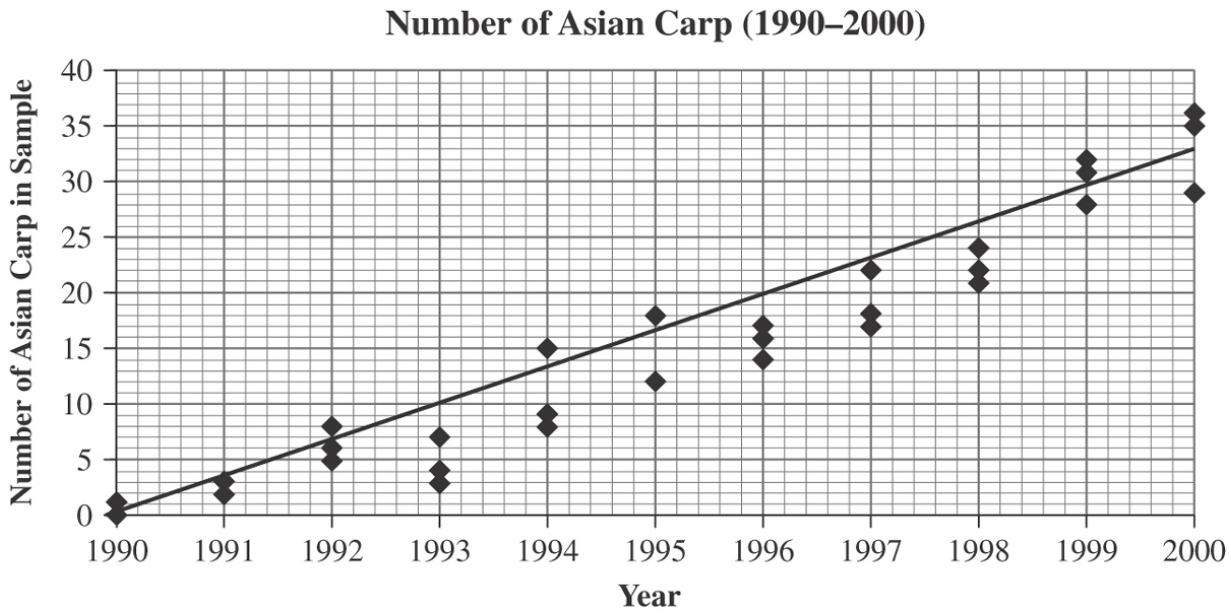
$$1 + 2x = -3x - 7 \rightarrow$$
$$5x = -8 \rightarrow$$
$$x = -\frac{8}{5}$$

SOLUTION 4

(A) Some approximate points that would be on the best-fit line are (1990, 0) and (1996, 18). Calculate the approximate slope: 18 – 0/1996 – 1990 = 3,

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which comes closest to choice (A). You can also visualize this by drawing the approximate best-fit line on the graph:



SOLUTION 5

(B) Factor an x^n out of the expression to get the answer:

$$4x^n + x^{4n} = x^n\,(4 + x^{3n})$$

You cannot combine x^n and x^{4n} into one term because they are not raised to the same power.

SOLUTION 6

31.41 or 31.42. To solve for the circumference of a circle, multiply the diameter by pi: $\pi \times 10 \approx 31.41593$, which can be entered on the fill-in as 31.41 or 31.42.

SOLUTION 7

(B) Use substitution to solve for a:

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$b = 2a + 1$ and $b + 2 = a^2 \rightarrow (2a + 1) + 2 = a^2$

$2a + 3 = a^2 \rightarrow$

$a^2 - 2a - 3 = 0 \rightarrow (a - 3)(a + 1) = 0$

When $a = 3$, $b = 7$, and when $a = -1$, $b = -1$.

SOLUTION 8

2.66 or 2.67 Marcus purchased $34 of gas at $3 a gallon. You can determine how many gallons of gas he purchased:

$$\frac{34}{3} = 11.333 = 11.333$$

Then subtract 11.333 from the total capacity of the tank:

$$14 - 11.333 \approx 2.67$$

You can answer 2.66 or 2.67—the SAT will be fine if you round up or round down. Just be sure to fill out all the spots in the grid.

SOLUTION 9

(A) Set the two equations equal to each other. Express the result as a quadratic equation:

$$2x - 5 = 2x^2 + 4 \rightarrow 2x^2 - 2x + 9 = 0$$

Plug these values for *a, b,* and *c* into the quadratic equation. The only solutions are imaginary:

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{2 \pm \sqrt{4 - 4 \times 18}}{2 \times 2} = \frac{2 \pm i\sqrt{68}}{4}$$

Therefore, there are zero solutions.

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SOLUTION 10

(A) This line has a *y*-intercept of –3 because that is where the line intersects the *y*-axis. You can calculate the slope using points on the line, (0, –3) and (6, 0):

$$Slope = \frac{Rise}{Run} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3-0}{0-6} = \frac{1}{2}$$

Putting this in slope-intercept form ($y = mx + b$) results in the equation of the line:

$$y = \frac{1}{2}x - 3$$

SOLUTION 11

(C) To determine a 3% increase on an original amount of *x*, add 3% to the original amount:

$$x + 0.03x = 1.03x$$

You can save time if you recognize that you can simply multiply *x* by 1.03 to determine the total of *x* plus 3% interest. The amount in the account is compounded twice. So multiply *x* by 1.03 twice:

$$x \cdot 1.03 \cdot 1.03 = 1.0609x$$

SOLUTION 12

(D) Use FOIL to calculate the product of the terms in parentheses:

$$2(a - 4b)(3 + b^3) = 2(3a + ab^3 - 12b - 4b^4) = 6a + 2ab^3 - 24b - 8b^4$$

Rearrange the values to put them in the order shown in the choices:

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$$2ab^3 + 6a - 8b^4 - 24b$$

SOLUTION 13

5 Since the supply and demand are at equilibrium, set the two expressions equal to one another and solve for the number of lamps:

$$30 - \text{Quantity} = 10 + 3 \times \text{Quantity}$$
$$20 = 4 \times \text{Quantity}$$
$$5 = \text{Quantity}$$

SOLUTION 14

(B) The volume for a cylinder is one of the given formulas: $V = \pi r^2 h$. If the height is tripled while the radius remains the same, the volume of the new cylinder will be $\pi r^2(3h) \rightarrow 3(\pi r^2 h)$. So, it is triple the original value, making the correct answer $3x$.

SOLUTION 15

(B) The programs are permitted a maximum of 12 coaches. So C must be equal to or less than 12. Choice (B) is the only option with this statement. All of the other options do not allow for the full range of possible values for the number of coaches. Moreover, the number of players will be limited by the number of coaches if the university is to maintain a ratio of a maximum of 4 players per coach. By making the number of players less than or equal to 4 times the number of coaches, $P \leq 4C$, the university will ensure that it has at least 1 coach for every 4 players.

SOLUTION 16

(C) Try plugging in some sample values for x, like 2 and 100, and assume n is a constant, like 3, to see how the equations behave: Choice (C) clearly has the greatest overall increase, going from 11 to 1,000,003. Alternatively,

you can simply realize that a number greater than 1 to a power more than 1 will be greater than the other possibilities.

Equation	Substitute $x = 2$ and $n = 3$	Value when $x = 2$ and $n = 3$	Substitute $x = 100$ and $n = 3$	Value when $x = 100$ and $n = 3$
A. $y = nx + 3$	$y = 3 \times 2 + 3$	9	$y = 3 \times 100 + 3$	303
B. $y = -nx + 3$	$y = -3 \times 2 + 3$	–3	$y = -3 \times 100 + 3$	–297
C. $y = x^n + 3$	$y = 2^3 + 3$	11	$y = 100^3 + 3$	1,000,003
D. $y = x^{-n} + 3$	$y = 2^{-3} + 3$	$3\frac{1}{8}$	$y = 100^{-3} + 3$	3.000001

SOLUTION 17

17 Work inside out by first solving for $g(1)$:

$$g(x) = 2x^2 \rightarrow g(1) = 2(1)^2 = 2$$

Then put 2 in for x in the $f(x)$:

$$f(x) = 7x + 3 \rightarrow f(2) = 7(2) + 3 = 17$$

SOLUTION 18

(C) Plug the freezing point of water in degrees C into the equation:

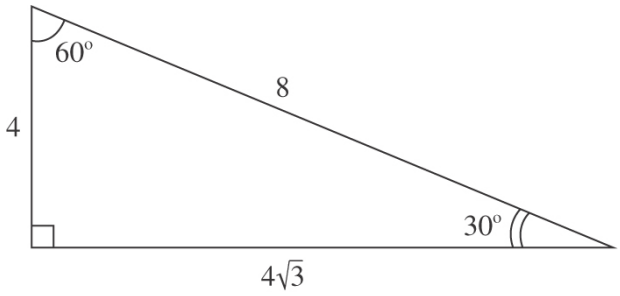
$$K = 273 + C$$
$$K = 273 + 0 = 273$$

Choice (C) is the only option that has 273 for the freezing point. You can also plug in 100 for the boiling point in degrees C. You will get 373 as the result.

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SOLUTION 19

4 You can see what the side lengths are of this particular triangle in the drawing below:



You can easily calculate these side lengths because this is a 30-60-90 triangle. So the side lengths can be expressed as x, $\sqrt{3}x$, and $2x$. (This formula is provided at the beginning of the Math section.) The hypotenuse of 8 equals 2x, and the shortest side equals x. Do the calculations to find the length of the shortest side:

$$8 = 2x$$
$$x = 4$$

Alternatively, you can just recognize that ratio of the smallest side to the hypotenuse in a 30-60-90 triangle is 1:2. So the value of the smallest side in a right triangle with a hypotenuse of 8 is 4.

SOLUTION 20

(C) Rewrite the table by calculating the actual sums:

n	Pattern	Sum
1	1	1
2	1 + 3	4

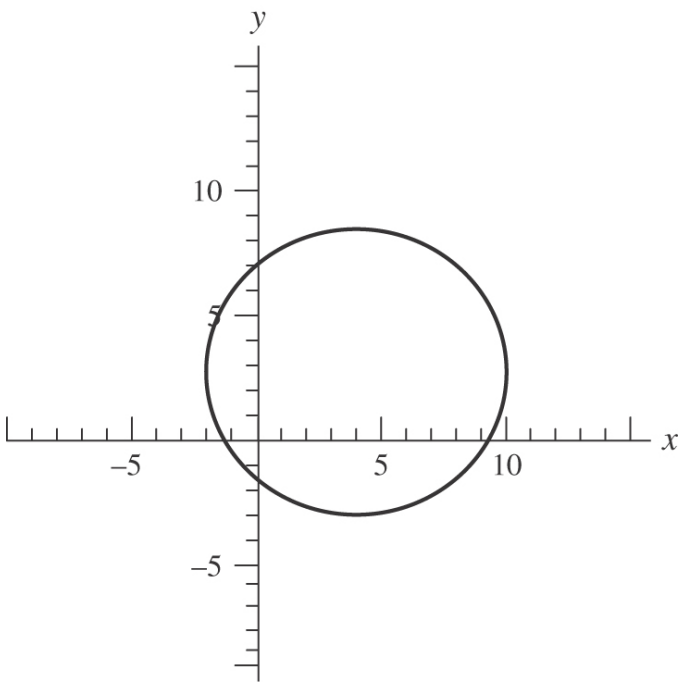
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n	Pattern	Sum
3	1 + 3 + 5	9
4	1 + 3 + 5 + 7	16
5	1 + 3 + 5 + 7 + 9	25

Each value in the "Sum" column is the corresponding value of *n* squared: $1 = 1^2$; $4 = 2^2$; $9 = 3^2$; $16 = 4^2$; $25 = 5^2$

SOLUTION 21

5 Based on the general equation of a circle, $(x - h)^2 + (y - k)^2 = r^2$, the center point is (h, k). For this circle, the center point is (4, 3). This point is a distance of 5 from the origin, which has the coordinates (0, 0). The graph of the circle is as follows:



You can calculate the shortest straight-line distance by using the distance formula or, even easier, recognizing that these numbers form a Pythagorean triple: 3-4-5. Recognizing that this is a Pythagorean triple will save you the time and trouble of calculating the distance using the distance formula.

SOLUTION 22

(B) Use the formula Distance = Rate x Time to make your calculations. The distance is 16 km/hour for the journey in either direction. The rates, however, are different. The rate going upstream is 1 km/hr less than the rate at which John is actually rowing because he is going against the current. The rate going downstream is 1 km/hr more than the rate at which he is actually rowing because he is going with the current. If x is the rate at which John is rowing, the time, u, to go upstream is:

$$d = ru \rightarrow 16 = (x - 1) \rightarrow u = \frac{16}{x - 1}$$

The time going downstream, t, can be calculated in a similar way:

$$d = rt \rightarrow 16 = (x + 1)t \rightarrow t = \frac{16}{x + 1}$$

Since the total time of the journey is 4 hours, combine these two expressions together into one equation:

$$\frac{16}{x - 1} + \frac{16}{x + 1} = 4$$

Then solve for x:

$$\frac{16}{x-1}+\frac{16}{x+1}=4\rightarrow\frac{16(x+1)}{(x-1)(x+1)}+\frac{16(x-1)}{(x+1)(x-1)}=4\rightarrow$$

$$\frac{16(x+1)+16(x-1)}{x^2-1}=4\rightarrow\frac{16x+16+16x-16}{x^2-1}=4\rightarrow$$

$$\frac{32x}{x^2-1}=4\rightarrow 32x=4x^2-4\rightarrow 4x^2-32x-4=0\rightarrow x^2-8x-1=0$$

Use the quadratic formula to solve:

$$\frac{-b\pm\sqrt{b^2-4ac}}{2a}\rightarrow\frac{8\pm\sqrt{(-8)^2-4\cdot1\cdot(-1)}}{2\cdot1}=\frac{8\pm\sqrt{68}}{2}=$$

$$\frac{8\pm2\sqrt{17}}{2}=4\pm\sqrt{17}$$

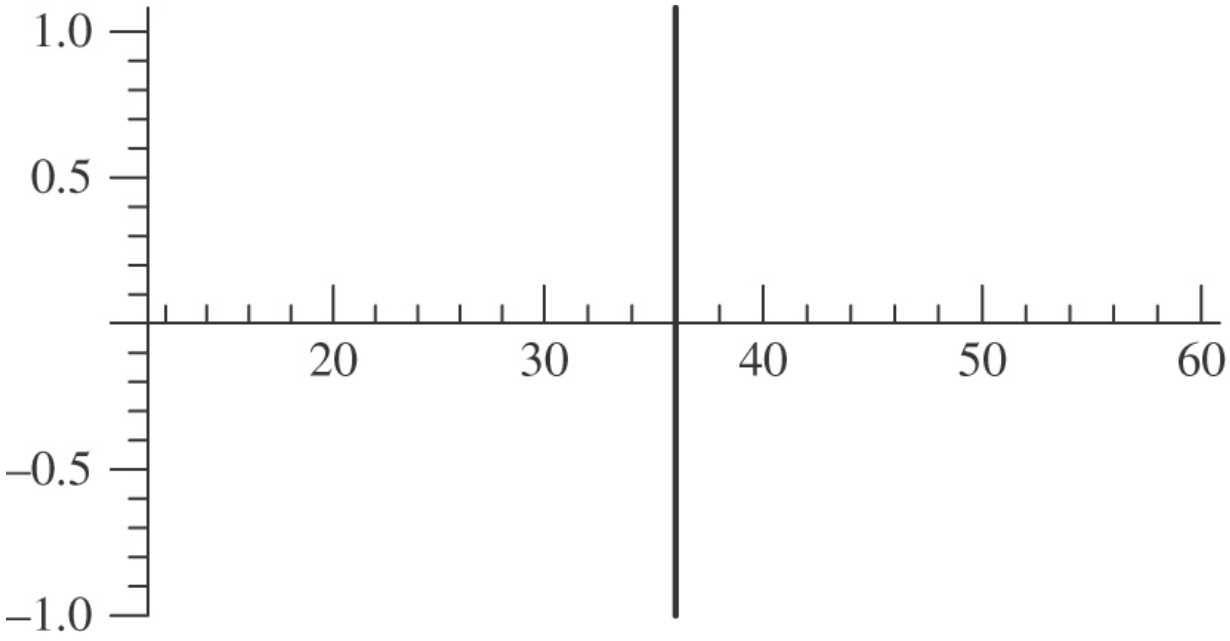
You get two solutions. However, you can use only $4+\sqrt{17}$, because velocity cannot be negative. The value of $4+\sqrt{17}$ is approximately 8.1.

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Math Module 2 Solutions

SOLUTION 1

(C) $x = 36$ does not have a y-intercept, because it runs parallel to the y-axis. Therefore, this equation never intersects the y-axis. Here is a graph of $x = 36$:



All of the other choices intersect the y-axis one time, because they have a y-value when $x = 0$.

SOLUTION 2

(C) Multiply 180 by 1.61 to get the maximum value of the speedometer in kilometers per hour: 180 miles/hour × 1.61 km/mile → the miles cancel → (180 × 1.61) km/hour ≈ 290 km/hour

SOLUTION 3

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(C) To format the equation like 3a + 4b, multiply the entire equation by 12:

$$\frac{1}{3}a + \frac{1}{3}b = 2 \rightarrow \text{multiply by } 12 \rightarrow 3a + 4b = 24$$

Because there are two variables with just one equation, you need to do some sort of manipulation like this; *a* and *b* cannot be solved for individually without having another intersecting equation.

SOLUTION 4

(A) The formula for calculating a percentage is Part/Whole × 100 = Percentage.

So *m* represents the overall percentage, *n* represents the part, and *x* represents the whole. Plugging these values into the original equation gives:

$$\text{Part/Whole x 100 = Percentage} \rightarrow$$

$$n/x \times 100 = m \rightarrow$$
$$n = mx/100$$

Alternatively, you can rephrase the question using concrete numbers:

"If 10 represents 50 percent of 20, how can we calculate the value of 100?" The only solution that gives the correct answer is choice (A):

$$\text{Part/Whole} \times 100 = \text{Percentage} \rightarrow$$
$$10/20 \times 100 = 50 \rightarrow$$
$$10 = (50 \times 20)/100 \rightarrow$$

This equation is in the same format as the equation shown in choice (A):

$$n = mx/100$$

SOLUTION 5

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4 Set up equations expressing the total costs for each DJ, where T represents time:

$$\text{DJ A's cost: } 300 + 150T$$
$$\text{DJ B's cost: } 200 + 175T$$

Set the equations equal to one another and solve for time:

$300 + 150T = 200 + 175T \rightarrow 100 = 25T \rightarrow T = 4$

SOLUTION 6

(D) Simplify by combining the like terms within the parentheses:

$$(x^2 + 3x^2)^3 = (4x^2)^3$$

Next, cube both the 4 and the x^2:

$$(4x^2)^3 \rightarrow (4^3)(x^2)^3 \rightarrow 64x^6$$

SOLUTION 7

(D) There are 3 teaspoons in each tablespoon. So multiply $3 \times 3 \times 2$ to get the 18 total teaspoons needed for the two cakes.

SOLUTION 8

2 Cancel out the y-terms on each side, and solve for x:

$4x - y = 1/2x - y + 7 \rightarrow 4x = 1/2x + 7 \rightarrow 3.5x = 7 \rightarrow x = 2$

SOLUTION 9

(A) For each hour the librarian works, he or she shelves a total of 220 items. Therefore, the total number of items shelved during T hours is $220 \times T$. The other answer choices have constants either added to or subtracted from the

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term multiplied by T. These answer choices would illogically mean that the librarian could shelve or remove items without spending any time at all doing so.

SOLUTION 10

12. Use the Pythagorean Theorem, $a^2 + b^2 = c^2$, to solve for the unknown side. Use 20 for the c, because it is the hypotenuse. Use 16 for a, because it is one of the legs of the triangle (you could also use 16 for b). Solve for the unknown side as follows:

$$a^2 + b^2 = c^2 \rightarrow 16^2 + b^2 = 20^2 \rightarrow$$
$$256 + b^2 = 400 \rightarrow b^2 = 400 - 256 \rightarrow b^2 = 144 \rightarrow$$
$$b = \sqrt{144} = 12$$

SOLUTION 11

(D) $2/k = x$ is undefined if $k = 0$. Dividing by 0 results in an undefined solution. All of the other equations have a solution for x when $k = 0$.

SOLUTION 12

(A) Since the company does not want the passengers to lose consciousness, the passengers must not experience g forces equal to or greater than 5. The only possible range of g-values is $g < 5$, in which all the g-values are less than 5.

SOLUTION 13

(D) The arithmetic mean is the average. Solve this problem using a weighted average. In other words, calculate the average by factoring in the relative amounts of the item sold by each store.

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Store	Price Before Sale	Quantity Sold Before Sale	Sale Price	Quantity Sold After Sale
Store A	$12.50	350	$11.00	400
Store B	$13.25	260	$10.00	520
Store C	$11.75	550	$9.50	625
Store D	$14.00	220	$10.25	460

Store A sold 350 items for $12.50 each, and Store B sold 260 items for $13.25 each. The total number of items sold is 350 + 260. You can compute the average as follows:

$$\text{Total Income/Total Number of Items Sold} = [(12.50 \times 350) + (13.25 \times 260)]/(350 + 260) \approx 12.8$$

SOLUTION 14

(B) When you are told, "Take an input variable," that refers to x. Then divide the x by 4 and subtract 5 from this, which gives the function $f(x) = x/4 - 5$.

SOLUTION 15

(C) Since there are three separate measurements that are each off by up to 2 units, you can determine the range of possible values by adding all the individual measurements together and then including a range of plus or minus 6:

$$48 + 56 + 40 = 144$$
$$144 + 6 = 150$$
$$144 - 6 = 138$$

Choice (C) shows the correct range.

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SOLUTION 16

(C) To minimize the overall gravitational force, the value of the numerator should be as small as possible, and the value of the denominator should be as large as possible. Out of the possible answers, choice (C) would best accomplish this. It would make the value of m_1 x m_2 as small as possible and make the denominator d^2 as large as possible.

SOLUTION 17

24. There are six faces to a cube, each of which will have the same edge length of 2 inches. Find the area of one of these faces by multiplying the length of the face by the width:. Then, multiply 4 by 6 to get the total area of all the cube's faces: $4 \times 6 = 24$.

SOLUTION 18

(A) Plug the given values into the equation:

$$\text{Final velocity} = \text{Initial velocity} + \text{Acceleration x Time}$$
$$\text{Initial velocity} = 4 \text{ m/s}$$
$$\text{Acceleration} = 6 \text{ m/s}^2$$
$$\text{Final velocity} = 22 \text{ m/s}$$

The final velocity must be at least 22 m/s. Set up the inequality so that the result for the final velocity could exceed 22 m/s:

$$22 \leq 4 + 6T$$
$$18 \leq 6T$$
$$3 \leq T$$

SOLUTION 19

(B) Divide 1.0×10^6 kg/m^3 by 990 kg/m^3 to determine by what multiple her weight will increase. Her weight will be 1,010 times greater. Then

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multiply 1,010 by 150 pounds to get 151,500 pounds.

SOLUTION 20

3 There will be infinitely many solutions if the two equations are multiples of the same equation. The coefficients of the A and B terms in $A + 2B = 4$ add up to 3 because they are 1 and 2. Since $XA + YB = 4X$ is divisible by 4 on the right-hand side, as is the other equation, the sum of X and Y must also be divisible by 3 in order for the two equations to be multiples of one another. To replicate the structure of the first equation, Y must equal $2X$ so that the two equations will be multiples of one another. To see this with greater clarity, consider this example:

$$A + 2B = 4$$
$$XA + YB = 4X$$

If the second equation had $X = 2$ and $Y = 4$, the equation would be twice the first equation: $2A + 4B = 8$. This equation is simply a multiple of the first one, making them essentially identical. As a result, there are infinitely many solutions since the equations overlap each other when graphed.

SOLUTION 21

(A) The height of Pam's television is 36 inches, because 48:36 reduces to her screen ratio of 4:3. You can determine how many inches of height the movie image will take up on Pam's TV by setting up a ratio: $1/1.85 = x/48 \rightarrow \times \approx 26$. Now subtract the height of the movie from the height of the TV screen to determine how many inches of screen height will NOT be used: $36 - 26 = 10$.

SOLUTION 22

(C) The different terms on the two sides of the equation equal each other. So $-16 = -8b$, $-6x = -abx$, and $x^2 = x^2$. Why? This occurs because the

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constants must equal each other, the terms with an x must equal each other, and the terms with an x^2 must equal one another. Since $-16 = -8b$, $b = 2$. Plug in 2 for b in the second equation and cancel out the $-x$ to solve for a:

$$-6x = -abx \rightarrow 6 = a \bullet 2 \rightarrow a = 3$$

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Digital SAT Scoring Chart

This will give you an approximation of the score you would earn on the Digital SAT.[1] Tally the number of correct answers from the Reading & Writing section (out of 54) and the Math section (out of 44). Take the total for each of these and find the corresponding section score in the tables below.

Number of Correct Reading & Writing Questions (out of 54)	Reading & Writing Test Score (out of 800)
0	200
1	210
2	220
3	230
4	240
5	250
6	260
7	270
8	280
9	290
10	300
11	310
12	330
13	340
14	350
15	360
16	380

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Number of Correct Reading & Writing Questions (out of 54)	Reading & Writing Test Score (out of 800)
17	390
18	400
19	410
20	430
21	440
22	460
23	470
24	490
25	500
26	510
27	520
28	530
29	540
30	550
31	560
32	570
33	580
34	590
35	600
36	610
37	620
38	630
39	640
40	650

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Number of Correct Reading & Writing Questions (out of 54)	Reading & Writing Test Score (out of 800)
41	660
42	670
43	680
44	690
45	700
46	710
47	720
48	730
49	740
50	750
51	760
52	770
53	790
54	800

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Number of Correct Math Questions (out of 44)	Math Section Score (out of 800)
0	200
1	220
2	230
3	240
4	250
5	280
6	300
7	320
8	340
9	350
10	360
11	380
12	390
13	400
14	410
15	430
16	440
17	450
18	460
19	480
20	490
21	500

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Number of Correct Math Questions (out of 44)	Math Section Score (out of 800)
22	510
23	520
24	530
25	540
26	550
27	560
28	570
29	580
30	590
31	600
32	610
33	620
34	630
35	650
36	660
37	680
38	690
39	700
40	720
41	750
42	770
43	790
44	800

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Add the Reading & Writing Test Score and the Math Section Score to find your total SAT test score:

_____ Evidence-Based Reading & Writing Score +

_____ Math Section Score =

_____ **Total SAT Test Score (between 400 and 1600)**

Approximate your testing percentiles (1st to 99th) using this chart:

Total Score	Section Score	Total Percentile	Reading & Writing Percentile	Math Percentile
1600	800	99+	99+	99
1500	750	98	98	96
1400	700	94	94	91
1300	650	86	86	84
1200	600	74	73	75
1100	550	59	57	61
1000	500	41	40	42
900	450	25	24	27
800	400	11	11	15
700	350	3	3	5
600	300	1	1	1
500	250	1	1	1
400	200	1	1	1

[2]

[1] Keep in mind that some of the questions on an actual SAT test will be research questions that will not count toward your actual score. For the sake of simplicity, we are including possible research questions in your calculation.

[2] Scoring data based on information at Collgeboard.org.