Marks Prep's Four Realistic SAT Practice Tests
Answer Explanations for Test 1

Question Types

Reading Question Types

WIC   **Words in Context:** These questions ask about the meaning or use of specific words or phrases as they are used in the passage.

COE   **Command of Evidence:** These questions are usually in two parts, with the first being a challenging reading comprehension question and the second question providing line numbers to choose from for the best evidence for the correct answer. When these questions are paired, **both** questions are coded as **COE** in the answer keys.

IG   **Informational Graphic:** These questions are based on what the test calls "supplemental materials," such as graphs, tables or maps.

RC   **Reading Comprehension:** These questions make up the remainder of the test questions, asking about such things as tone, main ideas, or inferences.

Writing Question Types

SEC   **Standard English Conventions:** These questions are based on rules for grammar and correct usage, covering topics such as punctuations, pronoun reference, sentence structure and more.

EOI   **Expression of Ideas:** These questions are based on the context of the passage, so there are no rules to learn to answer them. They often ask students to do certain compositional tasks, including ordering of sentences or paragraphs, transitioning between ideas, adding or deleting text, and much more.

Math Question Types

HOA   **Heart of Algebra:** These questions involve the kind of basic algebraic translation, equation solving, and linear expression found in a first-year Algebra class.

PAM   **Passport to Advanced Math:** These questions involve the kind of algebraic form changes and higher level functions found both in a first-year and a second-year Algebra class.

PSD   **Problem Solving and Data Analysis:** These questions include manipulating data from graphs and tables, as well as data representation topics such as percent, probability, and statistics.

ATM   **Additional Topics in Math:** These questions include geometry and trigonometry topics, plus a few lesser-taught topics such as complex numbers.

Answer Explanations Icons

Indicates that a test-taking strategy can be applied

Warns of a common error to avoid

Alerts to the possibility of using an alternative method

Reading Test

Passage 1

The first passage of the SAT reading test is always a literary passage, and so the key elements to look for are different than they would be in an informational or argumentative passage. For this passage, it is essential to identify the central characters and understand their relationships to each other. Another important aspect is tone: understanding the tone of not only the narrator but also the various characters will make the passage as a whole much more clear. In this passage, Henry Tilney is a bit pedantic, and he enjoys teasing both his sister Eleanor and friend Catherine Moreland. He tends to speak with an ironic tone. Eleanor teases her brother back and also uses irony regularly in her speech. Catherine is not quite as quick as the Tilneys. She speaks earnestly in all her words and often doesn't seem to understand exactly what Henry and Eleanor mean when they speak. Perhaps you can sympathize! Two tips for this passage and others like it:

1. Read the introduction! It is the clearest indication of both the full names of the characters and their relationships to each other—the narrator uses the name Catherine, while the other characters always call her "Miss Moreland." The fact that they are one and the same is easy to miss if you don't read the introduction!

2. Mark each character's initials in the margins to indicate who is speaking when. The speeches often proceed without any tags to indicate who is speaking, and the questions ask about specific characters' words, so doing so will help keep things straight and lead to correct answers.

1 **C** RC   You need to understand Henry's character as a whole to get this one correct. Choice (A) is not supported by lines 3–4 at all—he may not like the book, but that's not what he says here.

Choices (B) and (D) are there to tempt you to see Henry's words as sincere—only choice (C), which indicates that Henry is choosing to pretend not to understand and that he is teasing Catherine, fits with the character and the lines referenced.

2 **D** WIC   This is a words-in-context (WIC) question that is based on an idiomatic expression rather than the dictionary definition of the words, so don't just think about what the words mean.

Re-read the sentence starting in line 8 and replace the phrase with your own words to fit the context. Eleanor says that her brother finds fault with her way of speaking all the time and that he is now "treating Catherine the same way." Looking at the answer choices, only (B) and (D) are close to this, but (B) is incorrect because the treatment is in no way romantic!

3 **A** RC   It is important to consider this reference as a continuation of the same teasing speech the last question referred to. (B) might be tempting, because her knowledge of these men does show that she is well-read, but she is not mentioning them for the purpose of showing off—she is teasing her brother for being pedantic in response to Catherine's use of the word "nicest."

4   **A** COE   This is the first of a pair of Command of Evidence (COE) questions. The test often sneaks these on the bottom of one page so that you won't notice that it is only one part of a two-part question!

Don't try to answer it without first going to the line references provided in question 5. After reviewing those lines, we can readily choose (A), as explained below. Choice (B) is particularly tempting without making reference to the specific lines—we know that Henry is mocking Catherine, and there is no reason to believe that he doesn't disapprove of what he speaks of. Choices (C) and (D) are easier to rule out—they both suggest he is being sincere in his use of the word "nice."

5   **D** COE   You want to read these lines before choosing your answer to question 4: the correct answer here is easy to pick out if you work carefully. Further, once you have this one correct, the previous question is delivered to you on a silver platter with a nice bottle of wine. Choices (A) and (B) feature Eleanor and Catherine, respectively, so we are unlikely to understand Henry's intention from their words. Choice (C) is immediately after the lines referenced in question 4, but it provides no clue as to his purpose in using the word "nice" in the preceding lines. Choice (D) gives us a direct statement of his complaint: "But now every commendation [mention of praise] on every subject is comprised in that one word [nice!]." Thus, we can choose (D) and go back and pick (A) for question 4, because it references the overuse of the word "nice."

6   **C** RC   This question requires you to make an inference about the reading preferences of Catherine based on the passage as a whole. Luckily, she has talked about little else but her reading preferences throughout the passage! We know that she enjoys the gothic novel *The Mysteries of Udolpho* (lines 1–2), and she tells us she doesn't like other kinds of reading much, other than poems and plays, and that she particularly doesn't like history (lines 34–37). Based upon this, the word "novel" in choice (C) makes this answer a good bet.

Another way to answer this question is to use the process of elimination and cross out the wrong answers. Choice (A) is the easiest answer to dispose of, since it is clearly a book about history, but (B) or (D) might be tempting, given that one mentions plays and the other mentions journeys, but you have to make sure that the ENTIRE answer is correct, not just part of it. Both of these answers present texts of historical analysis—of the accuracy of speeches and of the impact of an explorer. This kind of "serious history" is just what she does not enjoy!

7   **A**   WIC   This (WIC) question simply requires that we return to the text to get its meaning.

Choice (B) tempting if you don't go back to the passage—"a newly developed technology" sounds like a great definition for an invention until you read how the word is used in the passage. When we re-read the lines, we can see that "invention" must mean something like "made up": only choice (A) gives us an answer that fits with this meaning. "Fabricated" means made up—don't rule the answer choice out if you don't know this word!

If you don't know the word "fabricated," you can eliminate all the other choices and still get to the right answer. We know that choice (B) is irrelevant to the passage, and choice (C) is relevant to the topic but does not make sense in either line 45 or 48. Choice (D) is somewhat tempting for a careful reader who realizes that invention is used to mean something that is not true, but the inference required is too large: we cannot assume that the authors are intending to deceive anyone based on what the passage states.

8   **B**   COE   This is the first of another COE pair, and answering the second question first makes this otherwise very difficult question very easy. Once you see that the answer to question 9 is (D), you know that she calls the speeches "embellishments" written by the authors themselves and that she likes them. An almost perfect match for choice B!

9   **D**   COE   This is a perfect example of how to use the strategy of answering the second question of a COE pair first. You want to find which section tells Ms. Tilney's view of the speeches in history books, and only choice (D) actually does this at all.

Choice (A) seems to answer the question, but it is Catherine Moreland's view of speeches in history books, and so is irrelevant! Choice (B) is Ms. Tilney's statement, but she is merely reflecting Catherine's view back to her, not speaking her own view at all.

Choice (C) is tricky: it is Ms. Tilney speaking, but she speaks about the supposed *facts* recorded in history books, not the speeches. Beware! This answer corresponds perfectly to choice (D) in question 8, so you have to be certain to read carefully to determine which lines actually answer the exact question asked.

10   **A**   RC   Unless you are quite erudite, reading the footnote is essential to answer this question. In it, you learn that the gentlemen mentioned in the question are historical figures whose deeds are recorded in history books by contemporary historians, such as those mentioned in lines 61–62. Knowing that this comparison is the general purpose allows us see that (A) and (D) seem like possible answers.

Choosing between these two answers can be done in two ways: (1) if you understand her point, Ms. Tilney is expressing a preference for the "inventions" of contemporary historians, which makes choice (A) the best choice; (2) if you closely examine the two answers, choice (D) suggests that the speakers of the past are compared to "later rhetoricians," persuasive speakers, but she is comparing past speakers to historians, not other speakers. Remember that often just one word can make a tricky answer choice incorrect!

Passage 2

This passage is a social science passage, and it is part of what the test makers refer to as the "great global conversation," which is comprised of contemporary or classic readings on significant social or political topics. In this passage, Mary Fisher addresses the then-emerging issue of the AIDS crisis. This passage is neatly organized into relatively short paragraphs, and it is clear in its rhetorical purpose throughout. Fisher wants to inform her audience about the realities of AIDS and call for sympathy and support for those who suffer from the disease, and all of the passage is clearly directed toward these aims. The passage includes a pair of graphs—this is worth noticing upon initial reading, but don't bother studying or trying to perfectly understand the graphs before you start the questions. When questions ask directly about the graphs, use them to answer those questions, but don't worry about them as you complete the rest of the passage and questions.

11 **A** COE   This is the first of a pair of COE questions. The context of the passage suggests that the author might support the actions described in each of these answer choices, but only one is stated in the passage directly—choice (A).

To understand why the lines in the next question support this answer choice, you must understand the third paragraph in detail. It begins by suggesting that HIV patients are often stereotyped and goes on to explain why this stereotyping is unfair and misguided. This is an instance where using the line numbers in the second COE is very helpful!

12 **B** COE   Choice (A) describes the dangers of AIDS but does not include specific suggestions about how to respond. That comes later. Choice (C) describes the effect membership in the Republican Party has had on the author, but does not relate directly to the primary discussion in the passage. Choice (D), similar to choice (A), describes the fears associated with AIDS along with how people perceive those fears. Choice (B) explains that AIDS patients are worthy of compassion and support. This is in stark contrast to the stereotypes that are often negatively applied to such people, as described in this paragraph.

13 **C** RC   In this context, "though" is used to mean "despite the fact that." The author begins sentences with "though" to show how she is affected by AIDS despite the fact that she is not a member of the populations most directly and strongly impacted by the disease at that time in America. In this way, she is showing how she is similar to people within those groups and how she is an example of how faulty the stereotypes about AIDS victims are.

14 **D** RC   Notice that the author states in this sentence that "people with HIV have *not* entered some alien state of being." The author here is arguing that AIDS patients are not fundamentally different from other people. Choice (D) is correct, as the author is contradicting the mistaken assumptions of others about AIDS patients, but the word "belie" may not be familiar to you, which could make it hard to choose this answer.

Even if you do not know this word, you can still get this correct if you know what you are looking for, which is that "AIDS patients are not fundamentally different from other people." If we know that this is the correct idea based on the passage, we can use this information to rule out all the other answers. Choices (A) and (C) are clearly opposite to the intended idea of the passage, and choice (B) treats the description as if the "alien state" were about physical characteristics, which we know it is not.

15   **A**   COE   This is another COE question that can be answered most effectively by using the answer choices in the following question to find the answer in the passage. Carry on to question 16!

16   **B**   COE   Here, choice (B) provides the best evidence, although noticing this requires looking at the context of the lines and not only the lines themselves. Without reading the start of the paragraph in which lines 36–40 appear, it would be difficult to notice that the "them" in these lines refers to President and Mrs. Bush. The other answer choices discuss only the responses to President Bush's response to the AIDS crisis, rather than the way in which he himself responded.

17   **C**   WIC   Always consider the full context of a word for any WIC question. All four choices arguably work grammatically and choice (D) is particularly tempting in the context of the individual sentence by itself, but only choice (C) fits the context in the paragraph as a whole. This part of the passage is discussing the hypocrisy of ignoring the AIDS epidemic. The first sentence of the paragraph—all the way back in line 46—is the most direct indication of the best meaning of "integrity" in line 50, so remember to look at the context fully to choose the best meaning!

18   **C**   WIC   Choice (B) is a very tempting answer, especially if you read the introduction to the passage. It is arguable that the author is referring to her own party as "we," but she is not using "you" to refer to those "who don't wish to show compassion." Choice (A) is incorrect because some people in the category of "you" (those without fear) are included in "we" as well, regardless of exactly how "we" must be defined here. Choice (D) may be tempting because the author has AIDS. However, she is speaking primarily to an audience that does not and is advocating action by those who do not. Rather, "you" refers to people who do not fear that AIDS may impact them or people they care about. Choice (C) best defines "we" and "you" in this context.

19   **C**   RC   Answer this question for yourself based on the passage rather than going directly to the answer choices. The quotation describes the reactions of the public during the Holocaust and is referenced to relate that reaction to the public response to the AIDS crisis. Choice (A) refers to the devastation caused rather than the public response, so is easy to rule out if you have answered the question for yourself before reading the answer choices. The quote is not primarily religious in nature nor does it primarily relate to a theological issue, which rules out choice (B).

Choice (D) is tempting, because it suggests that the historical precedent is applicable to the current discussion, but it is incorrect because the quote does not provide the proper response but a dangerously ignorant response. Choice (C) alone shows that the analogy between the two is based on that response—one which suggests that a widespread problem is "not my concern."

20   **B**   IG   This informational graphic (IG) question can be tricky, as the two graphs look quite similar at first glance. If you look closely, however, you will notice that the scale of each graph is quite different. The numbers on the Adult Cases graph are much higher than those on the Pediatric Cases graph. Choice (B) is therefore correct because there were many more adult cases than pediatric cases. The graphs do not give the necessary information to know if either of choices (A) or (D) is true. Choice (C) is false because the two graphs are very similar in appearance, which tells us that the rates of change in both data sets have been similar over time.

Passage 3

This passage is one of two science passages on the test. Because science passages tend to be loaded with terms and names, be sure to circle all terms and names as you read them in the passage. This habit will keep you focused as you read and is often useful for finding key information to answer questions. In this case, the article presents information on a specific topic rather than a specific study or researcher, so you need to keep names like Fetz, Nicolelis, Donoghue, and Chen straight so that when you are asked about specific people's work or ideas, you can find them quickly. It is also, as always, important to identify the main idea of the passage: here, the article discusses research and developments in brain–machine interfaces and considers their applications and possibilities.

21 B RC Use the main idea of the passage to answer these first two general questions! This passage focuses on the advancements discovered through research into a treatment option for some forms of paralysis, which makes (B) the best choice.

22 D RC The trick to this question is finding an answer choice that correctly characterizes the author's main point as optimistic, but not too optimistic. The passage does not claim that the brain-machine interface technologies being discussed are a cure for paralysis, but rather that they have promising and interesting applications, as in choice (D).

23 D WIC Like many WIC questions, this one includes the most common meaning of the word as an incorrect answer, "transport" (B).

This is a great question to answer for yourself based on the passage instead of going straight to the answer choices. This sentence is about how technology is being advanced through the insights gained by the research discussed in the passage, so a good write-in for this question would be something like "bring forward," "advance," or the correct answer, "stimulate" (D).

24 C COE This is a COE question, so make sure to use the answer choices in the following question to help figure out which answer is best for this question. Choice (C) is correct and matches the correct line numbers in the following question.

25 B COE Notice that only choice (B) actually features a quote from Fetz! Lines 56–59 discuss the brain-machine interface research of Fetz and his team, but nothing about the development of related technology. Lines 15–18 and Lines 89–92 might seem tempting, but the previous question begins with "[a]ccording to Fetz." Lines 15–18 are by Nicolelis, and 89–92 are quotes by Chen, not Fetz. Choice (B) is correct because lines 31–35 give Fetz's description of how the development of brain-machine interface research is operating in parallel with the development of related technology.

26 C COE This is another COE question that should be answered by using the line numbers in the second question of the pair. Choice (C) here is best because it is explained as an advantage of using electrodes implanted deep within the brain as described in the passage.

27 **B** COE Choice (B), lines 50–52, describes a way in which electrodes implanted deep within the brain are superior to other types of electrode sensors. The lines in choices (A) and (C) explain a result of a study involving the use of brain electrodes but not an advantage of the use of that kind of electrode over others. The lines in choice (D) make no direct mention of brain embedded electrodes.

28 **D** WIC This is another WIC question, but one that uses a (probably) familiar word in a very unusual way. The sentence involves a feeling only within the mind, rather than one brought about as a result of physical presence, so choice (D), "imagined," most closely matches the odd use of "phantom" in this sentence.

29 **A** RC This is another great question to illustrate the importance of writing in your own answer! If you don't do so, choice (D) will probably be tempting, because it presents a fairly accurate claim about the reference, but does not give the *reason* that Nicolelis made the reference. In the passage, "they like grapes" is mentioned shortly after Nicolelis tells us that the monkeys can reliably steer wheelchairs to get grapes. The reason that it matters to us that the monkeys like grapes is that the grapes provide a motivation for them to learn to use the wheelchairs well. That way they can get the grapes that they like!

30 **D** RC Hopefully you circled the names in this passage so it was easy to look up "Fetz" and "Chen" in the passage when trying to figure out what their attitudes were. Fetz has a few positive and optimistic comments about the advancing technology, such as those mentioned in lines 31–35 and 59–61. Chen, on the other hand, focuses on the current limitations and how we still have a long way to go before this technology will be as helpful as possible as in lines 83–85.

Choice (D) alone shows the proper relationship, contrasting the "tentative" Chen with the "optimistic" Fetz.

Passage 4

This is a paired passage, and it is a fairly difficult one because of how old it is and because of the level of rhetorical sophistication of each speaker. The topic of these passages is history, as each of the pair presents an excerpt from the famous Lincoln–Douglas debates. Often, it is best to read the first passage and then answer the questions about it only (31–34, in this case) and then read the second passage and answer the questions about it (35–38) and finally to do the ones about the two together. This prevents the perspective and information in the second passage from "intruding" into your answers on the first, and vice versa. However, it is also essential to understand how the two relate to each other. As you read the second passage, you want to ask yourself what it has in common with the first passage and how it is different from it. In this case, the two share a common topic—slavery in the United States—but come to opposite conclusions about what should be done about it, based primarily on differing views of the United States as a whole and the relationship between the collective and the individual states that make it up.

31 B COE Notice that this is the first of a paired COE set. Skip 31 for a moment, and move on to question 32. After you have decided that answer choice (B) for question 32 is correct because author refers to the founding fathers as "great men" in lines 9–15, come back to this question. Let's try to match up "great men" to one of our answer choices. If you know all of these words, you can readily choose (B)—"paragons," meaning "exceptional people"—as the best answer.

Some of these answer choices include pretty hard vocabulary words, so you may not know all of them. You can still use the process of elimination to find the right answer. Choice (C) may be the easiest to cross off because "conservatives" is fairly familiar and does not have the same meaning as "great men." Choice (D), "heroes," doesn't seem to quite capture the author's attitude toward the founding fathers correctly—he doesn't remark upon their courage or other heroic traits. We've thus got it narrowed down to two choices, so we've got a 50-50 chance if we are unfamiliar with the remaining words. If you recognize the root word "chronos," meaning time, in choice (A), you can probably eliminate "anachronisms," which means something or someone out of its proper time, such as a dinosaur in 1920s New York or a stopwatch on the wrist of the Odysseus.

32 B COE Remember that for this question you are looking for the line numbers where you can find the answer to question 31: how does the author view the founding fathers? In line 11, the author places Washington and other founding fathers along side "the great men of that day." Therefore (B), the answer choice containing line 11, is correct.

33 A RC If you read the passage carefully, you know that the author speaks primarily about his belief that the country can and should continue to exist divided into slave and free states. How does he make this argument? The author insists that "people necessarily required different laws and regulations in different localities" (lines 19–20) and that "[o]ne of the reserved rights of the States, was the right to regulate the relations between Master and Servant." In other words, each state is different and should be allowed to make its own laws regarding slavery. Therefore, answer choice (A) is correct.

34 C RC The author describes the contrasting geographical features of New Hampshire and South Carolina to emphasize that each state is different and therefore needs different laws. If you followed the author's argument as you read, you can quickly choose (C) as the correct answer. Although choice (B) also indicates that the author is emphasizing differences between the states, he does not argue that these differences are irreconcilable. In fact, he claims that the various states can continue to coexist despite their differences.

35 **D** COE This is the first question about Passage 2, and that is where you need to look for the answers to this and the next three questions.

Notice that question 35 is the first of a pair of COE questions, which means that you should answer question 36 first and then come back to this question afterward. According to the correct answer for question 36, the author says that the institution of slavery has always created discord and division. Therefore (D), the answer choice that describes slavery as a source of conflict, is the correct answer to 35.

36 **B** COE Choosing the correct answer to this question may be a little trickier than other Command of Evidence questions you have encountered. Answer choices (B), (C), and (D) all direct you to lines in the passage that describe characteristics of slavery recognized by the author. In the line numbers from choice (B) we learn that the author views slavery as an institution that has always been "an element of division."

In the lines from choice (C)—probably the most tricky answer to eliminate—the author expresses that slavery is an institution that has existed in some states for 80 years, but in the context of conceding that the states are different in this regard, which is not his point about slavery, but his opponent's. In the lines from choice (D), the author expresses the founding fathers' view that slavery is an institution that they restricted by ending the slave-trade and curtailing its spread to new Territories. Each of these choices might seem as though it contains an answer to the question, but only (B) gives the author's own view about the institution of slavery.

37 **C** WIC Be careful! The word "constitution" is used in both Passage 1 and Passage 2. However, in each passage the word is used differently. Remember: words may change their meaning depending on the context in which they appear. No matter how tempted you may be to answer a WIC question without referring back to the passage, *always* look back at the line number you are directed to in the question.

If you don't look back, you might choose (A), "governing document," because "Constitution" is used in line 16 and line 30 to refer to a particular governing document. In line 66, however, "constitution" has the connotation of "composition," and so (C) is the correct choice.

38 **A** WIC Again, to answer this WIC question look back at the passage. In this case, we are directed to line 82. If you are unfamiliar with the word "abrogation," don't worry!

Simply substitute a word of your own that makes sense in the context of the sentence and then try to match that word with an answer choice. From the sentence in which "abrogation" appears, we learn that the founding fathers cut off the source of slavery by the "abrogation" of the slave trade. What is another word that makes sense here? Maybe "elimination" or simply "cutting off" which is used in line 81. Now it's easy to realize that the answer is (A), "abolition."

39 **C** RC   This is the first question that refers to the authors by name and it's important to know who said what!

💡   Before you read the passages, did you read the introduction? This is where you'll find which author wrote which passage (Hint: Douglas wrote Passage 1, and Lincoln wrote Passage 2). Throughout the passage, Douglas argues that the founders of the country supported the right of states to make their own laws governing slavery. Lincoln does not agree with him, as stated in (B). Rather, Lincoln argues at the end of Passage 2 that the founding fathers created national laws to keep slavery from spreading. The answer choice which best states these positions is (C).

40 **A** COE   Another COE pair! Are you getting the hang of these?

💡   Let's hold off on this question for a moment and answer 41 first. After finding in the line numbers from question 41 where in the passages the authors agree, it's not hard to answer this question. According to our answer from 41, both authors agree that the country is made up of unique states. If you compare this to the answer choices, you will see that (A) is the correct answer.

41 **C** COE   The authors of these passages don't seem to have many beliefs in common, but for this question we are looking for where they do agree. Re-read the lines you are directed to in the answer choices, and compare what is stated in the first passage to what is being said in the second passage. Answer choice (C) is correct because it directs you to places in the passages where both authors talk about the physical differences as well as the differences in local institutions that exist in different parts of the country.

Passage 5

Another science passage, this one is a bit more rhetorically complex than the previous science passage, but it is still filled with names and terms, so circling these as you encounter them is a good strategy. It is, however, less of a mere overview of a topic and more of a purposeful argument, using evidence to support a claim. That claim is that a curious pattern of migration can be accounted for by the continents having drifted apart through time. Understanding how the evidence and argument work together in this passage will help you to answer many of the questions.

42 **A** COE   This is the first of another COE pair. Go ahead and answer question 43 first and then come back to this one when you have decided what lines best represent the author's description of the turtles' journey. You will have found that the answer to 43 is (C) because it best matches one of the answers listed for this question. All you have to do now is indicate which answer that is—choice (A), "a curious phenomenon."

43 **C** COE   Don't be fooled by the line numbers in answer choice (C), the correct answer. Just because the lines direct you to a question rather than a statement doesn't mean that you aren't provided with an understanding of the author's position. The author uses a rhetorical question in lines 40–42 to emphasize that the 2,000 mile migration of the green turtle is an unusual and surprising behavior (this matches nicely with choice (A), the correct answer to question 42). Indeed, the fact that a question is the best evidence supports the idea of its being curious, as it has aroused the author's curiosity enough to ask the question! Choice (A) is not about the turtles' migration at all, and choices (B) and (D) reveal details about the turtles' journey, but not the author's perspective about it.

44 **D** RC   For this question, let's read through all the answer choices and eliminate those that don't describe the structure of the passage. Choice (A) is incorrect because the passage is not a narrative, and the author discusses the turtles' migration habits over millions (not hundreds) of years. Choice (B) is incorrect as well. Although the passage explains the theory of plate tectonics, this theory is neither revolutionary nor the main focus of the passage. Choice (C) also incorrectly identifies the structure of the passage as an "interpretation of turtles' motives." The words "interpretation" and "motives" are inappropriate references for the nature of the passage as a whole and the way the turtles are described in the passage, respectively. The author only briefly mentions that green turtles migrate to breed on sandy beaches, but this can hardly be labeled as a "motive," a term which is restricted to human reasoning for actions. We have eliminated three answer choices and only (D), the correct answer, remains.

45 **C** RC   This is an analogy question, which many students find quite difficult because it requires you to go beyond what is directly in the passage. In order to get it correct, you have to understand the point being made in the lines referenced: the idea the author conveys in these lines is that researchers should pay attention to geological history in order to understand some aspects of modern biology. Choice (C) is correct because it describes an approach to studying genetic characteristics of a (human) animal without paying attention to the geology of the past, a direct violation of what Gould advocates in lines 6–10.

46 **C** WIC   This is a WIC question that gives a (likely) familiar word which has shades of meaning that can make the term more or less positive. "Astounding" suggests that one is stunned, which can mean alarming or even horrifying in extreme cases, but these words are both too negative to suit this sentence.

Choice (B) makes good sense of the sentence as a whole, but "astonishing" does not mean "good," so this is not an acceptable synonym.

47 **D** COE   This is the first of a pair of COE questions, but it is one of the pairs that you may find easier to approach by answering the two questions together rather than by simply answering the second one first. See below for the reason that solving the second question in isolation from the first might be difficult. To easily eliminate the incorrect answers to this question, refer back to lines 25–59. If you had originally read through the chosen sections particularly closely, you should now be able to cross out (A) and (B) from question 48 fairly quickly and then cross out answers that don't relate to choices (C) or (D). (A), (B), and (C) are all either irrelevant or inaccurate based on the passage, so the best answer is choice (D) for question 47, which restates what the author says in choice (D) of question 48.

48 **D** COE   If you take on the line numbers first in this pair, you should be able to fairly readily eliminate choice (A), as it is clearly just a single reference to one aspect of history that is not developed or central to the passage as a whole. Since we know that the passage as whole—and these paragraphs in particular—is primarily about the turles' migration, we can also eliminate (B) fairly readily, because it discusses the turtles' breeding and feeding habits without direct reference to their migration.

Choices (C) and (D) might both seem possible, as they are both about the migration, which is the main point of these paragraphs. There are two ways to make the right choice between them. Since choice (D) gives the claim about the migration and choice (C) merely asserts that the migration is completed successfully, you may be confident enough to choose (D) and then match it up with (D) in 47. However, if you cannot choose between them, go back to the first question and think about which answers might relate to which lines. In question 47, we can eliminate (A), (B), and (C) as not clearly related to either choice (C) or (D). Choice (D) in 47 is a perfect fit for lines 48–52.

49 **B** RC   This is a tough question because it only gives line numbers and doesn't ask a specific question at all.

Thus, you want to revisit lines 48–73 quickly to remind yourself of the purpose of these lines and then read through the answer choices to eliminate answers that don't fit with what you find in the passage. We can quickly rule out choices (C) and (D) because although the passage explains that coral reefs prevent the erosion of islands, it does not say whether either Ascension or Iceland are surrounded by reefs. (A) is also incorrect. The passage indicates that Africa and South America, not North America, were at one time contiguous, and it gives no indication that the continents will reconnect. (B) is the correct answer. We can infer from the author's description of island formation along ridges that new islands may continue to be formed in this manner along the Mid-Atlantic Ridge.

50　**C**　RC　This is a very tough question, because Carr's theory is fairly complex and it is explained only very briefly in lines 48–82, requiring the reader to pick up pieces of his explanation along the way.

Choice (A) is tempting, but it contains two key inaccuracies. First, it claims that the island itself has moved, which is not what the theory suggests. Second, it indicates that the turtles have always swum to the *same* island, but Carr refers to the island they initially swam to as "proto-Ascension" in line 76, which is the clearest indication that the island is *not* the same. Choice (B) is incorrect because it situates the change in an evolving ability in the turtles, whereas the theory is based on change in the geology of their migration, not their swimming skills. Choice (D) is *very* similar to choice (C), but it claims that the Mid-Atlantic Ridge destroyed the turtles' migratory island, whereas the passage claims that sea waves eventually eroded the islands away. Choice (C) accurately represents the theory as explained in the passage, and thus is correct.

51　**B**　RC　In lines 79–82, the author compares the gradual lengthening of the turtles' migration to the process of a jogger who runs a little farther every day until finally covering many miles in a single run. Illustrating a concept by making a comparison to an example in this fashion is called an analogy, which makes choice (B) correct.

If you are not familiar with all the vocabulary in the answer choices—especially if you are not sure what an analogy is—you can still get this question correct by using process of elimination. You can eliminate (A) because no elements or ideas are repeated and (D) because the extreme length of the turtles' journey is a fact rather than an exaggeration. Choice (C) is probably an unfamiliar word for most students, so you may have to take your best guess and between (C) and (B), which at least gives you a 50-50 chance. If you recognize the "meta" root—Greek for "change," as in metamorphosis and metaphor—and the "nym" root—from the Greek word for "name," as in synonym and antonym—you might be able to guess that metonymy means "a change of name." As a literary term, "metonymy" refers to the use of a closely associated term in the place of another term, as when we speak of the executive branch of the US government in the phrase "the White House released a statement today." The White House is literally a house, so it doesn't do anything at all! And now, you know what metonymy is, and that's a lot of knowledge for a wrong answer.

52　**B**　IG　This question is one of the few IG questions that requires you to use your ability to interpret visual information. Take a look at the maps that accompany the passage. What do they show? Could they support the explanations in the passage?

You want to answer this core question for yourself first, so that you can eliminate the two wrong answers—the "Yes" or "No" pairs—immediately. The maps seem to show the positions of the continents millions of years ago and their positions as we know them today, which supports the author's claim that the turtles' journey has lengthened over time because continents drifted apart, and so (B) is the correct choice.

You may notice that answer choice (C) also provides a correct interpretation of the maps—nowhere is the turtle breeding ground labeled. However, this does not mean that the map does not provide other information to support the author's claim as choice (B) makes clear, which is why the essential first step on IG questions is to figure the answer out for yourself before you even read the answer choices. Often, wrong answer choices provide accurate information about the figures, but this information does not answer the question that was asked.

Writing and Language Test

1 A EOI Because the entire paragraph follows a chronological progression, the information about the time these events took place is important to add. If you are uncertain about whether to add the phrase, notice that none of the other three answers are true about the phrase!

2 B EOI Again, the chronological arrangement of the paragraph is the key to answering this question. Because the date 661 is earlier than any other date in the passage, we want to move it to beginning of the whole passage.

3 D EOI Since all the other options include redundant material, the best answer is (D).

Always notice when one answer is shorter than the others: it is often the correct answer, and a good clue to look for redundancy or wordiness in the other options.

4 B EOI This passage is obsessed with dates, and choice (B) has got 'em! The question asked for <u>specific chronological information</u>, and (B) is the most specific.

Don't be fooled by choice (D)—a century is a long time, but it is not as specific as exact years.

5 B SEC This is a parallelism question, so we need all the items in the list to be the same grammatical structure. Choice (B) provides one gerund, overseeing, and then lists four objects, all nouns.

Remember that lists cannot mix verb forms and nouns!

6 D SEC Since what comes before the comma and what comes after it in this sentence are both independent clauses, we need to fix the comma splice in the original sentence. While there are many ways to punctuate two independent clauses in a sentence, choice (D) provides one—a semi-colon can always replace a comma to correct a comma splice.

7 A SEC This subject-verb agreement question requires us to find the subject for the underlined verbs—when you go back in the sentence, you should find that "Ayatollah" is the subject, which is singular, so we need both verbs to be singular forms, as they are in (A).

Two quick tips:

- Notice that "authorities" is the closest noun to these verbs, but it is NOT the subject. Since it is part of a nonessential and is the object of a prepositional phrase, it CANNOT be the subject of the sentence.

- Notice that choice (B) and (C) both "mix and match" verb forms, giving one singular and one plural form. Since a subject cannot be simultaneously singular and plural, you can rule both of these out, even if you cannot tell whether "Ayatollah" or "authorities" is the subject of the sentence.

8   **A**   EOI   This is a standard but tricky question type on the new SAT, one which makes you choose the best transition word. The choice here is not at all grammatical—all options are grammatically correct—nor is it based on how it "sounds." Rather, you must choose based on the context of passage as a whole.

⚠   This question is particularly tricky. "Finally" is tempting, since this is the last paragraph of the passage. However, none of the transition words indicated provide an appropriate introduction to the paragraph. Consider:

"However" indicates contrast, and this last paragraph is summarizing the passage, not offering something different. "Therefore" indicates causality, but the previous paragraph has not given the reasons for the deviation mentioned but merely given the ways in which Iran has deviated from the rest of the Middle East. Although "Finally" is tempting, it doesn't make sense in the passage. The whole passage thus far has been arranged chronologically, but this last paragraph is a summary of the whole, and this sentence actually goes back to the beginning of the passage, rather than being the "final" event discussed.

💡   Always remember to read well past the underlined section on a "transition" question, because you need to understand what follows the underlined portion to know how to move from the previous part of the passage to the new section.

9   **C**   SEC   This is a misplaced modifier question, which is rarely tested on the new SAT, but is easy to get correct if you recognize it. Because the sentence starts with a participle—an "-ing" or past tense verb form used as an adjective—the subject of the sentence MUST be the person or thing doing the action of the participle. Thus, the subject of the sentence must be the ulema themselves, not their power. Choice (D) also seems to make "ulema" the subject, but introduces the faulty form "ulemas's."

💡   Remember that 's and s' are used at the end of nouns to show POSSESSION, not to make them plural.

10   **B**   SEC   This is an idiom question, which many students find tricky. Technically, an idiom is not based on any rule—the term comes from a Latin term meaning "only like itself," so we cannot memorize or study any rule to know what is correct about these "one of a kind" questions.

💡   The best method to determine the right answer for an idiom is to read through all the options and choose the one that sounds best and expresses the intended meaning of the sentence. "Unique of" and "unique towards" are simply faulty forms, but "unique to" is wrong because of context. Iran's history cannot be "unique to" others—the history discussed is "unique to" Iran. Thus, "unique to" is acceptable idiomatically, but it does not make sense in this sentence.

11   **A**   EOI   This is a sentence-combining question that asks which choice is most effective; thus, all the choices are grammatically correct. The best choice for these types of questions is the one that shows the relationship between the ideas of the two sentences and does not repeat information needlessly. Choice (A) is the most concise expression, and it includes all the essential information contained in the two sentences.

12 **C** SEC   This is another idiom question. The phrase "not only" in answer choice (C) correctly parallels with the phrase later in this sentence, "but also."

You will almost never see one of these two phrases without the other in a correctly arranged sentence.

13 **B** EOI   This is a transition question that asks you to decide which word best fits the meaning of the sentence as it related to the rest of the passage, rather than which fits best grammatically or sounds the best.

This sentence provides information that shows a strong contrast with that of the previous two sentences. "However" works well to show this transition. A second way to find the correct answer here is to consider the other answer choices: "Therefore," "thus," and "because" all are used to show a causal relation (i.e. one thing causing another), and so don't work here. Also, because all three mean basically the same thing, none of them can be correct.

14 **B** EOI   This passage is all about how college professors have become increasingly rare, so this sentence fits nicely to start this paragraph. Notice also that the explanations given in the other three answer choices are all false.

15 **D** SEC   Answer choices (A), (B), and (C) are all pronouns that must refer to either community colleges or liberal arts colleges, but the sentence doesn't make sense with either of these options as the antecedent. Choice (D) makes clear who the subject of the sentence is by providing a new subject, "these instructors."

16 **D** SEC   This is a pronoun-antecedent number-agreement question. The antecedent of the pronoun is "these instructors" for the previous sentence, and so we need a plural pronoun here. Only choice (D) uses the plural and correctly agrees "they" (plural) with "teachers" (plural).

17 **B** EOI   Often when a question asks for which word works best in context, going by what sounds best is a good starting point to narrow down the choices. "Thing" is too informal. "Event" refers to something happening only at a specific time, whereas the occurrence described is ongoing. "Activity" refers to a specific action, whereas "phenomenon" describes a general circumstance like the lack of continuity and depth described here.

18 **C** SEC   Use a comma along with a coordinating conjunction (remember the acronym FANBOYS) to join together two independent clauses, much like you would use a period or a semi-colon. Both parts of this sentence are independent clauses because they could each be a separate full sentence. Choices (B) and (D) don't work because, even though a period or semi-colon could work here, they both add a subordinating conjunction, making the second clause subordinate.

19 **C** EOI   This question is tricky because it requires you to pay close attention to the wording of the graph. Notice that the graph doesn't show the percent of tenured faculty, but rather the percent of tenure *track* faculty. Choice (A) is not correct because it mixes up tenured with tenure track. (B) and (D) are arguably true statements, but aren't shown through the information in the graph.

20　**A**　EOI　At this part of the passage, the material is transitioning from an explanation of the problem into an analysis of its cause. The rhetorical question presented in choice (A) does a great job of introducing this new part of the passage. The other answer choices are all grammatically correct and true statements, but leave us without a transition statement to get from the discussion of the current problem to that of the issues causing it.

21　**D**　SEC　This question requires you to think about subject–verb agreement and verb tense. When trying to figure out if a verb should be singular or plural, try to find the simple subject of the sentence—who or what is doing the verb.

⚠　Be careful: many students will try to figure out subject-verb agreement by what sounds best with the noun closest to the verb, but this often leads to an incorrect answer. The word "adjuncts" is closest to the verb, which "sounds" correct with the verb "are."

💡　However, words in prepositional phrases are NEVER the subject of the sentence, so you can cross out the entire phrase when you are trying to find the subject of the sentence. Once you do so, you will be left with "use" as the only noun that could be the subject of the verb. Since "use" is singular, we need to choose a singular verb, which eliminates choices (A) and (C). Then, to check the tense, look at other verbs in the sentence that aren't in the underlined section. If the other verbs are in past, present, or future tense, stick with that same tense unless there's a specific reason to change. In this sentence, "receive" is present tense, suggesting that we should stick with present tense and choose "is." Also, think about when the setting is in the passage. Here in this passage, we're talking about the present day in general, so we want to keep the verb tense present to keep that clear!

22　**D**　EOI　The tricky part of this question is recognizing the difference between percent and number. The graph shows the percentage of tenure track professors decreasing and the percentage of non-tenure track professors going up, but it doesn't tell us anything about the changing number of either.

23　**B**　EOI　This question is easier to answer after reading the next couple of sentences in the passage for
💡　context. Choice (B) best introduces the topic by describing Stalin as he relates to the subject of the passage—Soviet control of music in Russia.

24　**B**　EOI　This is a redundancy question. All four of the choices are grammatically correct and essentially identical in meaning. Choice (B), however, is the most concise and avoids any unnecessary extra wordiness.

25　**C**　EOI　Choices (B) and (D) do not refer to specific members of Shostakovich's family, so those are out. Between choices (A) and (C), (C) is a better answer because it describes the experiences of the specific family members individually, rather than broadly and grouped together, as in choice (A).

26 C SEC   "Nor" must be paired with "neither" in this instance, but "neither" is incorrect because it would create a double-negative. Choice (C) is better than (D) because "either" is unnecessary in this context, and because it is in the wrong place in the sentence in choice (D). "To" starts an infinitive phrase. If we put "either" between "to" and the verb form "comply," we create a parallel structure error, because we cannot possibly put "or" between "to" and "represent."

27 A SEC   This is a long sentence with a complex structure. When looking at the punctuation rules for this part of the sentence, note that you don't use commas to separate a short prepositional statement from the rest of a sentence. Further, the prepositional statement "on a basic level" could not be a full sentence, so it doesn't work to separate it from the rest of the sentence using a comma with a FANBOYS word, as in choice (C), or a period as in choice (D).

28 D SEC   This question is about the correct form of the verb. First, we need to use the past tense, because the sentence begins narrating past events with this verb, as shown by the use of the verb "understood" as the narration continues in the following sentence. The second aspect in choosing the right answer to this question is recognizing the verb: "lie" can mean both to speak something untrue—as in to lie about what happened—and to be placed or situated, as in to lie about the house.

In this case, we need the second meaning, which is conjugated differently than the first. "Lied" is the past tense of the first version, but the past tense of the second is "lay," which is why (D) is the correct answer. Another difficulty about this question is that many students confuse the forms of the words lie and lay. The verb "to lay" requires an object, where the verb "to lie" does not. Here, the verb is immediately followed by two prepositional statements and has no direct object itself. Therefore, we must use the verb "to lie" in this case. However, the past tense of "to lie" is "lay," so this is a difficult question if you have not memorized these irregular forms!

29 B EOI   This sentence, while true and correctly following the first sentence of the paragraph, adds unnecessary detail to the passage that detracts from the main point of the paragraph.

The reasons given in choices (A), (C), and (D) for saying yes or no are all incorrect as well.

30 B SEC   This is a prepositional idiom question. Just as you would walk "in" a hallway and not "on" a hallway and sit "in" a car and not "among" a car, so too would nouns adhere "to" themes, rather than "with," "among," or "of" them.

31 D EOI   This sentence is complicated and detailed, with more music jargon than any of the other sentences in the passage for no apparent reason, so it has to go.

If your first reaction was to feel that the sentence should be added, read the "Yes" explanations carefully: neither of them is true!

32 **A** EOI   Choice (A) is most consistent with the information in the rest of the passage.

The difficult language of choice (C) makes it a tough choice to rule out for many students, as they assume that answers with harder words are "better." "Visceral" refers to the quality of being felt deeply in the body, rather than only through reason. "Polemical" means relating to controversial or critical use of language, like sarcasm, a hostile or bitter comment, or a caustic or cutting phrase. These words do not do as good a job as "moving and satirical" do to reflect how Shostakovich's music is described through the rest of the passage, and they introduce a style that doesn't fit with the more common language used throughout the passage.

33 **A** SEC   Choices (C) and (D) have incorrect subject–verb agreement because they do not correctly pair "listeners" with "are" or "listener" with "is." Choice (B) is overly broad because it refers to "every listener," rather than listeners generally, and because "is being" suggests that all listeners are being, at this very moment, taken aback by the horrors mentioned.

34 **D** EOI   This sentence disrupts the flow of the paragraph: the topic of the paragraph—and the entire passage—is the controversy regarding these specific genes.

35 **C** SEC   This is a pronoun question. Here, each of the answers choices except (C) either uses a vague pronoun, making it unclear which noun that pronoun is replacing, or uses the wrong pronoun.

"Myriad" is a singular non-person entity, so "it" is the correct pronoun to use. Similarly, the Hospital at the University of Pennsylvania is also a singular non-person entity that must be referred to as "it." Answer choices (A) and (D) use the plural "their" and "they" to refer to these singular nouns. Choice (B) uses an ambiguous pronoun—it is ambiguous exactly which of the two nouns "its" refers to. Further, the tense is incorrect in choice (B): we need to use the past tense, as all the other answer choices do.

36 **D** EOI   The graph shows that BRCA1 Positive people are at a much greater risk (almost eight times the risk) of contracting breast cancer than the general population. Choices (A) and (C) incorrectly present this information.

Be careful: choice (B) presents correct information but in a way that does not support the point of the paragraph—that the BRCA1 gene is useful in testing for cancer risk factors.

37 **C** SEC   This is a sentence structure question.

To evaluate the structure of a sentence, one trick is to remove any prepositional phrases, appositives, and subordinate clauses, then see if the core subject/verb part of the sentence still makes sense. In choice (A), after removing those things, we are left with "The case ruling," which is not a complete sentence. In choice (B), after removing the extra parts, there is no main verb for "case" at all, and choice (D) is actually a comma-splice: the run-on is created by turning the subordinate clause into an independent clause and using only a comma to combine them.

38   **B**   EOI   "However" is the best transition in this context because it means "regardless of that," referring to the information in the previous sentence. The other transition words do not show the correct relationship between the previous paragraph and the new information in this paragraph.

39   **B**   EOI   Choices (C) and (D) explain only why one party would dislike the ruling, but not both.

⚠   Choice (A) is concise and so is an attractive choice, but it is not as good an answer as choice (B), because choice (A) does not give any information to explain why both parties were not pleased with the Court's finding. Choice (B) explains in just enough detail for the reader to understand why both Myriad and the plaintiffs disliked the ruling.

40   **D**   SEC   "Except" means "not including" as in, "I like every *Star Wars* movie except for the first three." "Accept," on the other hand, means to recognize, agree, or receive, as in "I am willing to accept that I may never get to go to Mars." Here, the parties asked the Court to decide the case, so "accept" is the correct term. Both choices (C) and (D) have the same meaning and are grammatically correct, but choice (D) is more succinct and so is the better choice.

41   **B**   SEC   The noun being replaced by a pronoun in the underlined section here is "the Supreme Court," which is a single non-person. Therefore, "it" is the correct pronoun.

42   **B**   EOI   Choice (C) takes a stance on the issue that eliminates the neutral tone the writer uses in the context of the rest of the passage. Choice (D) is quite concise, but overly so, as it doesn't explain what cDNA is, and that term is likely to be unfamiliar to most readers. Between choices (A) and (B), (B) is worded more clearly—choice (A) interrupts the flow of the sentence by putting a clause and an appositive phrase between the subject and verb, and also creates ambiguity with the use of "it."

43   **A**   SEC   A colon should be used to connect an independent clause with a quote, as in choice (A).

44   **D**   EOI   It can be difficult to notice without careful inspection, but paragraph 5 takes place chronologically after paragraph 6.

💡   Here's how to know what to do with ordering these paragraphs: paragraph 5 explains the significance of the "landmark precedent," which was set through the decision of the Supreme Court, which is explained in the paragraph currently marked 6. Thus, the paragraph describing the court decision must precede the one explaining the consequences and importance of that decision.

Math Test – No Calculator

Multiple-Choice Questions

1 **C** HOA   Plug in 2 for x in both binomials on the left side of the equation:

$$(2-1)(2+3) = k+2$$
$$(1)(5) = k+2$$
$$5 = k+2$$
$$3 = k$$

⚠️ You may be tempted to FOIL (double distribute) the binomials because sometimes that kind of form change is useful, but since the value of x is known, it is best to just plug 2 into the equation as written. FOILing will only lead to extra work, which may cause unforced errors.

2 **A** HOA   The surest way to solve this is to backsolve the choices.

You can begin by plugging the choices into the first equation since it is simpler. Quickly, you will notice that only choice (A) works in the equation $a - b = 12$ since $19 - 7 = 12$. You can verify that choice (A) is correct by also plugging it into the second equation to see that $2(19) - 5(7) = 3$.

💡 Alternatively, you can use the elimination method by first multiplying the top equation by 2 to arrive at $2a - 2b = 24$. Then, subtracting the bottom equation gets you $3b = 21$ or $b = 7$. Choice (A) is the only choice where b is 7. Though this algebraic method is valid, it has a higher chance of yielding errors than backsolving the choices.

3 **C** PAM   Though plugging in numbers is an option for this problem, it is significantly more tedious on this problem than on most others, especially without the use of a calculator. The algebra here requires that you recall that squaring simply means multiplying something by itself, so calculate $(3a^2 + 6b^2)(3a^2 + 6b^2)$ by FOILing:

$$9a^4 + 18a^2b^2 + 18a^2b^2 + 36b^4 = 9a^4 + 36a^2b^2 + 36b^4$$

⚠️ Beware: powers cannot be distributed over addition. The common error here is to solely square both terms in the binomial. Luckily, that result does not yield one of the choices.

💡 When you get an answer that isn't one of the choices, as could happen for this question if you mistakenly distribute the power, the test is telling you that you've made a mistake. Consider it a gift, and either look for a calculation error or think about a different method.

4 **B** HOA   In most SAT formula interpretation problems there are two kinds of numbers: numbers, like the 35 in this question, that are constant values unattached to any variable; and numbers, like the 8 in this question, that act as coefficients to variables. These coefficients are rates of increase or decrease because they change linearly as the variable changes. Since the 8 in this question is a coefficient for both the variable representing hours and the variable representing number of guests, it means the restaurant charges $8 per hour per guest. Choice (A) is irrelevant because the formula has no mechanism for a maximum (like a $\leq$ symbol), choice (C) is an example of a constant because flat rates cannot increase or decrease, and choice (D) indicates a decrease which could only happen if there were a negative sign in the formula.

5 **B** PAM   Plug in 4 for a and solve for x:

$$\frac{\sqrt{x^2-9}}{4}=1$$
$$\sqrt{x^2-9}=4$$
$$x^2-9=16$$
$$x^2=25$$
$$x=\pm5$$

Since $x<0$, x must $=-5$. Therefore $x-5=-10$.

6 **C** HOA   Like in question 4, you have a formula here with both a constant number and a coefficient number. The coefficient 24.45 is the rate per session so that $24.45x$ changes as x changes, increasing by 24.45 every time x increases by 1.

7 **B** PAM   If $h(2)=20,$ then:

$$3(2)^3-a(2)=20$$
$$3(8)-2a=20$$
$$24-2a=20$$
$$-2a=-4$$
$$a=2$$

So $h(x)=3x^3-2x$, and $h(-1)=3(-1)^3-2(-1)=-3-(-2)=-1$.

8 **B** PAM   You can begin this problem by multiplying both sides by a^4 yielding $a^{2x^3}=(a^{12})(a^4)$.

It is important to remember your exponent rules here. When you multiply terms with the same base, the exponents are added, so you get $a^{2x^3}=a^{16}$. Since you have the same base on both sides, you can now just conclude that $2x^3=16$ or $x^3=8$. This means that x must equal 2, and since you are asked for 2^x, you get 2^2 or 4.

◇   Alternatively, you can make the left side of the original equation equal a^{2x^3-4} by using a different exponent rule. The remaining algebra would be similar from there.

9 **C** HOA Set the prices for plan A and plan B equal to each other and solve for m:

$$3.85 + 0.45m = 7.65 + 0.25m$$
$$0.45m = 3.80 + 0.25m$$
$$0.20m = 3.80$$
$$m = 19$$

Alternatively, you can backsolve the choices into each formula. Without a calculator, the difficulty of the backsolving calculations may prove prohibitive, but remember that you can backsolve at any stage of the above solution. So, for example, it may be easier to plug the choices in to $0.20m = 3.80$ than it is to complete the algebra.

10 **A** HOA A better case can be made for backsolving in this problem than in the previous one, since choices (A) and (D) are very easy to multiply by even the most complicated decimals. Still, the algebra may prove just as simple:

$$3.85 + 0.45m = 8.35$$
$$0.45m = 4.50$$
$$m = 10$$

11 **A** ATM When an expression is divided by a complex number, you should multiply the top and bottom of the fraction by the conjugate (change the middle sign) of the bottom. This is, in effect, multiplying by 1, like when you want to get a common or rational denominator, so you are changing only the form and not the value. The benefit is that the bottom will no longer be a complex number because i will be eliminated:

$$\frac{(4+2i)}{(2-i)} \cdot \frac{(2+i)}{(2+i)} = \frac{8+4i+4i+2i^2}{4+2i-2i-i^2} = \frac{8+8i+2(-1)}{4-(-1)} = \frac{6+8i}{5}$$

If you recognize that you will need to multiply by the conjugate on both the top and the bottom and that the choices all have different tops and different bottoms, then you can save time by just doing half the work.

12 **C** PAM The difficulty level of isolating variables in formulas can vary wildly.

This problem is made to look more complicated than it is because the formula itself has so many operations. However, since you are only asked to solve for P, you need only divide both sides by everything else on the right side of the equation, namely $\left(1+\dfrac{r}{n}\right)^{nt}$. This leaves P alone on the right and $\dfrac{A}{\left(1+\dfrac{r}{n}\right)^{nt}}$ on the left.

13 **A** HOA   Try to first find the slope-intercept form of each line. Line q has a slope of -2 and a y-intercept of 8, so the equation for line q is $y = -2x + 8$. Line p has a slope that can be found by plugging the two points into $\text{slope} = \dfrac{\text{rise}}{\text{run}} = \dfrac{y_2 - y_1}{x_2 - x_1}$, so its slope is $\dfrac{5-7}{0-2} = \dfrac{-2}{-2} = 1$. Line p has a y-intercept of 5, so its equation is $y = 1x + 5$. Set the equations equal to each other, $-2x + 8 = 1x + 5$, and solve to get $x = 1$. This means that $a = 1$ because a is the x-value at the point of intersection. Plug 1 in for x in the second equation to get $b = 1(1) + 5$, so $b = 6$. The question asks for $a - b$, so $1 - 6 = -5$.

14 **D** PAM   In order to subtract these two fractions, you will need to get each one over the common denominator $(x+2)(x-3)$. That means multiplying each fraction on top and bottom by the denominator of the other:

$$\frac{1}{(x+2)} \bullet \frac{(x-3)}{(x-3)} - \frac{1}{(x-3)} \bullet \frac{(x+2)}{(x+2)}$$
$$= \frac{x-3}{x^2 - x - 6} - \frac{x+2}{x^2 - x - 6}$$
$$= \frac{-5}{x^2 - x - 6}$$

An alternative method is to plug in a number for x in both the original expression and the answer choices to see which choice matches. That involves many calculations, so is not ideal as a primary method in this example.

However, you could, if time permits, consider using that method as a check of the algebra above so that you are only plugging in to the answer you believe to be correct. For example, if you let $x = 2$, then the expression in the question becomes $\dfrac{1}{4} - \dfrac{1}{-1} = \dfrac{5}{4}$ and answer choice (D) becomes $\dfrac{-5}{2^2 - 2 - 6} = \dfrac{-5}{-4} = \dfrac{5}{4}$.

15 **D** PAM   If you FOIL the left side of the first equation you arrive at $6x^2 + 3bx + 2ax + ab$.

Since this equals $6x^2 + cx + 6$, you can conclude that $3bx + 2ax = cx$, or $3b + 2a = c$, and that $ab = 6$. Some of this is misdirection, a common hallmark of tougher SAT problems.

You need only recognize that $3b + 2a$ is half of the $4a + 6b$ from the second equation, so therefore c must be half of 12, or 6.

Student-Produced Response Questions

16   HOA   **3** or **6**

The number of multiple-choice questions has to be less than 8 because 8×8 is already more than the 60 total points. If you consider all possibilities between 1 and 7 multiple-choice questions, you can calculate the remaining points available for True/False questions and determine if the resulting number is a multiple of 3. For example, 2 multiple-choice questions will equal 16 points, leaving behind 44 points for True/False questions, but 44 is not a multiple of 3, so there cannot be 2 multiple-choice questions. On the other hand, 3 multiple-choice questions (24 points) leave 36 points available, and 6 multiple-choice questions (48 points) leave 12 points available. Both 36 and 12 are multiples of 3, so both 3 and 6 multiple-choice questions are valid options. Of course you only have to discover one of them to answer this correctly.

> When it is clear from the wording of a "grid-in" problem that multiple answers will be accepted, trial and error is often a useful method.

17   PAM   **6**

First add 12 to both sides to arrive at $2b^2 = 72$. Divide by 2 to find $b^2 = 36$, so $b = \pm 6$. The question specified that $b > 0$ (and negatives cannot be gridded anyway), so b must be 6.

18   ATM $\dfrac{4}{5}$ or **.8**
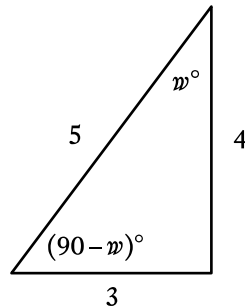
Draw a right triangle and label one of the acute angles as having a measure of $w°$. Because the tangent ratio is equal to $\dfrac{\text{opposite}}{\text{adjacent}}$ (SOH-CAH-TOA), you can label the leg opposite your marked angle as 3 and the other, adjacent, leg as 4. By the Pythagorean Theorem the hypotenuse has to be 5 because $\sqrt{3^2 + 4^2} = 5$.

> It also helps to remember that 3-4-5 is a Pythagorean Triple. The acute angle that isn't $w°$ must have a measure of $(90 - w)°$ because the two acute angles in a right triangle must be complementary. Therefore $\sin(90 - w)°$ equals the side opposite the $(90 - w)°$ angle, now 4, divided by the hypotenuse 5, so $\dfrac{4}{5}$.

19   HOA $\dfrac{3}{8}$ or **.375**

For a system of two equations to have infinitely many solutions, one of the equations must be a multiple of the other so that if you divide it through by a constant you will get the other equation exactly. Since 64 is 4 times 16, the second equation must be 4 times the first equation, and thus $3 = 4a$ and $2 = 4b$. From these equations you can arrive at $a = \dfrac{3}{4}$ and $b = \dfrac{1}{2}$, so $ab = \dfrac{3}{8}$.

20   ATM   **8**

Since the circumference of a circle is equal to $2\pi \times$ radius, a full turn of $360°$ can be said to be equivalent to 2π radians. The simplest way to look at this problem is to recognize that since the x and y coordinates of point P are equivalent, the segment connecting point P to the origin must cut halfway through the third quadrant. Thus the angle θ must be $\dfrac{5}{8}$ of a full turn. $\dfrac{5}{8}$ of 2π is equal to $\dfrac{10\pi}{8}$, so $a = 8$.

Math Test – Calculator

Multiple-Choice Questions

1 **B** HOA   To find the total lemonade sales, add the small cup sales to the large cup sales. The small cup sales will equal the number of small cups, s, times the price per small cup, \$2.25, which will give $2.25s$. Add this to the large cups sales, $3.50l$, and you get $2.25s + 3.50l$.

2 **C** ATM   Since the figure has two pairs of parallel lines, each of the four intersections has congruent angles at each respective corner. Angle 1, in the northeast corner of its intersection, is congruent to the angles in the northeast corners of each intersection, including the intersection where angle 2 resides. This means that angle 1 and angle 2 are supplementary (add to 180°), and angle 2 must measure 50°.

3 **B** HOA   This word problem translates to:

$$3a + 17 = 50 - 6$$
$$3a + 17 = 44$$
$$3a = 27$$
$$a = 9$$

⚠️ You may think the problem is done here, but you must remember to keep your eye on your target, which in this case is $9a$. The final answer is $9(9) = 81$. If you remain aware of this ultimate goal throughout the problem, you can skip the final step above and simply multiply $3a$ by 3 to achieve the same result.

4 **A** PSD   When two variables are inversely proportional, they multiply to make a constant product, which in this problem is the mass of the gas.

$$\text{Density} \times \text{Volume} = \text{Mass}$$
$$(0.50)(4) = 2$$

When you change the values for density and volume, they should continue to yield a product of 2:

$$\text{Density} \times 10 = 2$$
$$\text{Density} = \frac{2}{10} = 0.20$$

5 **C** PSD   First you must find the new volume after a 30 percent decrease:

$$\text{New Volume} = \text{Old Volume}(1 \pm \text{Percent Change})$$
$$4(1 - 0.3) = 4(0.7) = 2.8$$

Again, you will use the inverse proportion relationship and the constant mass of 2 in order to find the density after the volume change:

$$\text{Density} \times 2.8 = 2$$
$$\text{Density} = \frac{2}{2.8} = 0.71$$

6 **D** PSD   In order to convert units, you must understand how to make conversion ratios. For example, when the question tells you that 10 liters = 1 dekaliter, you can place these values in a fraction, and because the two values are equivalent, the fraction will always equal 1, regardless of which unit is placed in the top or bottom:

$$\left(\frac{1 \text{ dekaliter}}{10 \text{ liters}} = 1 \quad \text{OR} \quad \frac{10 \text{ liters}}{1 \text{ dekaliter}} = 1 \right)$$

Since this question asks you to convert 6 dekaliters into milliliters, you are merely changing the form (units) of the value by multiplying it by conversion ratios that equal one:

$$6 \text{ dekaliters } \times \frac{10 \text{ liters}}{1 \text{ dekaliter}} \times \frac{1000 \text{ milliliters}}{1 \text{ liter}} = 60{,}000 \text{ milliliters}$$

How do you know how to place your conversion ratios? Notice how the initial unit of dekaliters is canceled out by the dekaliters in the denominator of the first fraction, and the unit of liters is canceled out by the unit of liters in the denominator of the second fraction, thus leaving milliliters as the only uncanceled unit. Making sure that all the undesired units cancel out is a great way to ensure you've done your steps correctly!

7 **B** PAM   You are asked to find an equation that is equivalent to $y = 2x^2 - 8x - 20$ and which displays the vertex of the parabola. If you recall that the axis of symmetry for any parabola of the form $y = ax^2 + bx + c$ is the line $x = \frac{-b}{2a}$, you can work out that the x-coordinate of the vertex is $\frac{-(-8)}{2(2)} = 2$. Plugging 2 into the function yields a y-coordinate of -28, which is only seen in choice (B).

You can also backsolve the answer choices to see which can be simplified to the initial equation. Answer choice (B) is the only one to simplify correctly:

$$y = 2(x - 2)^2 - 28$$
$$y = 2(x^2 - 4x + 4) - 28$$
$$y = 2x^2 - 8x + 8 - 28$$
$$y = 2x^2 - 8x - 20$$

Alternatively, you could put $y = 2x^2 - 8x - 20$ into your graphing calculator and use that to calculate the vertex $(2, -28)$, which can only be seen in choice (B). You can find this either by expanding your window and visually estimating the vertex or by using ⌷CALC⌷, i.e. ⌷2ND⌷ → ⌷TRACE⌷, and selecting the `minimum` feature.

8 **C** PSD   The total number of apartment buildings is supposed to equal 15,000. If you add up the populations for the four cities from the graph, you will find that they sum to 15 units on the vertical axis. This means that each unit must equal 1,000 since 15 times 1,000 will give you your desired total of 15,000.

9   **D**   HOA   The easiest way to find the answer is to write an equation for how many calories are in one bag: if there are a chips that have 10 calories, $10a$ represents the total calories from the 10 calorie chips, $12b$ the calories from the 12 calorie chips, and $14c$ the calories from the 14 calorie chips. Since the total number of calories must equal 700, you get the equation $700 = 10a + 12b + 14c$, which can only be found in choice (D).

Backsolving allows you to examine several possibilities and learn from them. Since the question stipulates that a bag must contain *exactly* 700 calories worth of chips, only a choice that includes an equal sign with a 700 is valid. This eliminates choices (B) and (C). A brief examination of choice (A) shows an incorrect relationship between the variables and calorie numbers, so only (D) can be correct.

10   **A**   PAM   In order to isolate t, perform the following steps:

$$d = 171.3 + 55t$$
$$d - 171.3 = 55t$$
$$\frac{d - 171.3}{55} = t$$

Remember to check by plugging in numbers: if you plug an ordered pair into the original equation, the same values should also work in the new equation. For example, (1, 226.3) works in both the original and the new equations for (t, d), so you know you have found your answer.

11   **D**   PAM   To find the unknown time, plug the distance of 400 for d into the initial equation:

$$400 = 171.3 + 55t$$
$$228.7 = 55t$$
$$4.16 = t$$

Alternatively, you can backsolve by plugging each of the choices in for t and assessing which one gives you a d equal, or closest, to 400.

12   **A**   PSD   Like in question 6, you must use conversion ratios to change units, except that this question has some added difficulty. If you want your answer to be in the amount of days it would take for a single printer to run these books, you can use:

$$10{,}000 \text{ books} \times \frac{300 \text{ sheets}}{1 \text{ book}} \times \frac{1 \text{ minute}}{50 \text{ sheets}} \times \frac{1 \text{ hour}}{60 \text{ minutes}} \times \frac{1 \text{ day}}{10 \text{ hours}} = 100 \text{ days}$$

Note that you will be expected to know one conversion ratio (1 hour = 60 minutes) that is not supplied.

This question requires careful examination of all the data in the table. You should notice that the number of days the printers run per week and the number of employees running the printers are irrelevant. However, if there are 50 printers running, you must divide your total time by the number of printers to arrive at a final answer of 2 days.

13   **D**   PSD   First find the C-axis, which is the vertical axis, labeled as Cost. Since the line represents the cost of one pizza according to the number of toppings, and the number of toppings at the C-intercept is zero, then you know the C-intercept represents the price of one pizza without any toppings.

14 C PAM   You are being asked to determine the equation of a line in $y = mx + b$ form. Right off the bat, you should be able to see the value for b, the y-intercept, is 7, which means that choices (A) and (B) are out. Looking at choices (C) and (D), you now must examine the line more closely to determine if it has a slope of 0.5 or 1. Using points such as $(0, 7)$ and $(2, 8)$, you should be able to employ the slope formula to arrive at option (C).

$$\frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 7}{2 - 0} = \frac{1}{2} = 0.5$$

You can also use your graphing calculator to graph each choice in the $\boxed{Y=}$ menu. Then use either the $\boxed{\text{GRAPH}}$ function or $\boxed{\text{TABLE}}$ function to compare each choice to the graph or, respectively, two associated points from the table.

15 C HOA   Since you want a formula that expresses when the pool is full or overflowing, you must find the answer choice in which the sum of the initial water volume (3,250 gallons) and the volume added by the hose, 25 gallons per minutes over x minutes ($25x$), is greater than or equal to 9,500 gallons.

16 A PSD   You can find the percentage of the total group represented by each choice very easily on a calculator by dividing the number in each respective group by 152, the total number of people surveyed. For example, choice (A), males who prefer Macs, consists of 48 individuals, which constitutes a portion that is $\frac{48}{152} = .3158$ of the total. This translates, by simply moving the decimal point two places to the right, to about 32 percent.

You can tackle this problem through approximation as well: 32 percent is just a little bit less than one third, or 33.3 percent. If you approximate one third of 152 by dividing 150 by 3 in your head, then you get 50. When you examine each of the choices carefully, Males who prefer Macs is the closest to 50.

17 C PSD   You are given the speed of orbit in billions of km per hour. To find the speed as kilometers per hour, complete the following steps, noting that 4.9 billion should be written as 4,900,000,000 and that there are both 365 days in the average year and 24 hours in a day:

$$\frac{4,900,000,000 \text{ km}}{12 \text{ years}} \times \frac{1 \text{ year}}{365 \text{ days}} \times \frac{1 \text{ day}}{24 \text{ hours}} = 46,613 \text{ km/hour}$$

18 **A** PSD   The median number of 45 would be found by arranging the numbers of flowers on each bush in order from smallest to largest and then selecting the middle number. The average of 34 would be found by adding up all the numbers of flowers and then dividing by the number of bushes. However, here you are not given any of the numbers in the set so you have to examine the impact each of the answer choices would have on either the median or average:

- Choice (B) is suspect because, depending on the numbers in a set, a mode can have little to no effect on the median or average. For example, if all but one number in a set only appeared once, then a number that appeared twice would be the mode, but a number appearing twice would not explain how the average number of flowers could be so much smaller than the median.

- Choice (C) seems like a reasonable idea, except that since a median and an average are both ways of describing the middle of a set of numbers, you would expect many numbers between 34 and 45. This does not, though, explain why there is such a large difference between them.

- Choice (D) says that there is little variance in the numbers of flowers, which means that the numbers don't deviate much from the average. If this were true, then there would not be such a large gap between the median and average.

- Choice (A) is correct because if some bushes had very few flowers (for example, if a small but significant number of bushes had zero flowers), then the median would be relatively unaffected while the average would be driven down. Imagine you have a list of the integers from 0 to 50. The average and the median would each be 25. If you then changed the lowest twenty numbers to all be 0, that would lower the average dramatically while leaving the median unchanged.

19 **B** PAM   Since you are looking for the maximum of the function $f(x)$, you should look for the highest point on the graph, which has a height of 5. The question asks for the input value that yields the height of 5, which in this case is -2.

⚠️   Note that 5, the greatest y-value, is a choice, but you were asked explicitly for the value of x at the maximum.

20 B HOA You can solve this complicated system of equations by starting with either choice (B) or (C) and then backsolving.

If you start with choice (C), 2,149 weekend customers would result in 1,973 weekday customers in order for the total customers to add up to 4,122. If you multiply the number of weekend customers by the weekend price and add that to the number of weekday customers multiplied by the weekday price you get $2{,}149(15) + 1{,}973(11) = 53{,}938.$ This is only slightly larger than the desired total sales of 53,234. This means we need fewer of the higher-value weekend customers, which points to choice (B). Repeating the above steps shows choice (B) to be correct: $1{,}973(15) + 2{,}149(11) = 53{,}234.$

It is instructive to examine the algebraic method of solving a system of equations problem like this, even though it requires more steps in this particular case,

$$\text{let } x = \text{weekday parkers; let } y = \text{weekend parkers}$$
$$11x + 15y = 53{,}234 \text{ and } x + y = 4{,}122$$
$$11(4{,}122 - y) + 15y = 53{,}234$$
$$45{,}342 - 11y + 15y = 53{,}234$$
$$4y = 7{,}892$$
$$y = 1{,}973$$

21 B PSD There were 400 students surveyed, so to find the median value, you'd want to arrange the numbers of hours each student spent on homework from least to greatest and find out the number of hours the 200th and 201st students spent on homework. Luckily, the table has already placed the students in order, so you merely need to start at either the top or the bottom of the table, and add the number of students for each row until you find the row that contains the 200th and 201st students. The first 30 students (20 underclassmen and 10 upperclassmen) spent one hour on homework, and 120 more spent two hours. Since you have now accounted for 150 of the 400 students and there are 170 total students who spent three hours on homework, the 200th and 201st would surely reside there.

22 B PSD Based on the table, you might expect 10 underclassmen and 10 upperclassmen to have spent five hours on homework. However, the table represents the findings when 200 underclassmen and 200 upperclassmen are surveyed. This means it is likely that 5 percent of students, 10 out of 200, study for five hours whether they're underclassmen or upperclassmen, and since there are actually 80 more underclassmen than upperclassmen in total, there should be about four more underclassmen (5 percent of 80) who study for five hours.

23 C PSD When you are changing the value of something by a percentage, you can use the following formula: New Value = Old Value$(1 \pm \text{percent change as decimal}).$ Multiple percent changes can be arranged in a single step. In this case:

$$\text{New Population } (p) = \text{Original}(1 - 0.3)(1 + 0.47)$$
$$p = \text{Original}(0.7)(1.47)$$
$$\text{Original} = \frac{p}{(0.7)(1.47)}$$

24 D ATM   For this question, it is important to remember the equation for a circle is $(x-h)^2 + (y-k)^2 = r^2$, where (h, k) represents the center point, and r represents the radius. Your goal should be to change the given equation to this form, which can be accomplished by "completing the square" for the expression $y^2 - 10y$. The x^2 term is already a completed perfect square. When the coefficient of the squared term is 1, as it is here, you can complete a perfect square trinomial by halving the second term, -10 in this case, squaring that half, and then adding your result to the expression. So by adding the square of -5 we will create a set of terms that will be equivalent to the square of a binomial in y. Don't forget that you must add on both sides of the equal sign:

$$x^2 + y^2 - 10y + (-5)^2 = 9 + (-5)^2$$
$$x^2 + y^2 - 10y + 25 = 9 + 25$$
$$x^2 + (y-5)^2 = 34$$

In this form it is clear that $r^2 = 34$, so $r = \sqrt{34}$. Had you been asked for the center, you could also use this form to recognize that it would be $(0, 5)$.

25 C PAM   Isolating a variable in a formula requires all the same algebraic skills that you've learned to solve for a value in an equation. Essentially, you need to undo what has been done to the variable you are looking for, while remembering that whatever is done to one side of an equal sign must be done to the other. The first move here in isolating m is to divide both sides by 2π to arrive at $\frac{T}{2\pi} = \sqrt{\frac{m}{k}}$. Then square both sides to find $\frac{T^2}{4\pi^2} = \frac{m}{k}$.

Lastly, multiply both sides by k to isolate m: $\frac{T^2 k}{4\pi^2} = m$.

This problem can also be done by plugging in numbers for the variables. Since the calculations for each choice can get tedious, this problem is a good candidate for employing the plugging-in-numbers strategy as your check. If you are able to complete the primary method above, but are unsure if you've done all of the exponent work properly, consider choosing $m = 8$ and $k = 2$. This will ensure that you get a nice number, 4, under the square root in the original equation, and it will compute to a T value of 4π. Then plug 4π and 2, respectively, in for T and k in choice (C) and see that it gets you $m = 8$. If you'd made an error and didn't get choice (C), this maneuver would discover that error and allow you to continue the work of plugging in numbers as your new primary method.

26 B PAM   Here plugging in numbers should be your primary method, especially since there is no extra work to be done with the choices. Consider masses $m_1 = 25$ for object 1 and $m_2 = 1$ for object 2 to satisfy the conditions mentioned. Then work out T for each object:

$$T_1 = 2\pi \sqrt{\frac{25}{k}} = 2\pi(5)\sqrt{\frac{1}{k}} = 10\pi\sqrt{\frac{1}{k}} \text{ and } T_2 = 2\pi\sqrt{\frac{1}{k}}.$$

So the period for object 2 is $\frac{1}{5}$ that of object 1.

27   **B**   HOA   First examine the lines $y = \frac{1}{3}x + 2$ and $y = \frac{1}{2}x + 4$ on your graphing calculator, looking for the point of intersection. If you are in a standard window, you may want to expand the left side a little by changing the Xmin to -20 under the WINDOW menu. You'll see that these two lines clearly cross in the third quadrant, actually at the point $(-12, -2)$. Though points on the line $y = \frac{1}{2}x + 4$ are not valid for the graph of $y > \frac{1}{2}x + 4$, the points just above that line are. Also, points both on and just below the line $y = \frac{1}{3}x + 2$ are valid for the graph of $y \leq \frac{1}{3}x + 2$, so it is clear that there are points in that third quadrant that satisfy the system of inequalities.

    ◈   Most calculators allow you to graph shaded inequalities by toggling with the ENTER button through the line/shade options to the left of the Y in the Y= menu. However, this often results in hard-to-read graphs if your calculator does not feature multiple colors, so it is sufficient to simply examine the lines in the manner recommended above.

28   **C**   PSD   If Clara's score is 5 percent higher than the class average, then it can be represented by $1.05a$, where a stands for the class average. Thus, by solving for a when this is set equal to 85, you arrive at $\frac{85}{1.05} = 80.95 \approx 81$. Notice that the question asks for an answer that expresses your answer rounded to the nearest whole number, so the approximate value of 81 is sufficient.

    ⚠   We often think of scores on tests as percentages because many tests are calculated that way. For example, if you score 19 out of 20 on a vocabulary test, your teacher may write 95 on your test because you answered 95 percent of questions correctly. This example, though, does not stipulate that scores were percentages, yet it is easy to be fooled into thinking that if Clara scored 5 percent higher than the average, she must have scored 5 *points* higher than the average. For this reason, many students will incorrectly choose choice (B), 80. Remember, questions toward the end of a math section (this one is, after all, the third-to-last multiple-choice question in section 4) will likely involve a little more work or critical thought than simply subtracting 5. Treat each question with a level of respect commensurate with its position in a section or sub-section.

29   **C**   PSD   This question is based on the statistical conclusion that a representative sample can be used to approximate a total. Since Emily chose one shelf from each of her nine bookshelves, you can average the numbers in the table to reasonably estimate an average shelf among the 108 shelves that she has. That average, 94.22, can then be multiplied by 108 to approximate the total number of books in her collection at 10,176. Though there are flaws in this method if you are looking for a certain level of exactitude, the fact that no choice other than (C) comes close to 10,176 allows for a lot of latitude.

30   **C** PAM   The Remainder Theorem states that if r is the remainder when a polynomial $p(t)$ is divided by $(t-a)$, then $p(a)=r$. This is what choice (C) says. If you have not taken a higher-level Algebra or Pre-calculus class, you may not have seen the Remainder Theorem, but your knowledge of factors of quadratic functions should help you navigate such questions.

A polynomial function $p(t)$ has a linear factor, $(t-a)$, if $p(a)=0$. You see this often in math classes when the polynomial function is quadratic. For example, $(t-5)$ is a factor of $t^2 - 8t + 15$ because that polynomial can be written as $(t-5)(t-3)$, and if you were to plug 5 into the polynomial, you would get a result of 0. This is true for all levels of polynomials, so choice (B), which claims that $(t-3)$ is a factor of $h(t)$, is invalid since $h(3) \neq 0$. You also have no basis to conclude one way or the other whether $(t+3)$ is a factor of $h(t)$, so choice (A) is out.

Student-Produced Response Questions

31   HOA   **11**

Since 15 inches is an initial value and 2.5 inches per week is a rate, you can set the expression $15 + 2.5w$, where w represents weeks, equal to 42.5. Then isolate w:

$$15 + 2.5w = 42.5$$
$$2.5w = 27.5$$
$$w = 11$$

When time allows, you should make it a point to check your algebra by plugging your answer back in to the original equation.

Backsolving known choices is not an option on grid-in questions, but guess and check is. For example, if you could not figure out the equation that models this situation, you can start guessing possible answers that are easy to compute, like 10. After 10 weeks at 2.5 inches per week, the plant would have grown 25 inches beyond its initial height of 15 inches, giving you 40 total inches. It is not a far leap to realize that one more week will get you to 42.5 inches.

32   PAM   **2**

A point should be thought of as (x, y) or $(x, f(x))$, so if $(3,8)$ is a point on the graph of $f(x) = x^3 - bx^2 - x + 2$, then:

$$8 = (3)^3 - b(3)^2 - (3) + 2$$
$$8 = 27 - 9b - 3 + 2$$
$$8 = 26 - 9b$$
$$-18 = -9b$$
$$2 = b$$

You can now check your answer by simply putting $x^3 - 2x^2 - x + 2$ into the [Y=] feature on your calculator and seeing whether $(3,8)$ shows up on [TABLE] ([2ND] → [GRAPH]).

| 33 | HOA | $5 \leq x \leq 6.25$ or $5 \leq x \leq \dfrac{25}{4}$ |

If Joe reads at his slowest rate of 32 pages per hour over the entire 200 pages, it will take him $\dfrac{200}{32}$, or 6.25, hours. On the opposite end of the spectrum, if Joe reads at his fastest rate of 40 pages per hour over the entire 200 pages, it will take him $\dfrac{200}{40}$, or 5, hours. Any answer between, and including, these two numbers are possible lengths of time, in hours, that Joe might need to complete those pages.

| 34 | PSD | **5** |

To find the average number of books read, you need to calculate the total number of books read and then divide by the number of students. The easiest way to calculate a total when you have data in a bar graph (or frequency table) is to add the products of each pairing of books read and students. For example, since five students read three books each, there were a total of 15 books read by those five students. This calculation yields:
$3(0) + 1(1) + 2(2) + 5(3) + 2(4) + 7(7) + 1(8) + 4(10) = 125$.

Notice that five, six, and nine books read are not included because no students read those numbers of books. The number of students, essentially the sum of the heights of each bar, is $3 + 1 + 2 + 5 + 2 + 7 + 1 + 4 = 25$. Lastly, you find the average by dividing 125 by 25, arriving at 5. It should be reassuring that the calculation resulted in a whole number, especially since the question did not mention rounding your answer.

| 35 | HOA | **7** |

Since each day consists of 24 hours, d days has $24d$ hours. If d days and 6 hours totals 174 hours, you can use the equation $24d + 6 = 174$ to answer this question. The solution, $d = 7$, gives you the amount of full days that Herman was away. Like question 31, guess and check is another valid option here.

| 36 | PSD | **90** |

You can use the previously-mentioned percent change formula here,

New Value = Old Value$(1 \pm$ percent change as decimal$)$:
$150(1 - .40) = 150(.60) = 90$

37   PAM   **64**

The algebra required for this problem is:

$$(2x+3)^2 - (4x-7) =$$
$$(2x+3)(2x+3) - (4x-7) =$$
$$4x^2 + 6x + 6x + 9 - 4x + 7 =$$
$$4x^2 + 8x + 16$$

From this, you can conclude that $a = 4$ and $c = 16$, so $ac = (4)(16) = 64$.

There are at least two common algebraic errors to beware of in this problem. First, realize that squaring a binomial like $(2x+3)$ requires four separate multiplications, not, as is often thought, just a squaring of $2x$ and 3 individually. Also, remember to distribute the negative sign through the second binomial. It is easy to miss that and end up with a -7 instead of a $+7$ at the end of the third line above. That would give you a c value of 2 and an answer of 8. Since this is a grid-in question, there are no choices to act as a safety net, so these possible missteps can be deleterious.

Since there are many possible pitfalls to the algebra, a good checking mechanism is valuable in a problem like this. One option is to put both your final trinomial, $4x^2 + 8x + 16$, and the original left side of the equation, $(2x+3)^2 - (4x-7)$, into the $\boxed{Y=}$ feature of your graphing calculator and make sure that either the graph or table of both are the same as one another.

38   ATM   **1.5 or $\dfrac{3}{2}$**

The formula for the volume of a cone, supplied in the introduction to each math section, is

$V = \dfrac{1}{3}\pi r^2 h,$ where r is the base radius of the cone and h is its height.

If the volume of Darin's cone is 810π in^3 and its height is 30 inches, then you can solve

$810\pi = \dfrac{1}{3}\pi r^2 (30)$ to determine the radius of the cone in inches:

$$810\pi = \frac{1}{3}\pi r^2 (30)$$
$$810\pi = 10\pi r^2$$
$$81 = r^2$$
$$9 = r$$

Since the diameter is twice the radius, the diameter must be 18 inches long.

But be careful: you were asked for the diameter in <u>feet</u>. 18 inches equals 1.5 feet. Two words were underlined in the question, "diameter" and "feet," so take note, because it is easy to forget that you are looking for a diameter when the formula you are using references the radius, and it is easy to forget that the answer should be in feet when the dimensions you are given are in inches.

Words that are underlined, italicized, or in all capitals should be circled as well because you are likely to overlook these kinds of emphasis markers when you are in the midst of a complicated set of algebraic maneuvers.