Bluebook 4

Question explanations to accompany SAT practice test #4

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Problem 1   Official Answer: B

"Although people thought it wouldn't work, this didn't _____ his efforts to make it work." What word would you expect in the blank? Dampen? Restrict? Hold back?

Assuming you have a rough sense of what all of these words mean, you probably realize that "enhance", "misrepresent", and "aggravate" are all nonsense. Concerns about feasibility wouldn't enhance his efforts, misrepresent them, or aggravate them. To "hinder" means to hold back and is the only sensible word to put in the blank. Concerns about feasibility could have hindered his efforts, but his "determined advocacy" shows us that they didn't.

Problem 2   Official Answer: B

Artisans typically _____ their traditional techniques. What would artisans do to techniques? The clue lies in the contrasting word "but". If they *don't strictly observe every tradition* in some cases, then what do they do in other cases? One would assume that in most cases, they *do* observe tradition. They "adhere to" the traditional casting techniques. The other three answer choices might make sense in different contexts, but none of them provide the appropriate contrast to "strictly observing tradition".

Problem 3   Official Answer: A

The clue is in the parenthetical comment immediately after the blank: "with the protagonist ricocheting chaotically across time". We need an adjective to describe such a journey. We need an approximate synonym for "chaotic".

You might not be able to give precise definitions for all of these words, but perhaps you have enough of a sense of their meaning to realize that answers A-C are not synonyms for chaotic. A chaotic journey might be fruitless, but then again it might not. Those words are not synonyms. "Erratic" might work, but that's not a choice. "Haphazard" is the only word among the given alternatives that is consistent with "ricocheting chaotically".

Problem 4   Official Answer: B

If an organism could *not* change its mind, what kind of behavior would that be? Stubborn? Uncreative? Mindless? Automatic? None of the answer choices are good synonyms for "mindless". But "rudimentary" can serve as an antonym for sophisticated behavior that involves switching strategies.

If nothing else, you might see that we need a *negative* word in the blank, something that refers to basic or simple behavior, in contrast to the *better* behavior described in the first half of the paragraph. Neither "evolving" nor "advantageous" are such negative words. And aggression isn't really the issue, so "aggressive" behavior is off-topic.

Incidentally, you can probably buy *Stentor* cheaply from a science supply company. If you ever have the chance to watch them through a decent well-lit microscope, enjoy the show. Or just try searching for some youTube videos.

Problem 5   Official Answer: A

The clue here is the dash. The blank comes before the dash, and the clue lies on the other side of the dash. What did the historians do? The clause after the dash tells us that they "assumed". Are any of the answer choices close to "assumed"? You can probably rule out "questioned" and "regretted". If you don't know what either of the remaining two words mean, you'll just have to surmise their meanings.

To "surmise" is to conjecture or to hypothesize and is not far from "assume". To "contrive" is to try to arrange a certain outcome, and this is not what the historians did to the idea about earlier households. So the best choice among the four is "surmised".

Problem 6   Official Answer: D

Modern engineering has certain requirements, and the robot is no longer effective. It can't do the job. It doesn't meet the requirements. Which choice is the best synonym for "meet" in the sense of "meet the requirements"? You might not know what "rebut" means, but you probably realize that "explain" and "defend" don't work, and you probably realize that "fulfill" does.

Problem 7   Official Answer: A

This one is a "fact-finding question". Skim the passage, hunting for the reason why a helicopter couldn't fly on Mars. You can find it in the second sentence. The air is too thin. Now, do any of the answer choices say "the air is too thin"? Answer A isn't quite that specific, but it does refer to the "atmospheric conditions". The size of the blades, the gravitational pull, and the size of the helicopters were never mentioned as part of the problem. The paragraph did mention the length of the blades, but as the solution, not as the problem.

Problem 8   Official Answer: A

This is a "big picture" question. How would you summarize the theme of the passage in rough language? "Traditional story-tellers are still around, despite new technology"? We may need to refine this rough summary as we go through the answer choices, but it's a good place to start.

A. This one seems ok. It's similar to our own summary. Let's tentatively mark this as the correct answer, but let's check the others before we confirm our answer.

B. Do the jalis "like teaching best"? Did the passage say anything about which roles they like or don't like? We can't support this assertion with any evidence from the passage.

C. This one might seem ok, too, at least on a casual reading.

D. This one might also seem ok if you scanned the passage casually and didn't quite get the "main idea".

So a superficial reading might rule out B, but still leave A, C, and D. If you have eliminated the obviously wrong answers, and you can't decide among the remaining answers, it is time to start nitpicking. A closer inspection of answer C might draw our attention to the word "entertainment". Is "entertainment" really a good word for what the jalis do? The passage did mention "peoples' stories", but did it say that the jalis actually tell stories for entertainment purposes? In answer D, "technology" seems like a significant word. The passage did mention that technology has *changed* some aspects of the role, but did it actually say that technology has *replaced* certain functions? And even if it had, would you say that replacing traditional roles with technology was the *main idea* of the passage or only a counterpoint mentioned in a single clause?

Even if it isn't immediately obvious, answer A is the only one that survives a careful nit-picking process.

Problem 9   Official Answer: D

This is a "main idea" question. What's the gist of this passage? Perhaps we could summarize it like this: "Thornton's dog Buck only likes Thornton, and nobody else." Do any of the answer choices say anything like this? Answer D does, and the others are all flawed.

Answer A focuses on changes over time. The passage contrasted Buck's attitude to Thornton with Buck's attitude towards other people, not Buck's attitude in the past to Buck's attitude now. Answer B might be tempting if it said that he mistrusts everyone *except Thornton*, but it is false as written. Buck does not mistrust *all* humans. Answer C only mentions people's attitude towards Buck, not Buck's attitude towards people.

Problem 10   Official Answer: B

Boil the claim down to something simpler. We need to illustrate a claim that a particular music makes someone feel a particular way. Only one answer choice refers to an individual's personal feelings and perspectives. Answers A, C, and D are all about the music itself—its heritage, development, and cultural status—and not about how it makes the author feel.

Problem 11   Official Answer: C

This problem has a graph. If you skip the reading and just check the four answer choices against the graph, you can see that A, B, and D are all factually inaccurate. (Although one could quibble about what "relatively equal" means in answer D.)

If instead you start by looking for the example that you need to complete, you find that you need to provide an example of female farmers being unusually prevalent. Glancing at the graph, it might strike you that the black bars are all pretty high, indicating that the percentage of female farmers of non-root vegetables is near or even higher than 50% in all parts of Ondo. So to exemplify lots of women farmers, the answer should probably focus on non-root vegetables. Answers B and D completely fail to mention non-root vegetables. Answers A and C

both refer to non-root vegetables, but answer A makes an inaccurate claim about cereals as well. Answer C focuses on the two highest black bars, the ones over 50%, and points out their significance, so that's the best answer.

Problem 12   Official Answer: B

This paragraph is primarily about Zelda Fitzgerald's independent works. If she has a substantial body of work independent of her husband, then those who primarily view her as an inspiration for her husband's writings ... have only half of the picture? They oversimplify things? To simply say that these people were "wrong" is probably too vague. All four answer choices involve "them" being wrong. *How* are they wrong?

A & C – F. Scott's motivations and the couple's views of each other were never issues, so we can probably rule out A and C.

B – This could be clarified to read "they overlook Zelda's other contributions", which is what we want, so this one is probably the correct answer.

D – Huh? What is an "overly autobiographical light"? Does this gibberish mean that readers are going to think that F. Scott and Zelda intended all of their works to be autobiographies? If answers make no sense, they probably aren't correct. Anyway, the main issue seems to involve F. Scott and Zelda themselves, not who's writing their biographies.

Problem 13   Official Answer: B

In this paragraph, we are debating why some dinosaurs got so big. Some people say it was because of abundant plant life due to lots of CO_2 in the air. But there's no evidence of that, suggesting that _____.

What belongs in the blank? "The theory is wrong"? "Something else made the dinosaurs big"? Something like that?

Answer B amounts to "something else made the dinosaurs big", so that's probably the correct answer. Let's check the other answers to be sure.

Answer A? There's nothing at all in the passage about differences among different kinds of dinosaurs. Answer C? How would a lack of evidence for CO_2 spikes suggest that there were CO_2 spikes ... or any kind of variation

in CO_2 levels? Answer D? If this seems like a total non sequitur to you, you'd be right. It makes a dubious claim about a hypothetical situation on no foundation at all. (If anything, wouldn't higher CO_2 have made the dinosaurs even *bigger*?)

Problem 14   Official Answer: D

If you throw away all of the introductory fluff and the followup fluff, the sentence becomes "Calida Garcia _____ was the logical choice." How would you punctuate this sentence?

It doesn't need any punctuation. To put any marks after "Rawles" would be to separate the subject of the sentence from the verb. Nothing, with the exception of parenthetical comments, should ever separate a subject from its verb.

Problem 15   Official Answer: D

Unless we choose answer D, this whole paragraph is one long sentence with a blank in the middle. Let's try D to see if splitting it into smaller sentences works. "Tan was visiting Angkor Wat when he noticed paint on the walls." "With the help of imaging techniques, he discovered that they were part of a mural." These are both valid sentences, so we are dealing with two independent clauses, and D must be the correct answer. Answer A attempts to join two independent clauses with a mere comma (i.e. it's a comma splice), while B and C attempt to join the clauses without any mark of separation at all (i.e. they are run-on sentences).

Problem 16   Official Answer: B

Is "grains" a normal noun or a possessive? It's a possessive, identifying what possesses the physical properties in question, and possessives need apostrophes. Should the apostrophe go before or after the *s*? That depends on whether it is a plural or singular noun. If they had said "*an* individual snow grain's properties" or "*each* individual snow grain's properties", then we would be talking about a singular grain, and the apostrophe would go before the *s*. But we are referring to snow grains as a group, so the word refers to multiple snow grains. It's plural, and the apostrophe must go after the *s*. (Don't let the word "individual" distract

you. There's nothing wrong with talking about a group of individuals.) So the first word must be "grains' ".

Is "properties" a normal noun or a possessive? It's a normal noun. It's the subject of the clause "properties affect the light". Normal nouns should never have apostrophes, even if they're plural.

Problem 17   Official Answer: C

This whole mess is one long sentence with a blank in the middle. Let's start by seeing if we can split it into two separate sentences. "The initiative represented an investment in parks" could stand on its own as an independent sentence. So could "It prioritized improvements in stuff." So we are dealing with two complete, independent clauses, and putting them together into the same sentence requires a strong joint between the clauses — either a semicolon, or a comma strengthened by a conjunction. Answer C offers us the semicolon, and answers A, B, and D are all insufficient.

Problem 18   Official Answer: A

What noun needs to be paired with this verb? What is the subject of this sentence? Be careful, because they have tried to trip you up by rearranging the subject and predicate.

"Leaders" is not the subject of the sentence. It is the object of the preposition "among". Somebody was "among the leaders". Who? The real subject of the sentence is Josephine St. Pierre. If you were to rearrange the sentence so that the predicate phrase is at the end where it is more familiar, it would read "Josephine was among the leaders." And now it should be very clear which answer is correct. "Josephine" is singular, and answers B through D are all plural verbs. "Josephine was", not "Josephine were" or "Josephine are" or "Josephine have been".

Problem 19   Official Answer: D

You might get the sense that this is a "parenthetical" issue. The fact that two of the answer choices contain a pair of dashes is a clue. We are injecting an extra comment into the middle of the sentence, and the question is how to properly punctuate it. We need to set the parenthetical apart from the rest of the sentence with a matched pair of marks, like a pair of bookends or a pair of literal parentheses. But where exactly is the parenthetical?

First of all, let's identify exactly which words comprise the parenthetical. It's these: "ocean dwellers that include the squid, the octopus, and the cuttlefish". That's an extra clarification about what it means to be a cephalopod, and we can throw it away without changing the grammatical legitimacy of the sentence: "This expert discovered that cephalopods have a special genetic ability..." Now, this parenthetical comment needs to be isolated from the rest of the sentence by a matched pair of marks. A pair of commas would work, except for the fact that the parenthetical itself contains internal commas. That could get confusing, so we need a pair of dashes instead of a pair of commas. That's answer D.

Incidentally, "a genetics expert at Tel Aviv University in Israel" is also a parenthetical. Notice how it is isolated by a pair of commas, and notice how you can omit it without turning the sentence into gibberish.

Problem 20   Official Answer: D

This is a verb question, but you might notice that two of the answer choices have "to" in them. That's a clue that you probably need to tell apart "verbals" from true verbs. ("Verbals" is a handy umbrella term for participles, gerunds, and infinitives—all words that look like verbs but are actually working as a different part of speech. When the official "explanations" talk about finite versus nonfinite verb forms, they are referring to true verbs versus verbals.)

If you notice that three of the answer choices are verbals and one is a true verb, you can guess with some confidence that the verb will be the correct answer. To confirm, let's search for a subject to be paired with the verb. We find that the rate of speciation (whatever that is) on one island is triple the rate on another island. We are dealing with a clause for which the subject is "the rate" and the verb is to go into the blank. Boiled down, the sentence is "he predicts that the rate will be triple." Since we are discussing a prediction about the future, the future tense is perfectly appropriate, and D is the correct answer.

Problem 21   Official Answer: D

Both sentences state claims about the research phase of McFerrin's work. More precisely, they both state that she enjoys the research phase. The second sentence is an amplification or elaboration of the first, so "in fact" is an appropriate transition.

The two sentences clearly do not contrast with each other, so "by contrast" is not appropriate. You might be less sure about the other two, since they both seem like they might be appropriate when making two parallel or similar statements. Whenever you are unsure or hesitant, look more closely. The first sentence states that she enjoys something, the second states that she enjoys it as much as something else. That's not making a parallel claim, it's making the same claim more precisely or more emphatically with a quantitative comparison. So the emphatic "in fact" is the best choice.

Problem 22   Official Answer: C

What's the goal? To introduce this particular novel to an audience already familiar with the author. They are telling us that we don't need to say anything about the author, but we should give some general characteristics of the book. Searching the bullet points, we find the relevant information in the last two points. (The correct answer should probably also include the title of the book, which is given in the second bullet point as well as in the question prompt.) The general characteristics are these: there are two central characters living in different countries and different centuries. Answer C summarizes all of this information nicely.

Answer A doesn't mention the book at all. Answers B and D only mention the title as one among other works, and they give no other information about the book, which hardly counts as an introduction to the book.

Problem 23   Official Answer: D

What's the goal? To present the study and its findings. Pay attention to that last word: findings. The correct answer needs to present the results or conclusions of the study. Scanning the bullet points, we find the "finding" in the last bullet point: The bones belong to juveniles. Only answer D gives this conclusion (along with plenty of other contextual information to introduce the study itself). Answer A mentions "juveniles" but only as part

of the motivation, and answers B and C don't mention juveniles at all.

Problem 24   Official Answer: A

What's the goal? To introduce Samuel Selvon and *The Lonely Londoners* to a new audience. So the correct answer should contain both of these names, as well as some basic introductory information about each of them. Scanning the bullet points for introductory information we can use, we find that the first four all contain pertinent information. (We can probably ignore the last bullet point, since it brings in another novel, and that wasn't part of the goal.) That's a lot of information, and you may notice that the longest answer choice is basically a restatement of all of this information. Answer A gives the name of the author, his country of origin, the year in which he published *The Lonely Londoners*, and a description of the contents of this novel, which is a pretty thorough introduction to the author and his novel.

The next-longest answer choice contains some of the relevant information, but fails to mention the author's name, which makes it a pretty poor introduction of Samuel Selvon. Answers B and D are both brief comparisons of the two novels, and they both miss the goal completely.

Problem 25   Official Answer: C

What's the goal? to emphasize a similarity between the two sea turtle species. Scanning the bullet points for a similarity, we don't find much to go on. The two species share a genus name (*Lepidochelys*), but that's probably not what we want. The only information we can use is that they both exist today and that they both live in the Atlantic.

Answer A only mentions one turtle. Answer B gives the names, but no similarities. (Well, it does give the names, but the genus name isn't pointed out specifically, and that can hardly be called an emphasis on a similarity.) Answer C doesn't give the Latin names but otherwise fulfills the goal nicely, and the Latin names weren't part of the requirement. Answer D simply names them and states that they are not the same thing.

Problem 26 Official Answer: D

What's the goal? To summarize the study. That's pretty broad. The correct answer will probably contain a lot of information, including most or all of the following: who did it, when they did it, why they did it, what they did, and what they discovered after they had done it. It probably won't have all of these things, but who did it and what they found are probably essential. If the SAT asks you to summarize a study, the results or the conclusion are a necessary part of the correct answer, and probably the identity of the researchers as well. In this problem, only answer D contains the results of the study.

Answer A includes the when and the how, and irrelevant information about the who. Answer B includes the who and the why (i.e. what is it that they wanted to know), but nothing else. Answer C includes the who and the why, plus a minor contextual detail.

Problem 27 Official Answer: C

This question is a little annoying. How you answer it depends on what you think constitutes an "introduction", and on how much information you think needs to be given if the author is "unfamiliar to the audience." There is arguably room for reasonable debate on these points, and it could affect the answer.

On the SAT, if the question states that you are to introduce a book to an audience unfamiliar with an author, you can take this to mean that the answer should have some information about the author in it. What the correct answer will look like will be a little clearer if we examine the bullet points for relevant information. The bullet points give two pieces of information about the novel: It was praised in 1994, and it is a historical novel set in East Africa. So the correct answer will probably mention these two points by way of "introduction". We can clearly rule out answer A as stating nothing about the novel other than the name. Answers B-D all still look plausible, however. So now it's time to start nitpicking.

Answer B contains "readers" as the subject of the sentence rather than *Paradise*, so it makes for a much weaker "introduction" to the novel. It also doesn't state anything about the author other than his name. Answer C contains (after an introductory description) *Paradise* as the subject of the sentence, and it also mentions one of the facts about Gurnah given in the notes, so it does give something to "an audience unfamiliar with

the author". Answer D introduces the novel well, and it mentions Gurnah, but it doesn't explicitly state that Gurnah was the author. We can rule that one out on a technicality. So the best option is answer C.

Problem 1   Official Answer: D

The clue here is the word "expect". They *expect* growth, so they ... *produce* huge revenues? ...*deny* huge revenues? ...*worry* huge revenues? ... *predict* huge revenues?

"Deny" and "worry" don't make any sense at all. "Produce" might work if there were more words in the sentence: They might *expect to produce* huge revenues, but they don't *currently* produce huge revenues. The sentence is about what they are currently doing, which is predicting. They aren't producing huge revenues yet.

Problem 2   Official Answer: D

"On the other hand" means that the plants in this sentence are different from the plants in the previous sentence. Instead of being damaged, they are intact or normal or "healthy".

Problem 3   Official Answer: A

What did other researchers do to Nuttall's work? If you read past the semicolon you find a parallel clue word: "recognition". They recognized her work. Which of the four answer choices is closest to "recognized"? Assuming you know the meanings of all four words, you probably realize that the correct answer is "acknowledged".

Problem 4   Official Answer: A

What do these officials do to laws? The National Council *generates* laws, and then this is followed by the principal chief and cabinet officials doing what? After generating laws, would you implement them, presume them, improvise them, or mimic them? Perhaps you could mimic someone else's laws, but would that make sense in this context? If you suddenly needed a new law in a new situation with no precedents to guide you, you might want to try to improvise a law, but you wouldn't do this *after* you've already generated it. If you know the meanings of all four words, you probably realize that after writing laws, you "implement" them.

Problem 5   Official Answer: B

What would a photographer do to a series of images? Validate them, create them, challenge them, or restore them? Both "create" and "restore" could make sense, depending on whether or not the images existed already. They didn't, so "create" is the best word. If you aren't sure what "validate" means, think of "valid" or "validity".

Since they mention posters from the 1970s, you might think "restore" is the appropriate word, but that's a misdirect. If you read carefully, you see that the photographer is working with "new images *based on*" the old posters. If they had said "new photographs" instead of "new images", that would have been less ambiguous, but the SAT writers don't like to be helpful, at least not in the harder questions.

Problem 6   Official Answer: C

If you see someone being nice, you're more likely to be nice yourself? Assuming that we can attach any meaning to such a vague, non-quantitative statement, what would that do to "prosocial" behavior? Promote it? Nurture it?

You can probably rule out "remember" right away. Acts of kindness wouldn't remember behavior. "Require" is too strong. There's no way that seeing someone else be nice will require you to be nice in turn. If you stumble over the unfamiliar word "prosocial" and accidentally read "antisocial" instead of "prosocial", you might be tempted by D, but as written it's the opposite of what we want. We want to discourage antisocial behavior and promote prosocial behavior. "Foster" is the only synonym for "promote" or "nurture".

Incidentally, "prosocial" is a neologism. Google's Ngram Viewer shows that it has only become prevalent – in sociological research, presumably – in the last couple of decades. However, it is not too difficult to realize that it must be an antonym for "antisocial".

Problem 7   Official Answer: C

Sometimes the best strategy is no strategy, especially with "underlined sentence" questions. In this case, if you just read the passage and then read the four answer choices, you can probably see that three of them are factually wrong. The underlined sentence describes some-

thing that the female cuckoos do, not the appearance of the female cuckoos or of the nests, nor the reactions of other birds. Answers A, B, and D are all clearly wrong.

If you were to use a strategy for "underlined sentence" questions, one thing that might help is to try omitting the sentence, and seeing how the paragraph changes. In this case, the paragraph would still make perfect sense without the underlined sentence, but you might think it is a little duller or more vague or abstract. The underlined sentence adds more details and specific observations to support the broader discussion.

Problem 8   Official Answer: A

This is a "main purpose" question, so let's briefly scan the passage, and try to summarize the gist of it in our own words. The key thing seems to be a contrast in how this guy feels about his newly-acquired picture. There are two paragraphs: the first one describes his negative feelings towards the painting, and the second paragraph tells us that he was "secretly proud" of it. It doesn't tell us why he likes the painting, but it does say that he has positive feelings towards it as well as negative feelings. Answer A, about "conflicted feelings", hits the nail on the head.

The picture's seller was only mentioned once, and the passage never said that the shop owner resented him, so answer B doesn't work. The passage also mentions other pictures besides the one in question, but only in the first paragraph, and only to highlight that the picture in question doesn't fit in with them, so answers C and D don't work, either. They focus too much on the other pictures.

Problem 9   Official Answer: C

The author of Text 1 is very down on digital art, and his main criticism is that it is very easy to do. The author of Text 2 says that it isn't that easy after all, and points out some of the complexities in creating digital art. Answer C is a sort of summary of the point of view in Text 2, and it's the officially sanctioned answer.

Answer A refers to the *display* of art rather than its *creation*. The creation process is the main point of contention between the two paragraphs. Answer B refers to a specific piece of technology that Text 2 didn't mention, and while the author of Text 2 might have claimed that it *isn't easy* to use technological tools, there's no

indication he viewed it as *much harder* than traditional artists' tools. And there's no mention whatsoever of the opinions of the majority of digital artists on fundamental drawing skills, much less any indication that the author of Text 2 would "admit" this, so answer D doesn't make sense.

Problem 10   Official Answer: A

They give us a fairly easy-to-read graph, and all of the answer choices contain numbers, so let's begin by checking the four answer choices for accuracy. In a few seconds, we discover that answers B through D are all factually inaccurate. (In answer C, the numbers are correct for Wisconsin, but not for Iowa.) So A must be the correct answer.

You might wonder why someone would try to illustrate the popularity of organic farms by referring to the *lowest* bar in the graph, but answer A is nevertheless the only one that accurately "uses data from the graph".

Problem 11   Official Answer: C

Fix this in your mind: A hard worker dedicated to his job. Now nitpick the answer choices, looking for descriptions of such a person.

A – This portrays him as happy, and perhaps wealthy, but not necessarily hard-working or devoted to his job.

B – This portrays him as learning something new about his job, but not necessarily devoted to it.

C – If we take "fall of the afternoon" to mean late afternoon or sunset, then this portrays him as working long hours, and if we take bending as an indication of working hard (which is reasonable given his job as a water-carrier), then this answer choice could be interpreted to be a description of a hard-working, devoted water-carrier.

D – This might portray him as resourceful, but not necessarily hard-working or dedicated to carrying water around.

Problem 12   Official Answer: A

This is sloppy question-writing. Exactly which clause is the "claim", and whose "experience" are we talking

about? Apparently what we need to do is to pick the quotation that best depicts an "element of nature" as being an "active agent".

So set this in your mind: an element of nature as an active participant in a nighttime scene. Now nitpick the answer choices, looking for the best depiction of such a thing.

A – The moon could be counted as an element of nature, and writing is an activity, so this could work.

B – Water can be counted as an element of nature, and rippling is an activity, so this could also work ... except rippling is passive, while writing is an active process. Water is caused to ripple by external forces, but writing is self-generated action. So A is better than B.

C – This one might also seem to work on a casual glance, but dropping, like rippling, is a passive action. There's no "active participant" here. So A is still the best answer.

D – This one mentions the moon again, but staying the same is hardly being an "active participant".

The official "explanation" claims that you can rule out C and D because they don't mention a body of water, and the question prompt contained "body of water". But it also claims that answer B describes a nighttime scene, which it doesn't. Even in answer A, you have to infer that it's nighttime by the presence of moonlight. In messy interpretive questions like this, it is best to focus on the most distinctive and unusual aspects, like an element of nature being an "active participant", and worry less about more mundane things like bodies of water or daytime versus nighttime.

Problem 13   Official Answer: D

They give us a table of data, so we could begin by checking the answers against the table for accuracy. If we do, we find that answer B is inaccurate, so we can rule that one out. Answer A is accurate, but it looks suspiciously broad and unhelpful. We are probably looking for a longer, more detailed answer that gives a comparison of some kind. We should take a closer look at A, but the answer will probably be C or D.

At first glance, we can't evaluate the statements in C and D, because they make comparisons of the data to "what would be expected." What's expected? To find out, we need to go back to the reading material and search for the "expected" amounts. The figure of "15%"

might jump out at your eyes, and reading around this figure we find that this is indeed the expectation that we need to compare to. Randomly scattered plants? Expect to find 15% of them in patches.

Now we can see that C is factually wrong. The table gives percentages in the 50s, and the expectation was only 15%, so *far more* plants than expected were found in patches, not fewer plants. Answer D correctly gives percentages that were higher than expected, which supports the claim that plants do better in groups, and they even pointed out that this was true for all species, to boot.

What about revisiting answer A? The claim in a nutshell was that plants do better in groups, and answer A does absolutely nothing to support this claim.

Problem 14   Official Answer: A

Having to deal with poetry is bad enough, but here we have to deal with quotations from translations of 140-year-old analysis of poetry.

Anyway, we need to illustrate a claim. What's the claim for which we need to provide an example? In a nutshell, the claim is that literature is valuable to a society. Literature and poetry are necessary to a healthy society.

Answer A conveys that poetry and literature have a lot of power. It doesn't mention "society" explicitly, and maybe it doesn't grab you and say "this is the right answer", but it does mention "souls" and "a people", and it could work. Answer B makes literature seem like a good thing...but for telling the history of a nation, not for the health of the nation itself. Neither C nor D mention poetry or literature, so those probably aren't correct. Well, answer D mentions "the song of a nation", but it's more about Walt Whitman than the health of a nation. So answer A seems like it does the best job of doing what was asked.

Problem 15   Official Answer: D

Summarize the paragraph in simple, familiar language. Be crude if it helps. Perhaps we could summarize this paragraph this way: "The ancient Sumerians lived in the desert, so they irrigated their crops. They were so good at it that they often had a surplus. As a result _____." What would be the result of having a surplus?

You could store stuff for future use? Sell the surplus to neighbors in exchange for other stuff?

If you check the answer choices, D makes perfect sense, while A-C are complete non sequiturs.

By the way, if you've studied history, as college-bound students should have, you might be wondering why they didn't just say "Mesopotamia". It's a well-established name, and it literally means "between the rivers". Perhaps this is just another example of the SAT writers being unnecessarily verbose. Perhaps they are assuming that the educational system doesn't teach history very well and that you've never heard of Mesopotamia before.

Problem 16   Official Answer: C

Boy, there's a lot of jargon in this one. Try to gloss over the details and get the 30,000 foot overview. Perhaps we could summarize the paragraph this way: Somebody tested mice and found that certain brain cells are necessary to remember things, and these brain cells require a "happy chemical". Therefore, receiving a reward should _____. Is "help you to remember things" too over-simplified? Perhaps not, since this is more or less what answer C says. Utilizing dopamine, distinguishing things, and the origin of fan cells were not part of the discussion. (Well, the paragraph did mention that fan cells utilize dopamine, but only to point out that it was necessary, not to discuss the extent of the utilization.)

Problem 17   Official Answer: B

Unlike some verb questions, this one is pretty easy, because they haven't put any distracting extra nouns between the subject and the verb. Just try reading the four answer choices in the blank and see which one sounds the best.

    Historians claiming that it was X.
    Historians claim that it was X.
    Historians having claimed that it was X.
    Historians to claim that it was X.

Answers A, C, and D are all technically "verbals", verbs modified to work as some other part of speech. Only answer B contains a true verb, and only answer B will produce a valid sentence when you put the word in the blank.

Problem 18   Official Answer: A

No punctuation mark should ever come between a preposition and its object (or objects). The correct answer here is the one with no punctuation.

You might be tempted by the colon, thinking that it introduces the list of themes. But first of all, the sentence continues after the list, and second of all, in "Standard English", you must always precede a colon with a fully-formed independent clause. In formal printed prose, the colon serves as a mark separating an introduction from the thing being introduced, and the introduction must always be a complete thought.

Problem 19   Official Answer: A

This one shouldn't be too hard. Colons must be preceded by independent clauses, so just throw away everything after the colon and try reading the four answer choices in the blank.

    A study explains why.
    A study explaining why.
    A study having explained why.
    A study to explain why.

When you throw away all the distractions, answer A is obviously correct. Like problem 17, there are three verbals, and we need to choose the only true verb.

Problem 20   Official Answer: D

The subject of the sentence is "Bonnie Buratti", and all four verb choices could work with this subject. This is not a subject-verb agreement issue. It's a verb tense issue. Do we need a past, present, or future tense in the blank? We need a past tense, to match "she made a discovery". This rules out A and C, but still leaves B and D.

You can probably pick the correct choice just by imagining the four choices in a simplified sentence. Make the sentence as simple as you can. Just don't forget to include the second verb in the subordinate clause, because we need to make the first verb consistent with the second verb:

    She studies data when she made a discovery.
    She has been studying data when she made a discovery.
    She will study data when she made a discovery.

She was studying data when she made a discovery.

Hopefully, it will be obvious to you that D is correct.

Technically, "has been studying" is an example of the *present perfect continuous* tense. It implies that she started studying in the past and is still studying in the present. Our attention on her activity only needs to continue until the point when she made the discovery, which was in the past, so the present perfect tense is inappropriate. "Was studying" is technically an example of the *past continuous* tense. It implies that the activity was ongoing in the past, but makes no claims about the present. This is the tense we need to use, since our attention stops at some point in the past.

Problem 21   Official Answer: C

The first thing to ask yourself in any apostrophe question is whether you need apostrophes at all. Often you don't. In this case, both "stories" and "immigrants" are normal nouns and should not have apostrophes. It is a common mistake in advertising and public displays to use apostrophes in plural nouns, but words should only have apostrophes if they are contractions or possessives. Neither of the words in question here is either of these things, so answer C is correct.

Problem 22   Official Answer: D

Try placing a period after "decade", and you'll discover that the stuff before the blank can stand on its own. It's an independent clause. The stuff beginning with "while" cannot stand on its own. It's a dependent clause. This makes B and C both unacceptable. The colon is also inappropriate, because you can't use a colon to "introduce" a dependent clause. While you don't technically need a comma to separate a dependent clause following the independent clause that it supports, it is perfectly acceptable, especially if they are both lengthy.

Problem 23   Official Answer: B

We need to choose the approriate pronoun for the blank. What is the pronoun referring to? It refers to whatever is getting attached to the turtle shells, i.e. the barnacles. "Barnacles" is a plural noun, making the singular pronouns "it" and "itself" inappropriate. Should we use the reflexive "themselves" or just the normal "them"? What is attaching the barnacles to the turtle shells? The barnacles themselves are doing it. The barnacles are attaching themselves to the shells. We need a reflexive pronoun, because the subject and the object are the same thing. The things doing the action are also the things having the action done to them. (If you are unfamiliar with reflexive pronouns, that might be another topic worth reviewing, because they do come up on the SAT, although they don't come up very often.)

Problem 24   Official Answer: D

Focus on the two sentences on each side of the blank. How are they related? The second one is not an example or a contrast, so "for instance" and "however" are both inappropriate transitions. The second sentence is also not a parallel statement, making "similarly" inappropriate. The first sentence provides an explanation for the second one. Why are spiders able to walk on walls and ceilings? Because of their spatulae. The second one is a consequence of the first, making D the correct answer.

Problem 25   Official Answer: D

How are the two sentences related? The sentence before the blank mentions a common (and reasonable) assumption, and the sentence after the blank contradicts it. Thus we need a contrasting word in the blank, like "however". This is not a list or sequence, making "secondly" inappropriate, the second sentence is not part of a cause-and-consequence relationship, making "consequently" inappropriate, and it is not emphasizing or providing further support for the previous sentence, making "moreover" inappropriate.

Incidentally, Mauna Loa rises from the sea floor all the way to the surface, and then almost 14,000 feet higher. The elevation of the peak above sea level rivals that of many terrestrial mountains that start from ground level. One might wonder how we missed any volcano on Earth that is twice the size of Mauna Loa. What they don't tell you in this excerpt is that Pūhāhonu is entirely submerged. It lies below the ocean about halfway between Hawaii and the Midway Islands, and it is much broader than it is tall, allowing it to be huge while still remaining hidden below the surface of the sea.

11

Problem 26   Official Answer: A

How are the two sentences related? The sentence before the blank mentions a stew that makes you feel calm. The sentence containing the blank says that sometimes dishes were named after their effects, and that the researchers guessed that this dish was named for the calming effect. The guess about the name follows from the knowledge of its effects. It's a cause and consequence relationship, making "therefore" the best choice. The two sentences do not present parallel things, which would make "likewise" the best choice, nor do they present contrasting things, which would make "alternately" or "nevertheless" better choices.

Problem 27   Official Answer: B

What's the goal? To provide an explanation and an example of "flauna". Pay attention to both words. The correct answer choice needs to have both an *explanation* and an *example*. Checking the bullet points, we see that the second provides the explanation ("plant-animal hybrids"), and the last two provide examples. So the answer should probably have "plant-animal hybrid" in it, and it should probably mention at least one of the two mythical things in the two paintings.

Answer choice B does all of these things, and mentions the origin of the word as well. Answer A mentions the origin of the name, but doesn't say what it means and it doesn't give any examples. Answer C gives nothing more than the name, and answer D gives examples but no explanation.

Incidentally, these examples of "flauna" are obviously farcical, but there used to be a scientific term that meant much the same thing: *zoophyte*. It derives from the Greek words for "animal" and "plant", and it served as a group name for sponges, anemones, coral, and other living things that seem to be somewhere between plants and animals.

Problem 1   Official Answer: B

We need an adjective describing stimuli. Looking elsewhere for other descriptions of these stimuli, we can find "harmless". We also find the contrasting description of other things that are "less benign". So which word is closest to describing something that is benign and doesn't do any harm?

You can probably rule out "deceptive" and "impractical". You might think that "impractical" could be a synonym for "doesn't have any effects", but hopefully it doesn't sound quite right to you. We are looking for a positive word meaning "doesn't hurt", and "impractical" is a negative word meaning "doesn't work". "Innocuous" sounds like "innocent"; should we pick that one?

If you know the meanings of all four words, you can probably see that "innocuous" is the most appropriate word here. If you don't, you'll have to check off the words you do know, ruling them in or out, and then make your best guess among the remaining words.

Problem 2   Official Answer: B

This is a more challenging vocabulary problem, because you probably don't know several of the answer choices. Let's start with the clue. The clue is the contrasting word "though". We need a word that means the opposite of "many". Though there were many studies of this kind, there weren't many of that kind. Which of the words means "there aren't many of them"? Which word would be a good antonym for "abundance"? You can probably rule out "quarrel", but that still leaves three choices. If you don't know the meanings of these three, you'll just have to make your best guess.

"Paucity" means much the same thing as "scarcity", and is the most appropriate choice here. "Profusion" is similar to "abundance", and is the opposite of what we want. "Verisimilitude" means "resembling truth" (think of "verify" and "similar"), and makes no sense in the blank.

Problem 3   Official Answer: C

Assuming that a monarch wants to keep the throne, what would he do to his "right to hold the throne"? Assert it? Defend it? Do any of the word choices mean something similar to assert or defend?

If you don't know what reciprocate means, perhaps you have a reciprocating saw in your garage. Perhaps you've dealt with reciprocals, in which you swap numerators and denominators. "Reciprocate" means to go back and forth or to do back what's been done to you. If you don't know what annotate means, perhaps you've heard of annotations, or perhaps you can dig deep into the middle of the word to extract the root word "note". To "annotate" means to mark up with notes. Perhaps you've heard of buttresses in architecture or construction, which brace or reinforce or support something else. And you can probably recognize that disengage is the opposite of engage. Which of these options sounds most appropriate?

The monarch presumably wanted to buttress his right to hold the throne.

Problem 4   Official Answer: C

If you see someone being nice, you're more likely to be nice yourself? Assuming that we can attach any meaning to such a vague, non-quantitative statement, what would that do to "prosocial" behavior? Promote it? Nurture it?

You can probably rule out "remember" right away. Acts of kindness wouldn't remember behavior. "Require" is too strong. There's no way that seeing someone else be nice will require you to be nice in turn. If you stumble over the unfamiliar word "prosocial" and accidentally read "antisocial" instead of "prosocial", you might be tempted by D, but as written it's the opposite of what we want. We want to discourage antisocial behavior and promote prosocial behavior. "Foster" is the only synonym for "promote" or "nurture".

Incidentally, "prosocial" is a neologism. Google's Ngram Viewer shows that it has only become prevalent – in sociological research, presumably – in the last couple of decades. However, it is not too difficult to realize that it must be an antonym for "antisocial".

Problem 5   Official Answer: D

It's difficult to come up with a general strategy for underlined-sentence questions. Let's just examine the four answer choices one by one, paying close attention to all of the meaningful words.

A – The underlined sentence is describing trees, not women. (It does compare trees to people, but only to say that they are all individuals. It doesn't discuss any particular traits of women.)

B – The sentence is describing trees, not the relationship between trees and people. It does make the side note that trees are similar to people, but this is not "foregrounding a beneficial relationship".

C – The sentence is describing trees, not human behavior nor how it is influenced by the environment. Other sentences in the passage describe human behavior, but not this one.

D – This is the only answer choice that says "the sentence is describing the trees."

Problem 6   Official Answer: A

What's the gist of this passage, in your own words? Interpreting Brontë's 19th century English makes our job a little more difficult, but perhaps we could summarize this passage like this: "She is ruminating on life issues while she goes about her business." We may have to refine this as we proceed, but it's a good general summary to start with. Now let's check the four possibilities and see if any of them say something like this.

A – This could work. Most of the paragraph is about her "internal restlessness" as she ponders things, but the initial clause does also refer to "tranquility", so there is a little bit of a contrast here.

B – You can probably rule this one out easily. A passage emphasizing loyalty would have looked very different.

C – "Challenging" might sound ok, but if you read as far as "deeply fulfilling", you can probably rule this one out as well. There is nothing in the passage indicating deep fulfillment.

D – Maybe she is contemplating the possibility of finding a job elsewhere, but the passage never actually says this. It merely says that she is contemplating reasons for leaving her present position, and the passage definitely does not convey "determination".

So of the four choices, answer A seems to work the best.

Problem 7   Official Answer: A

This is a "structure" question, so think of it like a story,

and pay attention to the sequence of events. Try to summarize the "plot" of the passage. The passage starts by introducing Joni Mitchell and her album covers, and the rest of the passage is a discussion of a particular example of her album covers.

Answer A refers to a "claim" about Mitchell, but this "claim" can be that she uses album imagery to emphasize ideas in her music (in her lyrics, presumably). And the rest of the discussion can be considered as an example of this claim, so answer A works.

We can rule out answer B, because there is no discussion of Mitchell's influence on other artists. The only other artist in the passage is Van Gogh, and Mitchell could hardly have influenced someone who died 130 years ago. We can also rule out answer C. What would be the "similarity" and what would be the "difference"? The passage is not about comparing and contrasting the two artists, it's about Mitchell's album covers. And D is easy to rule out. Only the title song is mentioned, and the paragraph as a whole does not provide a description or explanation of the "songs" in general.

Problem 8   Official Answer: C

This is an underlined sentence question about scientific research, so let's start by asking if the sentence has to do with the motivation, the method, or the conclusions of the research. In this case, you might say that the sentence is about the conclusions or "results" after a casual reading, since the sentence has numbers in it, but to do that is to fall into a trap. If you read carefully, you discover that this sentence tells us what the researchers did. It gives the *method* of the study. The actual conclusions are in the final sentence, not the underlined sentence. Once you've realized that the underlined sentence is describing the methodology of the study, it should be pretty easy to zero in on answer C.

Problem 9   Official Answer: B

We read the prompt and see that we are interested in having a debate over EGR (whatever that is). We scan Text 1, looking for opinions on EGR. The opinion in Text 1 seems very positive. It makes it sound like EGR might be some new wonder drug or something. Now we scan Text 2, looking for a counter-opinion. They acknowledge the excitement, but then they do a "let's wait and see". They don't deny the good stuff or say it

can't happen, they just say we can't be so sure. Now, let's nitpick the four answer choices:

A – There's only agreement in this one, and no note of caution. This opinion also states that the team has identified how the gene functions in both humans and panther worms, which isn't true. Or at least it isn't supported by the given text. Panther worms maybe, but not humans.

B – What would the "additional observations" be? The stuff about how the the gene functions and how it works like a switch could qualify as "additional observations", and "overly optimistic" seems like a good characterization of Text 2's point of view regarding Text 1, so this could be the correct answer.

C – Unexpected? This opinion makes no sense. The claim about enthusiastic response comes out of the blue, and even if it were true, why would that make the positive characterization "unexpected"?

D – Unfairly dismissive? Was Text 1 "dismissive" in any way? Perhaps some third author might characterize the second author as dismissive, but the second author would hardly say that the first author was dismissive. The first author was very positive.

The opinion that is most consistent with the given texts is B.

Problem 10   Official Answer: C

We have some data in a table, so we could try checking the answer choices against the data table for factual accuracy, but unfortunately that doesn't help us in this case. We are dealing with hypothetically different numbers, and the two statements of actual fact check out as accurate. (Lillian St. Cyr is indeed credited with 66 performances, and Edwin Carewe with 47.)

So this one doesn't have shortcuts, and it will take a little more effort and time to answer correctly. But maybe not much.

What's the example that we're trying to complete? It's an example of actual figures being higher than reported figures. So the answer choice should give hypothetical numbers that are higher than the corresponding numbers in the data table.

A – This compares one actor to another, not known figures to potentially larger figures.

B – If the *years* being reported were in doubt, this might make some sense. But it is the *number of works* that is in question, not the years of those works.

C – This gives two figures accurately from the table, and says effectively "maybe these should be higher", so this does what is needed.

D – This gives two *lower* numbers than those reported in the table. We need hypothetical numbers that are *higher* that the numbers in the table.

Thus answer C does the best job of providing an example of numbers being potentially higher than the numbers reported in the table.

Problem 11   Official Answer: C

What's the claim? That endothermy would have enabled mosasaurs to include relatively cold waters in their range. What in the world is "endothermy"? They explain it in the previous sentence. It means to use "internal metabolic processes to maintain a stable body temperature..." In other words, they were warm-blooded. Just replace the jargon word "endothermic" with "warm-blooded" and the question might be easier to handle. (Technical words are important, but only when precise usage is necessary. They are often important to professionals, but on the SAT, they're usually just distracting jargon.) So let's restate the claim: Mosasaurs were warm-blooded, so they could live in cold waters. Now, do the answer choices support this claim?

A – This is a "finding"? In any case, the ease of making measurements has no implications for the range of dinosaurs.

B – If everybody was able to live everywhere, then being warm-blooded wouldn't make any difference. This does not support the claim that being warm-blooded made a difference.

C – Mosasaurs near the poles, but no other dinosaurs? If only warm-blooded dinosaurs lived near the poles, this would support the idea that being warm-blooded enabled them to live in colder regions than everybody else could.

D – This gives an alternate way *other than* endothermy for the mosasaurs to survive near the poles. It does not support the idea that being warm-blooded was necessary to live near the poles.

Problem 12   Official Answer: D

When there are tables or graphs involved, it can often be helpful to start by checking the answer choices for factual accuracy. Ignore the reading, jump straight to the answer choices, and see if you can rule any out for being incorrect. In this problem, A is clearly wrong, because the graphs are clearly not steady. Answer B can also quickly be ruled out. We can't eliminate any more because C and D are both true, but at least we've improved our odds to 50-50.

To distinguish between the remaining two answers, we have to do a little reading. But maybe not much. Let's start at the end. With all "support the claim" questions, it often helps to highlight the claim in your mind, and you can usually find it at or near the end of the paragraph. What idea do we need to support? That "across the years" there was a "growing interest". In other words, measurements should be increasing. Answer C compares "department leaders" to "managers" in each of the years. Does that help? No, we want to compare different years, not managers to department leaders. You might notice that in the graph, all bars are rising steadily as the years go by, which supports the idea of "growing interest". Answer D points this out, making it the best answer.

Problem 13   Official Answer: C

This claim is a little hard to grasp, even if you know something about astronomy. Or perhaps *especially* if you know something about astronomy. Clearly the Sun and the Earth are made of different stuff. And if you know anything at all about the relative sizes of stars and planets, it's obvious that planets have smaller quantities of stuff than their host stars. They're smaller. Perhaps what the authors meant to say is that stars and planets are composed of the same set of elements, but in different proportions.

But we don't have time to gripe about sloppy writing on the SAT, and we'll have to do the best we can with what we're given. Ignoring the relationship to reality and treating this purely as a story, the claim in a nutshell is that "planets and stars are made of the same stuff." We want to *weaken* this claim, so we'll have to find significant *differences* between stars and planets.

A – It would be fascinating to see a laboratory experiment in which someone cooled a star. Assuming we already know that the Earth contains iron and silicates, then this hypothetical discovery of the same elements in

a star would show a *similarity* between stars and planets, and it would help to *support* the claim, not weaken it.

B – This would support the idea that all stars are the same as each other, but would have no bearing on whether or not stars are the same as planets.

C – Here's a difference between stars and planets, so this is probably the "correct" answer.

D – This involves a difference between different kinds of planets, not between planets and stars.

Problem 14   Official Answer: B

What's the claim that we need to support? It fills the second half of the paragraph, but we can boil it down to something like this: Mr. Enwezor tried to show how the works of African artists fit into a global and historical context. Since they emphasize the contrast between "solely African artists" and the "larger global context", we can expect that the correct answer should say something about different cultures around the globe and/or different periods in history.

A – This mentions Ghana, Germany, and Europe ... but the focus of the sentence is one particular exhibition of works by one particular artist. If the other answers are all awful, we can choose this one, but there's probably a better answer.

B – This explicitly mentions the combination of works by African artists with "major figures from other countries", so this could count as placing African works within a larger global context.

C – Unless you count the reference to "European colonial powers", this is all about Africa. The "global context" is missing from this answer.

D – Like answer C, this answer is completely lacking any global context. It's all about Africa, and only African photography at that.

Problem 15   Official Answer: D

As the introductory sentence indicates, this paragraph is primarily about control groups. The best way to answer this question is to notice that there are only two answer choices that mention "control group", and that one of these wants us to select a control group that is *different*

instead of *the same*, which violates the whole purpose of having a control group.

Answering this question in a more direct and straightforward way is difficult, because the setup is a bit muddled. The first sentence makes a fair amount of sense, although one might wonder whether this issue is really worth scientific scrutiny, and whether an experiment is really the most appropriate research method for this question. But setting quibbles aside, we can see that a researcher who wants to study whether holding office changes your behavior would need to examine the behavior of two groups of people, one containing people who have held public office, and a control group of otherwise similar people who haven't held office. One could imagine all sorts of difficulties in ensuring that the two groups were as similar as possible in every other way. Most people who have never held public office probably never wanted to, which already makes them quite different. Furthermore, people who lose elections very often run again in similar elections.

If we examine the answer choices with a careful eye, we can rule out answers A and B, because they refer to politicians who do or do not *currently* hold office. The issue is whether or not people have ever held office, not whether they held office in the past or the present. Answer C advocates picking a control group that differs in important ways, which violates the purpose of having a control group in the first place. This leaves answer D, which we might have guessed the beginning would be the correct answer. Finding an appropriate control group in these circumstances is clearly going to be difficult.

Problem 16   Official Answer: A

Some scholars have concluded .... what? What would make sense here? The main issue seems to be whether *Cantares Mexicanos* has a recent origin or not. Mostly, it seems to have originated with the Aztecs, but there are also some Spanish influences so ... it has a mixed origin? It started out Aztec but acquired some Spanish elements later?

You can probably rule out B and C fairly easily. The language doesn't seem to have much relevance here, nor do societies other than those of the Aztecs and Spaniards.

Answer A makes perfect sense. It almost seems like a summary of what the paragraph just said.

Answer D requires a little thinking. If the paragraph had said "apparent" instead of "inarguable", and "could be" instead of "should be", then answer D might be plausible. If there was some resemblance to Spanish customs, it might be a coincidence. But the paragraph said "inarguable references to ... Spain", which seems to indicate that we should trust the narrator and believe that the Spanish connection can't be a coincidence. And if it can't be a coincidence, then there must have been later Spanish influences, bringing us back to answer A.

Problem 17   Official Answer: D

The answer choices contain a mix of commas and semicolons, and they are to be placed in the middle of a long series of words with a blank in the middle. Ignore the adverbial "rather" for a moment, and ask if this blank comes between two independent clauses. Try placing a period after "prey" and you should see that we are in fact dealing with two independent clauses. "It does not appear that the spider uses camouflage to capture its prey" and "The arachnid seems to wait" can both stand on their own as independent sentences. This rules out A and B, because commas without conjunctions to help them are too weak to hold together two fully-formed independent clauses. We need a stronger joint. Both C and D contain the stronger semicolon, but should the conjunctive adverb go before or after the semicolon?

Perhaps you feel that it is more natural after the semicolon, but why? The "rather" is a contrasting word, and it always contrasts the sentence (or clause) that contains it with the sentence (or clause) that came before. If the "rather" were to go before the semicolon, it would signal a contrast between the first clause of this sentence and the previous sentence...which doesn't exist in this passage. If it were to go after the semicolon, it would signal a contrast between the second clause of the sentence and the first clause of the sentence. This is what it needs to do in this case, so it needs to go after the semicolon.

Problem 18   Official Answer: D

The subject of the sentence is "Bonnie Buratti", and all four verb choices could work with this subject. This is not a subject-verb agreement issue. It's a verb tense issue. Do we need a past, present, or future tense in the blank? We need a past tense, to match "she made

a discovery". This rules out A and C, but still leaves B and D.

You can probably pick the correct choice just by imagining the four choices in a simplified sentence. Make the sentence as simple as you can. Just don't forget to include the second verb in the subordinate clause, because we need to make the first verb consistent with the second verb:

> She studies data when she made a discovery.
> She has been studying data when she made a discovery.
> She will study data when she made a discovery.
> She was studying data when she made a discovery.

Hopefully, it will be obvious to you that D is correct.

Technically, "has been studying" is an example of the *present perfect continuous* tense. It implies that she started studying in the past and is still studying in the present. Our attention on her activity only needs to continue until the point when she made the discovery, which was in the past, so the present perfect tense is inappropriate. "Was studying" is technically an example of the *past continuous* tense. It implies that the activity was ongoing in the past, but makes no claims about the present. This is the tense we need to use, since our attention stops at some point in the past.

Problem 19 Official Answer: B

Unless we split this string of words into two pieces at the blank, the entire thing is one long sentence. Let's try splitting it. More precisely, let's see if we are dealing with two independent clauses, or only one clause plus supplementary stuff.

"A ship entered San Franciso bay" is a complete clause. So is "Having left the harbor ... the ship set a record." So we have two independent clauses, and this requires a strong joint to link them and to mark the place where one clause ends and the next begins. A comma is not enough. We need a period or a semicolon, and our only option is to choose answer B.

Problem 20 Official Answer: A

What subject needs to be paired with this verb? What is doing the enhancing? In this case, it's a particular book, "A Sheaf Gleaned in French Fields". Let's just use "it" as our subject, and let's try the four verb choices with this simplified subject:

> It has enhanced...
> It are enhancing...
> It have enhanced...
> It enhance...

Hopefully this will make it clear that answer A is correct. We have a singular subject, and all of the other verb choices are plural.

(This book "has enhanced scholars' understanding of transnational and multilingual contexts"? Does academic writing always have to be so stuffy and unclear?)

Problem 21 Official Answer: A

Try placing a period after "tombs". In other words, start with answer A. The words on both sides of the blank can stand on their own. They are independent clauses. So A must be the correct answer. Neither a comma nor a conjunction by themselves are acceptable ways to join two independent clauses, and mashing two independent clauses together with nothing at all to mark the joint is awful.

(Actually, there are sometimes exceptions to the rules. For example, you can sometimes join clauses with commas if they are extremely brief and simple, as in "I came, I saw, I conquered." But these exceptions aren't part of "Standard English" and they never come up on the SAT.)

Problem 22 Official Answer: C

Here's a comma question. You can recognize it by the fact that the wording in all answer choices is identical, and the only difference is the commas. With comma questions, start with the answer containing no commas (or the fewest commas). If you can't think of a good reason for including any more, that's probably the correct answer.

Another pattern to notice is the "profession Proper Name" pattern, as in "astronaut Buzz Aldrin" and "painter William-Adolphe Bouguereau". Don't put commas around the name. You might be tempted to think that the name is "optional extra" stuff, and we normally surround such parenthetical comments with a pair of commas (or a pair of dashes). But in cases like

this, the name is *not* optional. It is essential to identifying the person you are talking about. So the name is not parenthetical and it should not be surrounded by commas.

So based on these hints alone, you may want to pick C. If you realize that the comma after "claims" separates the verb from its direct object, then you should definitely pick C. Never use a comma to separate things that belong together.

If you were taught that you always put a comma before a quote, you might think that you need the comma after "claims". But if you were taught the difference between direct quotes and "blended" or "spliced" quotes, then you will realize that you don't need the comma before the quote in this case.

Problem 23   Official Answer: B

This one has several semicolons floating around. There's one that we can't change, in the penultimate line after the word "research", and two of the answer choices also have semicolons. That's a clue. Look for a list. In large, messy lists, we can separate the items in the list with semicolons instead of commas, but we have to be careful not to mix up *commas within* list items and *semicolons between* list items. In this sentence, we identify two botanical gardens, and then we go on to list several things that they both do. So multiple semicolons are fine, as long as we are sure to place them in the proper places between the activities in the list. In pattern, we need to have a list with three actions: "They are dedicated to (1) growing plants; (2) fostering research; and (3) educating the public."

But what about the extra comment "both native and nonnative"? It goes with the first list item: "growing plants, both native and nonnative". So we need to have a comma after plants, to separate the action from the extra comment about that action, and then a semicolon after "nonnative", to end this list item and begin the next one. This makes B the correct answer.

Problem 24   Official Answer: C

How are the two sentence related? The previous sentence describes conquering and building. The sentence containing the blank describes a legal achievement. The latter is not a consequence or an example of the former, so "therefore" and "for instance" are not appropriate.

You might be tempted by answer B. If the final sentence didn't say "today" or "he is mainly remembered for", it might work. But the second sentence is not merely adding another achievement to the list. It is contrasting Hammurabi's poorly-known achievements with his famous achievement. This makes the contrasting word "however" most appropriate.

Problem 25   Official Answer: D

How are the sentences related? The sentence preceding the blank mentions Thomas's journey, and the sentence containing the blank mentions Beulah's personal life. This is either a comparison or a contrast of two parallel things. The second thing is neither a specification nor a consequence of the first thing, so "specifically" and "thus" are not appropriate. The second sentence is also not an exception to the first, so "regardless" doesn't work well, either. The two sentences both refer to the context or backdrop of the two people's stories, so the parallel word "similarly" is perfectly appropriate.

Problem 26   Official Answer: A

How are the two sentences related? The first sentence describes something that "typically" happens, which suggests that the next sentence is going to give an exception, which would make "nevertheless" an appropriate choice. Does the next sentence in fact give an exception? In the previous sentence, she "custom fits the garments to each actor", but in this sentence, she "had a factory reproduce it in a few standard sizes", with the result that they were "lacking a tailor-made quality". You might have to chew on the words a little bit, because they don't hit you over the head with contrasting words, but you should be able to infer that having "standard sizes" is the opposite of "custom fit" and "tailor-made". "Nevertheless" might also sound a little awkward, and you might prefer "however" or simply "but", but "nevertheless" is the only contrasting word among the answer choices, so it must be the right answer.

Problem 27   Official Answer: D

What's the goal? To make *and support* a *generalization* about the orbits of comets. The correct answer needs to make a broad claim about comets' orbits, and back

up that claim somehow. Searching the bullet points for a generalization and something that we could use to support this generalization, we find that many comets' orbits have changed over time. The last two bullet points give a particular example of a comet changing its orbit. Normally when they ask for a generalization, specific details are irrelevant distractions. In this case, however, we can use this concrete example as "support" for our generalization. We'll have to, since that's all we're given.

Answer A claims that orbits may change over time, but in a very faint way. The claim only comes after the semicolon and is weakened by the "may". It does not say that many orbits actually have changed, and it definitely provides no "support" for the claim.

Answer B makes no mention of orbits, except to imply that they exist.

Answer C gives the example, but no generalization.

Answer D leads with the general claim, then provides the supporting example after the colon. This is definitely the best choice.

Problem 1   Official Answer: C

It's hard to decide what skill they are trying to test here. Twenty more than seven is obviously twenty-seven. Judging from the official "Explanation", this is considered a substitution problem, but as long as you understand the basic usage of symbols, it's really just common sense.

Problem 2   Official Answer: B

Whenever they ask you to compare two data sets, the two data sets are always very similar, with only one or two minor changes between them. In this case, data set Y is identical to data set X, with the addition of an outlier on the high end. Adding an outlier always shifts the mean towards the outlier, so the mean of data set Y must be greater than the mean of data set X. Reading A and B carefully, we discover that B is the correct answer.

You can calculate the two means if you want to, but it isn't necessary.

Problem 3   Official Answer: B

What do you suppose this figure would look like if it *had* been "drawn to scale"? They apparently attach this caveat to every geometric figure just to warn you not to assume that things are as they appear ... and possibly to bother you with another visual distraction. They could at least have used a small italicized font.

Anyway, since the triangles are similar, angle T must equal angle Q, and since the triangles are right, angle S must be the complement of angle T. In other words, $T = 90 - 18 = 72$.

Be careful not to mix the angles up and think that S corresponds to Q, because then you'll arrive at answer A, which is a trap answer. Also be careful to subtract 18 from 90 and not from 180, because if you did that you'd arrive at answer D, which is another trap answer. (However, even if you do make this mistake, the fact that it is such an obtuse angle should raise a red flag in your head. You can't have an obtuse angle in a right triangle.)

Problem 4   Official Answer: A

We can easily solve this just by thinking it through ... with the aid of a calculator. By subtracting 362,105 from 467,000 we find that 104,895 of fuel was consumed, and dividing this number by 21 seconds gives the average consumption rate: 4995 kg per second.

Problem 5   Official Answer: C

The answer choices are all numbers, but by asking us for $x + y$, they are preventing us from testing the answers using trial-and-error, and they are forcing us to solve for both variables before we can rule out any answer choices.

That's not too difficult, however. We can easily solve the first equation for x by dividing by 4, giving $x = 5$. Now we can substitute this value into the second equation and deduce the corresponding values for y and $x + y$:

$$-3x + y = -7$$
$$-3(5) + y = -7$$
$$y = -7 + 15 = 8$$
$$x + y = 5 + 8 = 13$$

With a little foresight and creativity, we could also have simply added the two equations together, which would have yielded an equation for $x + y$ directly:

$$4x - 3x + y = 20 - 7$$
$$x + y = 13$$

Problem 6   Official Answer: 5

The equation $10x + 15y = 85$ represents ... what?

$$
\begin{array}{ccccc}
10x & + & 15y & = & 85 \\
10 \cdot \text{(On-Site)} & + & 15 \cdot \text{(Online)} & = & 85 \text{ Hours}
\end{array}
$$

The coefficients are clearly the number of hours per course: 10 hours for each on-site course, and 15 hours for each online course. (If only SAT courses were this brief...) They ask us how much longer each online course is than each on-site course, so the answer is 15-10 = 5.

Problem 7 $\hfill$ Official Answer: D

All linear measurements in any pair of similar figures, including any two squares, scale together according to the same scale factor. Or in other words, all corresponding pairs of measurements are in the same ratio. In this case, the ratio is 2. The perimeter of the larger square is twice that of the smaller square, so the sides of the larger square must also be twice those of the smaller square.

$$\text{Side of Y} = 2 \cdot \text{Side of X} = 2 \cdot 12 = 24$$

Problem 8 $\hfill$ Official Answer: A

This linear function has a positive constant term, which must stand for the initial value, and a negative slope, which must stand for the declining amount of fuel in the tank as the trip progresses. In other words, the tank must have contained 12.1 gallons at the beginning of the trip, and it must be losing 0.05 gallons per mile. They ask us for the usage rate of gasoline, so the answer is the rate coefficient, 0.05.

Problem 9 $\hfill$ Official Answer: 28

Whenever you are given an equation, your instinct might be to solve it for the unknown variable, and then state that as your answer. In real life, that's usually the most useful thing to do, and it's probably what you've practiced doing in most of your schooling. But the SAT likes to give you equations, and then ask you for something *other than the variable*. Beware of that, especially with free-response questions. In this case, we need the positive value of $x - 1$.

Sometimes the extra modification is a snare to try to catch you in a hasty overlooking of something. But often it can actually be helpful. Sometimes they are trying to see if you can recognize shortcuts or efficient methods. In this problem, notice what happens if we just divide the whole equation by 4. (We are allowed to do that, as long as we treat the absolute value symbols like parentheses, and divide the entire expression inside by 4.) This gives us $|x - 1| = 28$. This means that the quantity $x - 1$ can be either 28 or -28. Since they ask us for the positive value, we can just enter 28 into the answer box.

(If you had tried to solve the problem by brute algebra, you would have found that $4x - 4 = \pm 112$, which gives $4x = 4 \pm 112 = -108$ or 116, then dividing these values by 4 would give $x = -27$ or 29, and finally subtracting 1 gives $x - 1 = \pm 28$, as before.)

Problem 10 $\hfill$ Official Answer: C

You can solve the given equation for x simply by multiplying by y and dividing by 11, which gives this:

$$\frac{1}{7b} = \frac{11x}{y} \tag{1}$$

$$\frac{y}{11} \cdot \frac{1}{7b} = \frac{11x}{y} \cdot \frac{y}{11} \tag{2}$$

$$\frac{y}{77b} = x \tag{3}$$

Problem 11 $\hfill$ Official Answer: 11

They have carefully avoided any allusion to graphs, but this problem is pretty easy if you think of it graphically. They are basically asking for the slope of the line when you graph it. To figure this out, you can pick any two columns from the table and apply the "slope formula", or just calculate the ratio of rise and run.

$$\text{Slope} = \frac{\text{Rise}}{\text{Run}} = \frac{137 - 82}{15 - 10} = \frac{55}{5} = 11$$

This was calculated using the first two points, but since the relationship is linear, any pairing of points should give the same value.

Problem 12 $\hfill$ Official Answer: 9

Whenever they give you a mess, simplifying the mess is usually a good first step. Whenever they make you subtract a parenthetical expression (which they often do), be extra careful to get the signs right. In this case, we can simplify the mess as follows:

$$(5x^3 - 3) - (-4x^3 + 8) \tag{4}$$

$$= 5x^3 - 3 + 4x^3 - 8 \tag{5}$$

$$= 9x^3 - 11 \tag{6}$$

Comparing this to the pattern $bx^3 - 11$, we see immediately that $b = 9$.

Problem 13 Official Answer: A

This is a weird question, and there are several ways you could arrive at an answer, all of them annoying.

1. You could try solving the system by graphing. You were probably taught in school to graph systems of inequalities by graphing lines, shading one side of each line, and identifying solutions to the system by finding where the shaded regions overlap. The in-app calculator, powered by Desmos, can do this very nicely.
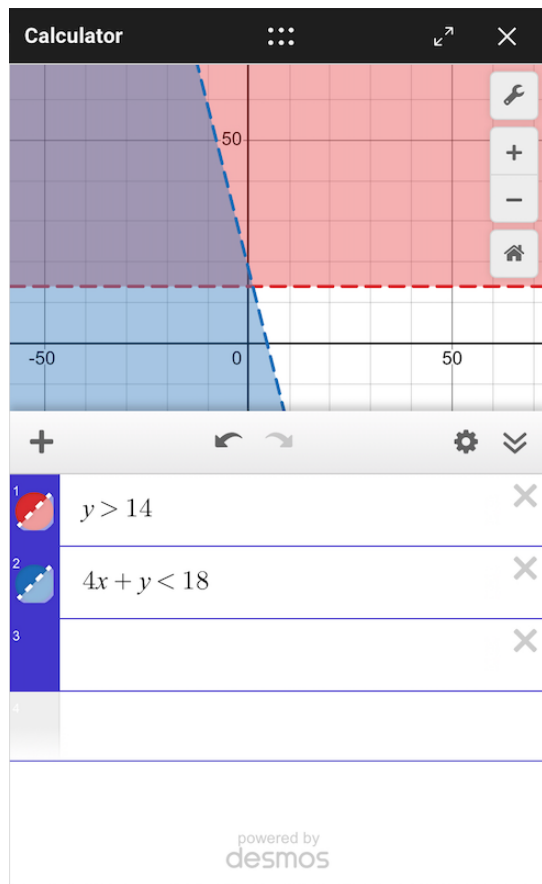
In this case, you'll notice that the solution region is in the upper left, that $y = 53$ is far up the y-axis, and therefore that the most negative answer for x is probably the correct answer. Positive values for x are clearly wrong, and you can confirm that -5 is not sufficiently negative by plugging it in: $4(-5) + 53 = 33$, which is not less than 18, so it fails to satisfy the inequality.

2. The most direct way to solve this problem is probably trial-and-error. You could just substitute 53 for y and each of the four answer choices for x, and see which one works.

3. You might notice that trial-and-error will involve

repeated calculations involving $y = 53$. You might also notice that the first inequality is irrelevant, since $53 > 14$ is automatically satisfied by the given value of $y = 53$. So an alternative approach would be to plug 53 into the second inequality and solve for x, and then you would have a much simpler test equation. Plugging 53 into the second inequality gives this:

$$4x + 53 < 18$$
$$4x < -35$$
$$x < -8\,{}^{3}\!/_{4}$$

Only answer choice A satisfies this requirement.

4. If you can do things in an easier way, that's usually best, especially during a timed test. But if you like to do things formally, symbolically, and abstractly, delaying substitution until the last minute, you could also combine the two inequalities like this:

$$
\begin{array}{ccccc}
14 & < & y & < & 18 - 4x \\
\text{-}4 & < & y - 18 & < & -4x \\
1 & > & \frac{y-18}{-4} & > & x
\end{array}
$$

This compound inequality represents exactly the same conditions as the original system. Now if you substitute $y = 53$, you have this:

$$
\begin{array}{ccc}
1 & > & \frac{53-18}{-4} & > & x \\
1 & > & -\frac{35}{4} & > & x
\end{array}
$$

Again, the first of the two inequalities is superfluous, and the second becomes this:

$$x < -\frac{35}{4} = -8\,{}^{3}\!/_{4}$$

Problem 14 Official Answer: D

This is a good time to get out your calculator. How many times does the population double in 15 hours? There are 5 three-hour intervals in 15 hours, so the population will double 5 times, and you could simply enter 300,000 and then multiply by 2 five times in your calculator, giving 9,600,000. If you remember that exponents were designed for exactly this type of situation, i.e. for repeated multiplication, you could also enter 300,000 times 2^5, which will also give you 9,600,000. If you are clever and want to save a little button-pushing, you could also reason in thousands: $300 \cdot 2^5 = 9600$. Just don't forget to add back the three zeros when you're done.

Problem 15   Official Answer: D

The x-axis represents time, and the y-intercept represents the value at the beginning. In this case, we can read the value as approximately 9 (thousand), and we interpret this to mean that there were 9000 catalogs sent at the end of 1992.

In most SAT problems, the domain restriction is merely annoying clutter, and you can ignore it. In this case, they are just telling you that the estimation is only valid for the first 10 years. But the graph doesn't extend beyond $x = 10$ anyway, so it's totally useless to tell us that in writing.

Problem 16   Official Answer: B

We need to rewrite the radical using fractional exponents:

$$\sqrt[7]{x^9 y^9} = (x^9 y^9)^{1/7} = ((xy)^9)^{1/7} = (xy)^{9/7}$$

Problem 17   Official Answer: C

What's the proper multiplication factor for a 7% increase? If you want to calculate the *amount of the increase*, you should multiply by 0.07. If you want the *final result after the increase*, you can multiply by 0.07 and then add the original amount, or you can just multiply by 1.07. We want the final result, so the proper multiplication factor is 1.07.

Problem 18   Official Answer: C

If you think of this graphically, the two lines must be parallel to have "no solution". Algebraically, the equations must have the same slope coefficient, but different y-intercepts. (If they had the same y-intercepts as well as the same slopes, they would be the same line and the system would have "an infinite number of solutions".) The only equation pair that contains the same slope but different y-intercepts is C.

Answer choice A gives a vertical line and a horizontal line, for which the solution is obviously (3,5). Answer D gives a horizontal line and a tilted line, which also clearly has a solution.

Problem 19   Official Answer: D

All four answer choices have the format of an exponential function, for which the initial coefficient represents a starting value and the number under the exponent represents the base or growth factor. However, here we are dealing with a sequence and a discrete independent variable, rather than a continuous exponential function with a continuous independent variable. That's different. That should be a red flag, indicating that we should be extra careful.

Since we are multiplying by 4 every time, the base or rate factor under the exponent needs to be 4. This rules out answers A and B. But should the exponent be n or $n - 1$? Let's try substituting $n = 1$, which should represent the first term in the sequence, into answer C. The first term needs to be 9, but answer C gives 36 for $n = 1$. Answer C jumps the gun and multiplies the initial value by 4 already, giving the wrong value for the first term. Answer D correctly compensates for the fact that the "initial value" corresponds to $n = 1$ instead of $n = 0$ by subtracting 1 from n. This makes the exponent zero for the first term, as it should be, and one for the second term and two for the third term and so on.

This problem is a sneaky variation on the usual exponential function questions, in which the coefficient represents the starting value. Here we are actually dealing with a *geometric series* rather than a true, continuous exponential function. (The exponential function was in fact invented to be a continuous version of a geometric series.) With geometric series, the "first" term is the starting value, and all subsequent terms are multiples of this value. When measuring along a ruler or number line, you start at zero, but when counting terms, you start at 1. In advanced math when dealing with sequences and series, the first term is often given an index number of "0", in an attempt to avoid just such a confusion. In computer programming, the first element in a list or array is often given an index number of zero for the same reason.

Problem 20   Official Answer: B

x has a minimum, which means $x \geq$ something. This rules out A and C, since those two have the arrows pointing the wrong way. Translating "12 less than 6 times n" into symbols, we have $6n - 12$, which makes B the correct answer.

Problem 21   Official Answer: B

Whenever they give you a geometric situation, but they don't give you a figure, you should probably make one of your own. It helps you to keep all of the information straight. In this case we have two similar right triangles, so let's draw two similar right triangles, and then label all the corners, making sure we keep corresponding corners labeled with corresponding letters. The don't tell us which angle is the right angle, but they do give us the side lengths, so we can deduce that S must be the right angle, since the hypotenuse must be the longest side and the right angle must be the one opposite to the hypotenuse. And thus we sketch something like this:
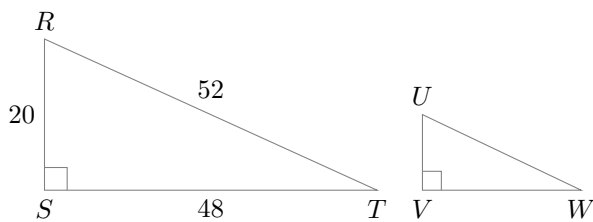
We don't know the scale factor that relates these two triangles, but it doesn't matter. When calculating a tangent, all we care about are the ratios, and the ratios are the same in similar triangles. So...

$$\tan W = \tan T = \frac{\text{Opposite}}{\text{Adjacent}} = \frac{20}{48} = \frac{5}{12}$$

Problem 22   Official Answer: 59/9, 6.555, 6.556

This is annoying and tedious, but not too difficult. Let's start by re-writing the equation in slope-intercept form. Then we can subtract 4 to shift it downwards, and then we can set this equal to zero to figure out the x-intercept. (Be careful. Intercept questions usually involve the y-intercept but not always. Sometimes they ask you about the less familiar x-intercept.)

$$y = \frac{9x - 19}{10} = \frac{9}{10}x - \frac{19}{10}$$

Translating this down 4 units gives...

$$y = \frac{9}{10}x - \frac{19}{10} - 4 = \frac{9}{10}x - \frac{59}{10}$$

Setting this equal to zero and solving for x will give us the x-intercept.

$$0 = \frac{9}{10}x - \frac{59}{10}$$

$$\frac{9}{10}x = \frac{59}{10}$$

$$x = \frac{59}{10} \cdot \frac{10}{9} = \frac{59}{9}$$

If you're comfortable with translations and standard-form equations, you can also just replace y with $y + 4$ in the original equation:

$$9x - 10(y + 4) = 19$$
$$9x - 10y - 40 = 19$$
$$9x - 10y = 59$$

Substituting $y = 0$ and solving for x gives the same result as before:

$$9x - (0) = 59$$
$$x = \frac{59}{2}$$

Problem 1   Official Answer: B

You have to multiply 7 by 4 to get 28, so $x = 4$, and 8 times 4 gives 32.

Problem 2   Official Answer: B

Ten percent is the same as one tenth, and you can calculate one tenth of a large number simply by dropping a zero. Ten percent of 760 is 76.

Problem 3   Official Answer: 2520

If there are 42 posters each minute, and 60 minutes in every hour, then there must be $42 \cdot 60 = 2520$ posters in every hour.

The official "explanation" applies the rigorous method of unit multipliers, which helps to keep things straight in complicated problems, but is totally unnecessary in such simple problems.

$$\frac{42 \text{ posters}}{1 \text{ minute}} \cdot \frac{60 \text{ minutes}}{1 \text{ hour}} = \frac{2520 \text{ posters}}{1 \text{ hour}}$$

Problem 4   Official Answer: 40

Yes, it's that easy. The bar over "6" rises up to the "40" line, so 40 is the answer.

Problem 5   Official Answer: 7

This one is barely more than a test of your ability to interpret weirdly-phrased questions. "The x-intercept of the graph shown is $(x, 0)$. What is the value of x?" That's just an unnecessarily cumbersome way of saying "Locate the x-intercept of the graph." Or, "Find the dot on the number line and state the number." Mathematicians might also wonder whether "tangent point" might have been a better name for the point in question, since the curve never actually crosses the axis.

But don't ponder things like this during an actual test. Just find the point where the graph touches the x-axis, which is helpfully marked with a dot, count where it is on the number line, and enter the number 7 into the response box.

Problem 6   Official Answer: 30

This is a simple substitution problem. We are given a function and an input value, and we just have to calculate the output for the given input.

$$f(4) = 7(4) + 2$$
$$= 28 + 2 = 30$$

Problem 7   Official Answer: 180

A square has four sides, and the perimeter is all the way around. The perimeter of a square with a side length of 45 is $4 \cdot 45 = 180$.

Problem 8   Official Answer: C

Eyeballing the graph, we see that the x-coordinate corresponding to a y-coordinate of 4 is about three and a half. But all four answer choices are also near three and a half, so we'll have to come up with a more precise evaluation based on the intercepts.

Most of the time, when they draw a dot in the coordinate plane, we can assume that the dot lies exactly on a grid line, i.e. it corresponds to an exact integer value. In this case, we can conclude that the x-intercept is 8 and the y-intercept is 7. From here, we can either set up and solve a linear equation based on these intercepts, or we can try to reason in proportions: The point in question lies at a height of 4, which is 4/7 of the height of the y-intercept. Therefore, the x-coordinate must lie 4/7 of the way from 8 to 0, or 3/7 of the way from 0 to 8. In other words, $d = 3/7 \cdot 8 = 24/7$.

More systematically, we can write the equation of a line and then solve for $y(d) = 4$. The line has a y-intercept of 7, and a slope of -7/8. If we write the equation for this line, substitute $y = 4$, and then solve for x, we have the following set of calculations:

$$y = -\frac{7}{8}x + 7$$
$$4 = -\frac{7}{8}x + 7$$
$$\frac{7}{8}x = 7 - 4 = 3$$
$$x = \frac{8}{7} \cdot 3 = \frac{24}{7}$$

Problem 9   Official Answer: A

They give us a binomial, and all four answer choices contain a monomial multiplied by something else, so this is apparently a factoring problem. Searching for common factors, we find that 5 is common to both 5 and 50, and x is common to both x^2 and xy^2. Dividing both terms by the common factor of $5x$ leaves behind $x - 10y^2$, so the factored form of the given expression is $5x(x - 10y^2)$, and the correct answer is A.

We could also have started by immediately ruling out answers C and D, because the two given terms are not like terms and cannot be reduced to a single product. Answers A and B both contain the same monomial, $5x$, which is a clue to factor $5x$ out of the given expression, so all that's left is to decide what's left behind when you factor $5x$ out of $5x^2 - 50xy^2$.

If you don't like factoring, you could also go in reverse. Just use the distributive property to multiply the factors in each of the four given answer choices and see which one gives you the original expression.

Problem 10   Official Answer: D

$$f(x) = 5x^2$$
$$f(8) = 5(8)^2 = 5(64) = 320$$

Problem 11   Official Answer: D

These are formally known as "consecutive interior angles", but that doesn't matter. What matters is that they must be supplementary, i.e. they must sum to 180 degrees, just like the pair of corners at the end of any corridor. One of the angles is very acute, so the other must be very obtuse, and we can just pick the only obtuse answer choice. (We are told not to assume that things are as they appear, so we probably shouldn't just assume that x is obtuse based on appearances, but 26 is very clearly an acute angle, so x must definitely be obtuse.)

More precisely: $x = 180 - 26 = 154$.

Problem 12   Official Answer: A

Answer choice B is a sloppiness trap. If you are hasty, you might be tempted to think that you need to make a fraction, with 14 in the denominator and the desired number 2 in the numerator. But when you construct a probability fraction, you are always counting the *number of ways*, not the *value of the results*. There is only *one* side of the die with a "2" on it, so we need to place 1 in the numerator, giving 1/14, or answer choice A.

Problem 13   Official Answer: A

Notice that all four answer choices are equations in slope-intercept form (albeit with the two terms reversed), and they are all identical except for the signs. We just need to figure out whether the slope and y-intercept are positive or negative. The y-intercept is clearly positive (at a value of about 3), and the slope is clearly positive, since the graph tilts up, or increases to the right. Only answer A has both terms positive.

Problem 14   Official Answer: C

If you add the same number to all values in a data set, all "measures of center" (including the median) are shifted by the same amount, and all "measures of dispersion" (including the range) remain the same. Graphically, you are sliding the entire distribution up or down the scale without changing its shape. So if we add 56 to every value in a data set, the median will go up by 56, the range will stay the same, and C is the correct answer.

You can calculate the median and the range of both sets from the given information if you want to, but that's a lot of unnecessary work. (Well, it's really not that hard. The range is just 26-22=4, and to find the median, you can just count dots. There are 15 values in the data set, so the median will be the 8th dot, which lies at 23 in data set A.)

Problem 15   Official Answer: A

She earns a total of $1258, so "stuff = 1258" is clearly a summation equation, totaling up her earnings. And the terms in the equation must represent the separate portions of her earnings from consulting and from plan-

ning.

$$68x + 85y = 1258$$

Since x represents hours consulting and y represents hours planning, she must charge \$68 per hour for consulting and \$85 per hour for drawing up plans, making A the correct answer.

Problem 16   Official Answer: D

This is a substitution problem disguised to look like a system-of-equations problem. Substituting $x = 8$ into the second equation gives y almost immediately.

$$y = 8^2 + 8 = 64 + 8 = 72$$

Problem 17   Official Answer: D

If you've never seen graphs of rational functions before, this may look very unfamiliar and worrisome. But the shape of the curve makes no difference. All they are asking you for is the value of $f(0)$, i.e. the y-intercept. In this case, the curve crosses the y-axis at $y = 3$, and D is the correct answer.

Problem 18   Official Answer: C

$$
\begin{aligned}
f(x) = 48 &= 8\sqrt{x} \\
\sqrt{x} &= 48/8 = 6 \\
x &= 6^2 = 36
\end{aligned}
$$

Problem 19   Official Answer: D

You know the slope must equal -1/3, which rules out answers A and B. To distinguish between C and D you have to figure out the correct intercept. If you remember the "point-slope" form of an equation, you could plug in the given point and the given slope as follows:

$$
\begin{aligned}
y - y_1 &= m(x - x_1) \\
y - 10 &= -\frac{1}{3}(x - 9)
\end{aligned}
$$

Adding 10 to both sides gives $y = -\frac{1}{3}x + 13$, which is answer choice D. If you don't remember point-slope form, you could also just plug the given x and y values into the slope-intercept form, and solve for the intercept.

$$
\begin{aligned}
y &= mx + b \\
10 &= -\frac{1}{3} \cdot 9 + b \\
b &= 10 + 3 = 13
\end{aligned}
$$

Only answer choice D has a y-intercept equal to 13.

Problem 20   Official Answer: C

Since this is multiple choice and the answers are all numbers, you could try trial-and-error here. You could get out your calculator, and test each of the four given numbers to see if that many children and the corresponding number of adults would add up to \$1440. For example, if there were 3 children, that would mean that 18 people were adults, and the bill would come to 3·\$60+18·\$80=\$1620. That's too much, so there must be more of the cheaper children and fewer of the expensive adults, and we should try one of the larger numbers. If you're good with a calculator, that wouldn't take too long. But it's a lot of button-pushing, and depending on how fast and reliable your algebra skills are, it might be better just to use algebra and do this the formal way.

Let's let a stand for the number of adults and c stand for the number of children. We can write $a + c = 21$ for our first equation, and $80a + 60c = 1440$ as our second. Since we are only interested in the number of children, let's solve the first equation for the number of adults, and then substitute that into the second equation.

$$
\begin{aligned}
a &= 21 - c \\
80(21 - c) + 60c &= 1440 \\
80 \cdot 21 - 20c &= 1440 \\
20c &= 80 \cdot 21 - 1440 = 240 \\
c &= 12
\end{aligned}
$$

Problem 21   Official Answer: D

This is a straightforward discriminant problem. They give you a quadratic equation, and ask you how many solutions it has, and this is exactly why we memorize the discriminant. The sign of the discriminant tells us

how many solutions there are. (Incidentally, they ask for "real" solutions just in case you have learned about imaginary numbers. Imaginary solutions never count on the SAT. And they ask you for "distinct" solutions just to rule out the possibility that you might have "two solutions, but they are really the same number".)

Plugging the coefficients into the discriminant formula gives us this:

$$b^2 - 4ac = (10)^2 - 4(5)(16) = 100 - 320 = -220$$

Since this is a negative number, there are no solutions to this quadratic equation.

Problem 22   Official Answer: A

Given any equation of a circle in standard form, you should be able to read the circle's size and position directly from the parameters in the equation. For the given equation, we can see that the center is located at (0,2), and the radius is $\sqrt{36} = 6$. We need to pick the equation from among the answer choices that represents the same circle translated down 4 units.

All four equations have the correct radius, so that doesn't help. We'll have to examine the central coordinates. Shifting (0,2) down by four units places the new center at (0,-2), for which answer A gives the correct equation.

We could have ruled out C and D immediately, because those express a horizontal translation, rather than a vertical translation. The difference between A and B lies in whether the translation is up or down.

Problem 1   Official Answer: A

Mathematically, this is a simple percent problem. Twenty percent or one-fifth of 55 is 11.

The only fancy concept here is extrapolation, or "inference" as the statisticians call it. We assume that the same percentage applies to the total as to the sample. But that assumption has no effect on your calculation or your answer.

Problem 2   Official Answer: B

Just be careful to match the right variable name to the right quantity. They have instructed us to use x for large boxes and y for small boxes, so the equation needs to look like this:

Time per Large	·	Number of Large	+	Time per Small	·	Number of Small	=	Total Time
10	·	x	+	5	·	y	=	700

Problem 3   Official Answer: B

The SAT is weird. Usually when they draw dots on graphs, we can assume that they mark places where the curves intersect grid lines, and we can therefore read them as representing whole-number values. Sometimes we have to make this assumption in order to read an intercept or a vertex or something. But here the dots do *not* represent integer values. They do in the y-direction, apparently, but not the x-direction.

Anyway, we are given four equations in slope-intercept form (albeit with the terms reversed), and all four equations are identical except for the signs. The line in the graph clearly has a negative slope, so we can rule out answers A and C. They y-intercept is clearly positive (with a value of about 13 and a half), which rules out C and D, and leaves only B.

Problem 4   Official Answer: C

Eyeballing the graph, we see that the x-coordinate corresponding to a y-coordinate of 4 is about three and a half. But all four answer choices are also near three and a half, so we'll have to come up with a more precise evaluation based on the intercepts.

Most of the time, when they draw a dot in the coordinate plane, we can assume that the dot lies exactly on a grid line, i.e. it corresponds to an exact integer value. In this case, we can conclude that the x-intercept is 8 and the y-intercept is 7. From here, we can either set up and solve a linear equation based on these intercepts, or we can try to reason in proportions: The point in question lies at a height of 4, which is 4/7 of the height of the y-intercept. Therefore, the x-coordinate must lie 4/7 of the way from 8 to 0, or 3/7 of the way from 0 to 8. In other words, $d = 3/7 \cdot 8 = 24/7$.

More systematically, we can write the equation of a line and then solve for $y(d) = 4$. The line has a y-intercept of 7, and a slope of -7/8. If we write the equation for this line, substitute $y = 4$, and then solve for x, we have the following set of calculations:

$$y = -\frac{7}{8}x + 7$$

$$4 = -\frac{7}{8}x + 7$$

$$\frac{7}{8}x = 7 - 4 = 3$$

$$x = \frac{8}{7} \cdot 3 = \frac{24}{7}$$

Problem 5   Official Answer: D

If we try $x = 0$ in the four answer choices, they all give $f(0) = 14$, so that doesn't help. Trying $x = 1$ doesn't help much, either. We find these values:

A: $f(1) = 3 + 3 + 14 = 20$
B: $f(1) = 5 + 1 + 14 = 20$
C: $f(1) = 9 - 1 + 14 = 22$
D: $f(1) = 1 + 5 + 14 = 20$

At least we can rule out C. Trying $x = -1$ gives the following values:

A: $f(-1) = 3 - 3 + 14 = 14$
B: $f(-1) = 5 - 1 + 14 = 18$
C: $f(-1) = 9 + 1 + 14 = 24$
D: $f(-1) = 1 - 5 + 14 = 10$

Thus D is the correct answer.

The official "explanation" wants us to write the general form of a parabola, $y = a(x - h)^2 + k$, deduce the values of a, h, and k by substituting the three given data

points, and then expand the vertex form into standard form, all of which takes about a half a page of calculations. Never use a long, tedious method when a simpler method is available.

Problem 6   Official Answer: C

In other words, what's the value of the independent variable when the dependent variable is 10?

$$f(a) = \frac{a + 15}{5} = 10$$
$$a + 15 = 5 \cdot 10 = 50$$
$$a = 50 - 15 = 35$$

Problem 7   Official Answer: C

Angles x and y are clearly vertical and therefore equal to each other. This means that we can equate the two algebraic expressions for x and y, which will produce an equation that can be solved for k:

$$6k + 13 = 8k - 29$$
$$13 + 29 = 8k - 6k$$
$$42 = 2k$$
$$k = 42/2 = 21$$

We are asked for z, which is supplementary to y (and to x). So to find z, we can substitute k back into either expression for y or x and then subtract the result from 180.

$$z = 180 - (6 \cdot 21 + 13)$$
$$= 180 - 126 - 13$$
$$= 41$$

Problem 8   Official Answer: C

If you are unfamiliar with slopes of equations in "standard form", just rearrange the given equation into the more familiar "slope-intercept form", giving $2y = -18x + 9$, or $y = -9x + 9/2$. The slope of this line (line p) is -9, and slopes of perpendicular lines are opposite reciprocals of each other, so the slope of line r must be $+1/9$.

If you realize that the slopes of lines in standard form are given by the (negative of the) ratios of the coefficients on x and y, then you can simply reason like this: Line p has a slope of -18/2=-9, so line r must have a slope of $+1/9$.

Problem 9   Official Answer: A

Physics problems on the SAT are normally just context for mathematical problems, but the one main exception is density. You should memorize how to calculate density: mass divided by volume. The greater the weight for a given volume, the greater the density, and vice versa. In reverse, the relationship is Mass = Density x Volume. To find out how heavy or massive a chunk of material is, multiply the volume by the density.

In this problem, they give us a density, and tell us that the sample is a cube with a known edge length, so we can easily calculate the volume. The volume of a cube is simply the cube, i.e. the third power, of the edge length. So we have this as our calculation:

$$\text{Mass} = \text{Density} \cdot \text{Volume} = 807 \cdot (0.9)^3 = 588$$

Problem 10   Official Answer: C

Be careful not to interpret the fraction in an upside-down way.

We can see from the base or growth factor of 1.04 that the population is predicted to increase by 4% every interval, meaning every time the exponent $\frac{4}{6}t$ increases by 1. If we invert $\frac{4}{6}t = 1$, we find $t = \frac{6}{4} = \frac{3}{2}$. t is measured in years, and 3/2 of a year is 18 months. So the population is expected to increase by 4% every 18 months, and C is the correct answer.

If you are treating this as a "throw-away" problem and you just want to guess in order to save time, you could ignore the messy time scale, and just look for an answer with a number that actually appears in the given base. That's risky, but if you skim the problem and realize that they are asking for a growth factor expressed as a percent, you might be able to guess C with reasonable confidence.

Problem 11   Official Answer: -.9333, -14/15

Here's one way to look at it: Notice that both sides of the equation are linear expressions.

$$2(kx - n) = -\tfrac{28}{15}x - \tfrac{36}{19}$$

$$2kx - 2n = -\tfrac{28}{15}x - \tfrac{36}{19}$$

Imagine graphing the left and right expressions separately as functions. If the equation has no solutions, the left and right sides will never be equal, and the two graphs will never cross. The lines will be parallel. This means that the slopes (i.e. the coefficients on x) must be the same, but the intercepts (i.e. the constant terms) must be different. We are told that $n > 1$, so the second condition is satisfied automatically. By comparing the slope on the left side ($2k$) to the slope on the right side (-28/15), we can deduce that $k = -14/15$.

What happens if, instead, we just try to solve the equation for k? We end up with something that looks like this:

$$k = -\frac{14}{15} - \frac{\text{constant mess}}{x}$$

If k had any value other than -14/15, we would be able to solve this equation for x. For the equation to have no solutions, k must be equal to -14/15, since then it would be equivalent to "a number divided by x equals zero".

The official "explanation" states that -14/15, -.9333, and -0.933 are all acceptable answers, but in cases like this it's probably safest to use as much precision as possible, and enter the fraction or the maximum number of significant figures.

Problem 12   Official Answer: 203/50, 4.06

This is a "successive percents" issue. Just convert both percents into decimals and multiply everything together:

$$7.00 \cdot 2.9 \cdot 0.2 = 4.06$$

Be careful to use 0.2 instead of 0.8, because we need to calculate the amount remaining after the discount, not the amount of the discount.

The official "explanation" states that 203/50 is also an acceptable answer, which is strange, since the answer box only allows you to enter five characters.

Problem 13   Official Answer: 289

This one looks challenging, but it really isn't too bad. Whenever you see a quadratic equation and the number of solutions is in question, always think of the discriminant:

$$\Delta = b^2 - 4ac$$

If this quantity is negative, there are no real solutions to the quadratic equation. In other words (in symbols, actually), in order for there to be no real solutions, this must be true:

$$b^2 - 4ac < 0$$

Ignoring for the moment the fact that we don't yet know what c is, let's try plugging the coefficients that we do know in to the discriminant formula and seeing what happens. We obtain this inequality:

$$(-34)^2 - 4(1)c < 0$$

We can rearrange this to make

$$c > 34^2/4$$
$$c > 289$$

The rest is just (deliberately) muddied waters. The question asks for a limiting value, and we just calculated the limiting value. If you enter 289 into the answer box at this point, you'll receive credit for a correct answer.

To elaborate, we know that $c > 289$, and we also are told that $c > n$. If we think of n as simply the name for the lower limit for c, we conclude that $n = 289$. But the question implies that n is a variable, with a range of possible values. If n were any less than 289, then this would potentially allow c to become less than 289, which would produce a quadratic equation with real solutions. So if n is allowed to vary, then we conclude that n must remain greater than 289 to prevent real solutions from appearing, and "the least possible value" for n is therefore 289. It's an obnoxious problem setup, but all you really need to recognize is that you need to calculate a limiting value using the discriminant.

Problem 14   Official Answer: 44

Sometimes there are questions about mean values, but instead of giving you a data set, they give you the means, and you have to re-calculate them. When this happens, always start by seeing if you can calculate a total, which you can as long as you know how many data points there are. The total is always the mean multiplied by the number of data points.

In this problem, we have 75 buildings with a mean height of 32 meters, so the total height of all buildings put together must be 75·32=2400 meters (or just under a kilometer and a half). That's the total for data set A. For data set B we have a total height of 50·62=3100 meters (a little over 3 kilometers). They ask us for the mean of the two sets put together, so all we have to do now is add the two height totals and divide by the total number of buildings. (2400+3100)/125=44 meters, which makes sense. The mean of two sets put together should be somewhere between the means of the two sets separately.

Problem 15   Official Answer: D

You might be tempted to expand the product of binomials to see if you can make it match up with the given polynomial. If you do, you find this comparison:

$$4x^2 \quad + \quad bx \quad - \quad 45$$
$$hx^2 \quad + \quad (k+hj)x \quad + \quad kj$$

Since h, k, and j are all integers, $k+hj$, and therefore b, must also be integers. By matching coefficients, we can see that $h = 4$, and $kj = -45$. Now let's examine the four answer choices one by one.

A – If you take an integer and divide by another integer, there's no guarantee that you will end up with an integer.

B – Ditto.

C – We know from the comparison of leading terms that h must be equal to 4, and 45 divided by 4 is clearly not an integer.

D – We know from the comparison of trailing terms that $kj = -45$. So $-45/k = j$, and we know j to be an integer. So this is the correct answer choice.

Problem 16   Official Answer: 14.5, 29/2

This is really a quadratic equation in disguise. They have taken a quadratic equation and turned it into a "system" by splitting off one of the numbers into a separate "equation". You can turn it back into a quadratic equation by simple substitution. Just replace y in the second equation with -1.5 and rearrange it into standard form.

$$-1.5 = x^2 + 8x + a$$
$$x^2 + 8x + (a + 1.5) = 0$$

Now, they tell us that this "system" has one solution. Whenever you meet a question involving how many solutions something has, always think of the discriminant. If you remember what the discriminant is and how to calculate it, the rest of this problem should be easy. If you don't, it is worth reviewing, because it is often useful on the SAT. In a nutshell, the sign of the discriminant tells you whether you have two, one, or no solutions, and you calculate it as $b^2 - 4ac$. So calculating the discriminant for this problem gives us this:

$$8^2 - 4(1)(a + 1.5) = 64 - 6 - 4a = 58 - 4a$$

In order for there to be exactly one solution, this must be equal to zero, so $58 - 4a = 0$, $4a = 58$, and $a = 58/4 = 29/2$.

Another way to look at this would be to think of it graphically. What do the two given "equations" look like when you graph them? The first is a horizontal line, and the second is a parabola. How is it possible for a horizontal line and a parabola to intersect at exactly one point? The line must be tangent to the parabola at the vertex. So you can use the vertex formula (assuming you remember it), to find the x-coordinate of the given parabola ($x = -b/2a = -8/2 = -4$), and then substitute this x-value, along with the known y-value, into the quadratic function and then solve for a.

$$-1.5 = (-4)^2 + 8(-4) + a$$
$$-1.5 = 16 - 32 + a$$
$$a = 32 - 16 - 1.5 = 14.5$$

Either 29/2 or 14.5 is an acceptable answer.

Problem 17   Official Answer: C

If you add the same number to all values in a data set, all "measures of center" (including the median) are shifted by the same amount, and all "measures of dispersion" (including the range) remain the same. Graphically, you are sliding the entire distribution up or down the scale without changing its shape. So if we add 56 to every value in a data set, the median will go up by 56, the range will stay the same, and C is the correct answer.

You can calculate the median and the range of both sets from the given information if you want to, but that's a

33

lot of unnecessary work. (Well, it's really not that hard. The range is just 26-22=4, and to find the median, you can just count dots. There are 15 values in the data set, so the median will be the 8th dot, which lies at 23 in data set A.)

Problem 18   Official Answer: C

This one is just obnoxious. We can rule out answer D right away, because that simplifies to a constant value (you can cancel the common factor of $x + 4$, leaving $g(x) = 6$). That would look like a horizontal line in the graph, and there is no way that $f(x)$ can be a curving rational function and $f(x + 4)$ can be a straight line. But choosing among the other three answer choices is more difficult.

You might notice that answer choices A-C are all similar, with a 6 in the numerator and x plus something (or plus nothing) in the denominator. Schools nowadays drill translations of functions in the coordinate plane pretty thoroughly, and you may recognize that we have a translation issue. All three of our remaining answer choices are just horizontally translated versions of each other. The function $f(x)$ is given to us in the graph, and the function $g(x)$ is the same as f, shifted left by 4 units. So we need to figure out which of the given formulas represents the graphed function translated left by 4 units.

If you are familiar with rational functions, you might recognize that there seems to be a vertical asymptote at approximately $x = -4$. So the equation for the graphed function must have $x+4$ in the denominator, and translating this left by four units would place $x + 8$ in the denominator, making C the correct answer choice.

If you aren't familiar with rational functions, you might notice that the graph seems to pass through the point (-5,-6). The translated function should therefore pass through the point (-9,-6), so you could test all four answer choices to see if $g(-9) = -6$. Only answer C gives -6 for $x = -9$.

If you don't recognize that this is a translation issue, you'll have to deduce the values of a and b from the fact that the curve seems to pass through the points (-10,-1), (-7,-2), (-6,-3), and (-5,-6). This is what the official "explanation" does, using the second and fourth of these data points, and it's a long, tedious process, involving the solution of a system of equations for a and b simultaneously. Here it is in summary:

$$f(x) = \frac{a}{x + b}$$

$$\text{Plug in (-7,-2):} \quad -2 = \frac{a}{-7 + b}$$
$$14 - 2b = a$$

$$\text{Plug in (-5,-6):} \quad -6 = \frac{a}{-5 + b}$$
$$30 - 6b = a$$

$$\text{Equation 1 - Equation 2:} \quad -16 + 4b = 0$$
$$b = 4$$

We could continue at this point to deduce the value of a, but it's pretty clear from the answer choices that $a = 6$, and we can instead just proceed to conclude that $f(x) = 6/(x + 4)$, and $g(x) = f(x + 4) = 6/(x + 8)$.

Problem 19   Official Answer: A

This looks like an awful mess, but there's a clue in the setup. The middle coefficient is a sum, and the final term is a product. That's a hint to look for factoring patterns.

$$57x^2 + (57b + a)x + ab = 0$$
$$(? + ?)(? + ?) = 0$$

After a few moments, you might realize that the two constants must be a and b, and the 57 must be a coefficient on x in one of the binomials. If you don't, you can expand the middle term and then factor by grouping.

$$57x^2 + 57bx + ax + ab = 0$$
$$57x(x + b) + a(x + b) = 0$$
$$(57x + a)(x + b) = 0$$

The solutions to this equation are $-b$ and $-a/57$. The product is therefore $ab/57$. Comparing this to the requested pattern kab, we see that $k = 1/57$, which is answer A.

Problem 20   Official Answer: 10

You may be tempted to get out your calculator, calculate $\sqrt{199/2}$, and enter 9.975 into the answer box, but

you would lose a point if you did that. This equation is not given in the "standard form" for the equation of a circle, and you can't assume that the number on the right-hand side is the square of the radius. You need to cast the equation into standard form before you can find meaning in the parameters, and you need to complete the square to do that.

Adding the square of half of the linear coefficients to both sides of the equation gives this:

$$(x^2 + x + {}^1\!/\!4) + (y^2 + y + {}^1\!/\!4) = \tfrac{199}{2} + {}^1\!/\!4 + {}^1\!/\!4$$
$$(x + {}^1\!/\!2)^2 + (y + {}^1\!/\!2)^2 = 100$$

So the radius is exactly 10.

Problem 21   Official Answer: B

We are given two identical prisms with a square cross-section and a known height, and we glue them together to make a single prism twice as long. If we let x stand for the unknown side length of the square, we can write expressions for the surface area of the prisms.

For each of the shorter prisms, we have four rectangles of area $90x$ and two squares of area x^2, for a total surface area of $360x + 2x^2 = K$. For the single longer prism, we have four rectangles of area $180x$ and two squares of area x^2, for a total surface area of $720x + 2x^2 = 92/47 \cdot K$.

This amounts to a system of two equations in K and x. If we substitute the first expression for K into the second expression, we obtain a single equation that we can solve for x:

$$720x + 2x^2 = \frac{92}{47}(360x + 2x^2)$$

This is a messy quadratic equation, but notice that all of the terms contain x, so $x = 0$ is one of the solutions of the equation. We know $x = 0$ can't be the correct side length of the square, so we can divide the entire equation by x to obtain

$$720 + 2x = \frac{92}{47}(360 + 2x)$$

This is still a mess, but at least we don't have to solve a quadratic equation. Solving this linear equation for x gives us the side of the square:

$$720 + 2x = \frac{92}{47}(360 + 2x)$$
$$47(720 + 2x) = 92(360 + 2x)$$
$$47 \cdot 720 + 94x = 92 \cdot 360 + 184x$$
$$(184 - 94)x = 47 \cdot 720 - 92 \cdot 360$$
$$x = \frac{33,840 - 33,120}{90}$$
$$= 8$$

Problem 22   Official Answer: D

It is completely meaningless to add together the coefficients of a quadratic expression. In real life, don't even have the same units. It's like trying to add 5 miles per hour to 7 miles. Like most of modern math education, this problem is purely a game with symbols.

Treating this like a logic puzzle taken from the pages of a puzzle magazine, we'll just have to try to work our way from the facts we are given in the general direction of an answer. We are given the vertex coordinates of the parabola, so it would be easy to plug these into the general formula for a parabola in vertex form, and then expand that so that it matches the standard form shown in the problem statement.

$$y = a(x - h)^2 + k$$
$$= a(x - 9)^2 - 14$$
$$= ax^2 - 18ax + 81a - 14$$
$$= (a)x^2 + (-18a)x + (81a - 14)$$
$$= ax^2 + bx + c$$

By comparing coefficients, we can conclude that $b = -18a$ and $c = 81a - 14$. Summing the values of a, b, and c gives this:

$$a + b + c = a + (-18a) + (81a - 14)$$
$$= (1 - 18 + 81)a - 14$$
$$= 64a - 14$$

What else are we told? That the parabola intersects the x-axis. Since the vertex lies below the x-axis (at $y = -14$), this means that the parabola must open upwards and a must therefore be greater than zero. This means that the sum of the coefficients must be greater than -14. Only one of the four answer choices gives a number that is greater than -14.