# Bluebook 9

Question explanations to accompany SAT practice test #9


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## Problem 1

Official Answer: A

You probably know what all of these words mean, or at least you have a sense of them. If you hesitate over "involuntarily", think of "voluntary" versus "involuntary". If you are not sure about "strenuously", think of "strain".

In this question, we are looking for an adverb that describes how the diaphragm contracts. Looking elsewhere for a description of this event, we find the contractions described as "uncontrollable". Which of the words is closest to "uncontrollable"? You can probably rule out "smooth" and "beneficial". Choosing between "involuntary" and "strenuous" might be a little harder, especially if you are uncertain about their exact meanings. You might think of a spasm or a seizure and think it is pretty "strenuous". It might be, but being vigorous and being uncontrollable are not the same thing. "Involuntary" means "not under voluntary control", and is the best synonym for "uncontrollable".

## Problem 2

Official Answer: C

We need an adjective to describe her accomplishments. Looking on the other side of the colon, we find an extensive list. There is nothing particularly controversial in the list, nor anything particularly dramatic or highly unusual; it is simply a long list. So "extensive" is the best choice.

## Problem 3

Official Answer: D

The words after the colon are the obvious clue. We need the adjective that means "present yet having no effect". If you don't know what "dormant" means, you can probably at least rule out the other three. "Decisive", "lacking", and "variable" definitely do not mean "present yet having no effect".

## Problem 4

Official Answer: B

All four of the answer choices might make sense in different contexts, but we need to pick the word that contrasts with "breaking in to the field". If she could break in to the field, then it wasn't impenetrable.

## Problem 5

Official Answer: D

You might notice that the underlined sentence stands at the end, and describes an outcome. You might also notice that only one answer choice describes an outcome or consequence.

If you want to approach the problem by nitpicking the answer choices, you can start by ruling out answer A, since the underlined sentence has nothing to do with geography. The sentence also has nothing to do with politics or with major historical events, so you should be able to rule out B and C as easily. The sentence does describe a benefit to Karida Brown, so answer D is the best of the four.

## Problem 6

Official Answer: D

If you had to summarize what you just read in your own words, what would you say? What's the main action (or inaction) happening in this passage? Having a summary in mind, perhaps you can confidently rule out one or two of the answer choices. To distinguish among the remaining answers, we need to start nitpicking.

A — Yes, there is a new guest involved. Miss Pyne is waiting, it is "almost time for the carriage to arrive", and there is mention of a "long-expected guest". But is anyone worried about anything? Has the guest actually caused anyone to worry about anything?

B — The entire passage is a description of an evening scene, lasting perhaps a few minutes. There is no "change over time".

C — This one might look ok on a casual reading. Indoors and outdoors are both part of the scene. But start nitpicking. Is there stillness outside? Does the passage contrast the inside with the outside?

D — Did the passage "depict a setting"? Yes, lots of descriptive details of the environment were provided. Were the characters awaiting a visitor's arrival? Yes, the last sentence especially mentions the "expected guest".

## Problem 7

Official Answer: B

What's the gist of the excerpt? In a nutshell, Mrs. Higgins doesn't want her son to stay, because her friends don't like him. Only one answer choice refers to Henry leaving.

Answer C is almost silly. There's no information whatsoever about what Henry's home looks like. Answers A and D are almost as easy to rule out. Mrs. Higgins's friends are mentioned, but there's no discussion of Mrs. Higgins going out with them, and there's no discussion of how often Henry visits his mother, much less why.

## Problem 8

Official Answer: A

Is this really a surprise to anyone? How seriously do *you* take all of the disclosures and other federally-mandated legal junk that people keep sending to you in the mail?

The underlined phrase isn't very long, and "negligible cost" seems to be the most significant part of it. It may be helpful to focus on that as you scrutinize the answer choices.

After chewing on the awkward wording, you may realize that answer A is acceptable. The "negligible cost" qualifies as a "factor that led Siera et al. to not dismiss" the messaging, for which there was "evidence of its limited utility".

Answer B doesn't make any sense. Do the underlined words acknowledge a type of messaging? What about C? You could say that the underlined words "describe a consideration"... but were the effects of messaging small relative to the costs? This implies that the costs were large, which is the opposite of what the underlined words state. So answer C is a bungled description of the underlined words. Finally, you might be able to argue that "negligible cost" qualifies as a "circumstance", but was there any hint in the paragraph that messaging may be *more effective*? The argument was not that the effectiveness of messaging was underestimated, but that the effect-to-cost ratio was still sufficiently high.

## Problem 9

Official Answer: D

What does the paragraph tell you about Mrs. Ochiltree's "acquaintance[s]"? (If the original text referred to Mrs. Ochiltree's acquaintance, singular, then why do you suppose the SAT writers forced the acquaintances to be plural?) The paragraph tells us that (1) Mrs. Ochiltree was frank in her evaluations of them, and that (2) they avoided her for this reason. Answer D gives a perfectly reasonable supposition, and answers A-C are all nonsense.

## Problem 10

Official Answer: C

What's the "claim" that we need to illustrate? Apparently, we need to pick the quote that gives an example of concern for what's going on at home in Seattle. Answers B and D both express what is going on while Mrs. Spring Fragrance is traveling, not concern for what is happening at home in Seattle. The location isn't clear in answer A, but it is still merely a description of things that are happening, not a concern for things that are happening elsewhere.

Answer C gives a list of admonishments and instructions regarding the care of living things, and these could be taken as expressing concern for the well-being of the cat, the birds, the flowers, and the addressee of the letter, all of whom presumably reside in Seattle.

## Problem 11

Official Answer: C

What's the claim that we need to support? That explanatory notes were added to a book to make it sell better. (As opposed to what?) What "evidence" would help support such a claim?

Let's find the bad answer choices, starting with answer A. Would differences in the text tell us anything about the publisher's or author's motives? Answer A doesn't seem likely. What about B? If trustworthy critics said that the notes were useless and ineffective, that might make us think that there were ulterior motives behind adding the notes to the book. But the opinions expressed in B are wishy-washy, and we probably can't assume that critic's opinions are relevant either to book sales or to the publisher's motives. Answer B just wanders around and wastes our time. What about D? If the poet went to the trouble of redrafting his notes several times, this would seem to indicate that the poet and publisher were taking the notes seriously, and if anything, this would *weaken* the student's callous supposition.

This leaves answer C. If the notes were the publisher's idea, and if the publisher's motives were to make people buy a copy of something that they already had, then this would count as a "marketing device", and would support the student's claim.

(Is there a hero in this story? A poet, whose job it is to create valuable combinations of words, wrote something so incomprehensible that he had to write additional explanatory words to explain what he meant with his previous words. Then a cynical student comes along

and, apparently with no basis, accuses the poet of being a money-grubber. What a dismal world the SAT writers must live in.)

## Problem 12

Official Answer: D

What's the hypothesis? That plants change their uptake of metals following kanamycin exposure. Look at the graph and see what strikes you. The graph shows "metal content" of plants, with and without kanamycin. There are two pairs of bars for two different metals, and both bars are lower with kanamycin. Plants that have been exposed to kanamycin have less of both metals.

Answer A compares zinc to iron, not kanamycin to no-kanamycin. Answer B doesn't make any comparisons at all. And answer C is factually incorrect. It has the numbers reversed. This leaves answer D, which correctly points out that the levels for both metals were lower with kanamycin than without.

## Problem 13

Official Answer: D

This problem has a table full of numbers, and all answer choices have numbers as well. Let's begin by checking the answers for factual accuracy. Answers A-C all misrepresent data from the table. (Answer A isn't off by much. It claims that none of the planets have an orbital period of more than 10 days, while the table states that TOI-1478 b has a period of 10.180 days. That's not much of an error, but it's enough to rule out answer A.)

If you have the time to dig deeper and confirm that D is the correct answer, start by looking for the assertion that we need to support. The researchers "asserted that four are hot Jupiters and one is a warm Jupiter." Searching for the paragraph for the meanings of these terms, we find that the difference lies in the speed (or period). "Hot Jupiters" take less than 10 days to go around their stars, while "warm Jupiters" take more than 10 days. (That's astonishing, considering that Mercury takes 88 days to go around our own star, and the farther planets take substantially longer. The real Jupiter takes almost 12 years. But there's no room on the SAT for elaborating on anything interesting.) Examining the "Orbital period" column in the table, we find four numbers less than 10, and one that is more than 10. This is what answer D points out, and this supports the assertion that there are four "hot Jupiters" and one "warm Jupiter" (although the "warm Jupiter" is very close to being "hot".) The issue of mass is a minor distraction. As long as the planets are at least one-quarter the size of Jupiter, which they all are, they qualify as "Jupiter-like".

## Problem 14

Official Answer: A

What would you expect in the blank? She was an important public figure? She was more than a mere figurehead or wife, even if she wasn't actually pharaoh herself? That's answer A, and the others are complete non sequiturs.

## Problem 15

Official Answer: D

Most of the paragraph describes the evolution of a certain modern word related to social media in a certain obscure language (well, obscure to the majority of SAT-takers, anyway). Then at the end it says that this is only one of many examples. What does this suggest about social media?

Let's scrutinize the answer choices. Answer A distinguishes formal from informal language, which wasn't part of the discussion. Answer B says the opposite of what we want. We want widespread, not unique to one language. Answer C doesn't follow. Why would having more data lead linguists to the wrong conclusion?

This leaves answer D, which states that social media can not only serve as a research tool, but it can actually "facilitate" changes, which probably means create new words and modify language itself as time goes on. You may have missed this implication on the first reading, but after ruling out the other answer choices, you can try going back to look for it to see if answer D is in fact accurate or not. The bulk of the paragraph discusses the example of *meng-*, which was in fact created for a certain social media purpose and then migrated into broader usage. The "many similar examples" can therefore be taken to mean examples of social media modifying language, or "facilitating change" in language.

## Problem 16

Official Answer: B

If you can tell the difference between "verbals" and true verbs, you may recognize that the answer choices contain three "verbals" and one true verb, so the true verb is probably the correct answer. Answer A contains "to",

making it an infinitive, and answers C and D both contain "-ing", making them either gerunds or present participles. Only answer B gives an actual verb.

If you are bewildered by participles, gerunds, and infinitives, and you simply notice that all answer choices look like verbs, start by finding the subject that needs to go with the verb. Who is using gourds? "People." ("Americas" is the object of the preposition "in".) Now try forming simple sentences with this subject: "People to use..." "People have used..." "People having used..." "People using..." Only one of these makes sense. ("People using the bottle gourd..." could make sense as a noun clause, as in "People using the bottle gourd must have obtained them from elsewhere." But this requires an actual verb later in the sentence, like "must have obtained", and there isn't such a verb in this case.)

## Problem 17

Official Answer: D

You probably don't need an explanation for this one. The SAT sometimes wants you to distinguish between statements and questions and choose the appropriate sentence-ending punctuation mark, but most people don't have much difficulty with this.

In this case, "could the blueberries thrive" is an interrogative clause (it puts the verb before the subject) and requires a question mark. "The blueberries could thrive" is a declarative clause (with the verb after the subject) and requires a period. Answers A and C have the wrong marks. Both B and D could make sense in different contexts, but only D makes sense here. The subsequent sentence indicates that Michel doesn't know yet, so the previous sentence should be a question, not a statement.

## Problem 18

Official Answer: A

We have a blank in the middle of a long series of words. One of the answer choices even offers us a period to split the words into two separate tenses, so let's see if that works. It does. Both the stuff before and the stuff after can stand on their own as complete sentences, so that must be the correct answer. Since we have independent clauses on both sides, none of the other answers work. You need to mark the joint between two independent clauses with something stronger than a lone comma or a lone conjunction. (A comma plus a conjunction would work, but they didn't offer us one of those.)

## Problem 19

Official Answer: D

Try pairing the verbs with the subjects "it" and "they". You might notice that three verbs are plural (they are, they have been, they are being), and one is singular (it is), which suggests that the sole singular verb is the correct answer. To confirm, find the subject that needs to be paired with this verb. Don't be distracted by mathematicians Richard S. Hamilton and Shing-Tung Yau. They occur between the commas in a parenthetical comment. If you throw away the parenthetical, the true subject of the sentence should be clear. "Mathematician Grigori Perelman is credited with proving the Poincaré conjecture."

## Problem 20

Official Answer: A

Start by looking for independent clauses. "Jetties can have the opposite effect" and "obstructing the flow can lead to erosion" are both independent clauses. This requires the semicolon and rules out answers B and D.

The remaining question is whether the "though" should go with the first clause before the semicolon, or with the second clause after the semicolon. Words that contrast two independent clauses always need to go with the second of the two contrasting clauses. If the contrast were between the two clauses on each side of the semicolon, then the "though" would need to go with the second one, after the semicolon. In this case, however, the contrast is between the first clause and *the previous sentence*, so the "though" needs to go with the first clause, before the semicolon.

## Problem 21

Official Answer: D

This one should be pretty obvious. The sentence preceding the blank starts with "First", so the sentence following it should begin with "Second".

## Problem 22

Official Answer: A

"Broadly speaking" is a clue. The first sentence gives a broad statement that the auroras result from solar activity. The second sentence mentions the release of charged particles and the capturing by magnetic fields. It elaborates on the previous broad claim with more

details. That makes "specifically" the most appropriate answer.

## Problem 23

Official Answer: A

How are the sentences related? The sentence preceding the blank states that wind turbines are to be located off the Virginia coast. The sentence containing the blank gives specific numbers and a specific city. That's a clarification or refinement, making "to be exact" appropriate.

## Problem 24

Official Answer: C

What's the goal? To recount the sequence of events proposed by the researchers. Answer D is almost humorous. It recounts a sequence of events *performed* by the researchers, not a sequence of events *proposed* by the researchers. To distinguish among the others, let's go to the bullet points searching for relevant information.

All of the bullet points contain events that may or may not have occurred at various times. The clearest is probably the last bullet point, which clearly indicates that this is something the researchers hypothesized would happen, and that it would happen as a result of something else. Let's scan the answer choices looking for "debris formed Saturn's rings" as a final result. It's in answer C. Answer A also ends with Saturn's rings, but it says that the rings cause something else to break up, not that the breakup of something else created the rings. Answer B repeats the first bullet point nearly verbatim, but it says nothing about the researchers or about any subsequent events. Approaching a planet and breaking up is not really a "sequence".

## Problem 25

Official Answer: C

What's the goal? To emphasize the fossil's significance. Searching the bullet points for the significance, we find a description in the third bullet point and the significance in the fourth and fifth. The fossil is "transitional" and illustrates an intermediate state between two other types of animal (i.e. between terrestrial carnivores and mammals with flippers).

Answer C doesn't include the word "transitional", but it repeats the final bullet point almost verbatim. Answer D includes the word "transitional" but it doesn't elaborate, and merely including one adjective hardly counts as "emphasis". Answer B mentions the dual resemblance but doesn't draw the conclusion, and answer A only mentions the resemblance to modern seals, and then proceeds to explain what a seal is.

## Problem 26

Official Answer: A

What's the goal? To emphasize a difference in the origins of the two words. Only answer A mentions a difference in the origins. Answer B doesn't say anything about the origins, answer C only mentions one word, and answer D states that they *have* different origins, but it doesn't tell us about either of them. That's hardly "emphasizing a difference".

## Problem 27

Official Answer: C

What's the goal? To emphasize a similarity between the two paintings. If you skip the bullet points and jump straight to the answers, you may notice that A, B and D all mention differences between the two paintings. Only answer C mentions a similarity.

If instead you jump to the bullet points first, hunting for similarities between two paintings, the only similarity you can find is "huge", in the second and fourth bullet points. Only answer C mentions the size of the paintings.

## Problem 1

Official Answer: B

Would someone be "surprised at" or "indifferent to" his own passions? You might say he is "concerned with" them, but "enthusiasm" is the best response to one's own "passions".

## Problem 2

Official Answer: D

You probably know most or all of the words here. Don't be too disconcerted if you don't know one of them, because if you know three, you can usually figure out whether the fourth is correct or not. In this case, we are looking for an adjective that describes the effect of something on the toxicity of venom. In scientific research, we probably want to know whether something has a "big effect" or a "small effect". To describe an effect as "disconcerting" or "acceptable" might make sense in a story or anecdote, but you probably feel that it seems a little off in the context of scientific research. Reading a little further, we find that the researchers are looking for "considerable variations" in venom. In other words, they are looking for these characteristics to have a big effect. What's the closest word to "big"?

## Problem 3

Official Answer: B

The word "this" is often a clue in vocabulary questions. Notice how the final sentence begins. "This conjecture..." This "this" tells us that what she just did in the previous sentence was to conjecture. So we need a word that is similar to "conjecture". If you know the meaning of all four words, you probably realize that "speculate" is the closest to "conjecture". Ochoa can't really "demand" that humans will someday need to have a certain ability. She might "doubt" that this will ever happen, but then why would she be so interested in "future research missions to the moon"? And she can't "establish" that humans will someday have any kind of need. Not without a long process of argumentation, anyway, and even then it would be doubtful.

## Problem 4

Official Answer: B

Colons in vocabulary questions are always clues. In this case, the clause before the colon introduces "mutually beneficial relationships" between fungi and trees. The first clause after the colon describes how the tree benefits the fungus, and the second clause describes how the fungus benefits the tree. We need a verb for the second clause that describes what the fungus does. Neither "overreact" nor "deviate" is good verb to describe what the fungus is doing. "Reciprocate" and "retaliate" both have similar meanings, but "reciprocate" is more neutral and general. You retaliate by doing something bad to someone who has done something bad to you. "Reciprocate" is more appropriate for neutral or positive things.

## Problem 5

Official Answer: D

With the reading questions, it usually helps to read the question prompt first. This helps focus your attention on a particular aspect of the passage in question.

This one is a "main purpose" or "big picture" question. It is also a poetry question, which makes it a little more challenging. Read the passage through a couple of times, try not to get bogged down in the details, and just get a sense of the "big picture" or the "forest for the trees". It might also help to ask yourself what the passage was about. Can you summarize it in a few of your own, familiar words? Maybe something like the following?

She's talking to someone, a son (figuratively or literally we don't know, but probably young), and she's very positive.

You can probably rule out answers B and C. They're too negative. The passage is not about "struggles" or "challenges". There is a small amount of negativity when the author is talking about herself, but not about the child. If you are debating between A and D, look closely at A. The poem does seem to be expressing a lot of hope, but read the rest of the sentence. Does the poem express hope that the child *will have the same accomplishments as his parent*? "Go forth" and "life is calling you" qualify as encouraging someone to embrace life's experiences, so answer D is appropriate.

## Problem 6

Official Answer: A

The underlined clause comes after a colon, and colons always work as introductions, so let's focus our attention on the clauses before and after the colon. The clause before the colon says that more production gave employees more power. The clause after the colon says that employees took advantage of this power. Which

answer choice does the best job of expressing this relationship?

You can probably rule out answers C and D. The underlined passage is not an exception, but a continuation, and it has nothing to do with the identities of the workers. This leaves A and B. Would it be better to describe the underlined clause as an elaboration of something earlier, or as an example of something earlier? It's a bit vague and non-specific to qualify as an example. Also, "labor relations" is more precise and informative than "a trend in the economy". So A is better than B.

## Problem 7

Official Answer: C

What's the gist of Text 1? They studied stars in a fancy way and concluded that the stars used to have rocky planets around them. What's the gist of Text 2? Text 1 was flawed. They assumed too much from observations of lithium and sodium.

Among "unexpected", "premature", "questionable", and "puzzling", the middle two are ways of being "flawed". We probably shouldn't rule out A and D just yet, but let's start by examining B and C more closely. Answer B refers to the crusts of the hypothetical planets, rather than the actual observations of lithium or sodium, so this probably isn't correct. Answer C mentions the elements, so this one could work. If we give answers A and D a closer inspection, we find that they present claims and information that were not present in either of the texts. They present "facts not in evidence", as lawyers might say. So of the four, answer C seems most appropriate.

## Problem 8

Official Answer: C

How does the narrator feel about being at camp? The excerpt gives us the two emotional adjectives "scared" and "excited", and answer C includes these exact words. You might think that "overjoyed" could be similar to "excited", but it clashes with "scared", so answer A is less appropriate, and answers B and D aren't even close.

By the way, if you pay attention to the punctuation in literature excerpts on the SAT, especially in fiction excerpts, you can often find violations of the rules of formal "Standard English". In this passage you might notice the comma separating the two adjectives in the compound predicate adjective. In this case, the comma is useful for stylistic reasons, to help emphasize the contrast between the two emotions, but it does not follow the rules of "Standard English", which say that a comma should be used with a coordinating conjunction only when joining two independent clauses.

## Problem 9

Official Answer: B

This is a "fact-finding" question, and they tell you exactly what fact to find. Read through the paragraph, looking for how Wagner made loud noise. The second sentence tells us that composers in general used more musicians, and the third sentence tells us that Wagner in particular used lots of brass instruments. Answer B repeats this information, and the other answer choices all bring in completely new issues that were nowhere in the given passage (outdoor vs. indoor, the shape of the concert hall, and training for singers).

## Problem 10

Official Answer: D

What's the main topic of discussion, and what does the passage say about this topic? The subject of every clause in this paragraph is one particular book: *The Fifty-Year Mission*. The paragraph starts by describing it and telling us how large the book is, and it ends by telling us about a flaw.

All four answer choices discuss *The Fifty-Year Mission*, so we'll have to dig deeper to distinguish among them. Both answers A and D have the "there's a good thing but also a bad thing" pattern, but in answer A both things are wrong. We have no information about the goals of the compilers, and the passage never said that the book lacked any information. We might be able to quibble about whether or not we can say that the work was "worthwhile" based on the given text, but the author did say that it was "valuable", which we can take as a synonym for "worthwhile", and the "shortcoming" that the paragraph mentions can be counted as a "limitation", so answer D is acceptable.

Answers B and C both make new claims that were not present in the paragraph, and neither one even comes close to the "main idea" of the entire paragraph. There was no contrasting of television versus film, and there was no discussion of proportions or percentages of people who were included in the book.

## Problem 11

Official Answer: D

Yes, it's that easy. Just find the row with "FB43", and read the corresponding year. It's 1992.

## Problem 12

Official Answer: A

What's the claim? That Morrison probably wanted to increase the number of Black writers on the list of published authors. Which answer choice would most support this claim? Answer A would not be conclusive, but it would strengthen the claim, and none of the others give us any information about Morrison's goals or the number of Black writers. Answer B would support a claim that Morrison wanted to influence the writing of other authors, but it says nothing about the number of authors. Answer C is all about Toni herself, not other authors. And answer D contrasts Morrison with other authors; it does not contrast earlier author numbers with later author numbers.

## Problem 13

Official Answer: A

Why in the name of all that's holy would someone tabulate data by depth and then *present the depths out of order*? That's sloppiness of the highest order. This is how the table should have been arranged:

| Depth | From Beach | From Seafloor |
|---|---|---|
| 2-3 | 7 | 0 |
| 3-4 | 99 | 33 |
| 4-5 | 2 | 0 |
| 5-6 | 18 | 7 |
| 6-7 | 1 | 0 |

Anyway, what's the conclusion that we need to support? That clamshells were harder to obtain from the seafloor than from the beach. (This needs support?) Look at the table, compare the beach column with the seafloor column, and see what you notice. At every depth, the beach clamshells were more numerous. This is probably what the "correct" answer should point out.

Answer A is a bit repetitive, but it does point out the differences in numbers between the two columns. None of the other answers have anything to do with ease of collection.

## Problem 14

Official Answer: B

What is this paragraph about? It's about judges writing opinions, and how considering opinions different from yours can be a good thing. Doing so could therefore ... do what? Make your case stronger? Make you more convincing? Something like that? Do any of the answer choices say something like "make the arguments better"?

A — If anything, wouldn't judges need to consult philosophical works *more*?

B — Isn't "improve their arguments" just what we were looking for?

C — How would discussing more philosophers make your opinion more comprehensible?

D — How would discussing disagreements make your opinions more conventional or common?

Incidentally, considering differing opinions and chewing on potential objections to your arguments is an important skill for any aspiring intellectual. It's a tradition that goes all the way back to the first Greek philosophers, and it's a skill that is appallingly lacking in modern culture. Get good at it, and you'll become a great thinker.

## Problem 15

Official Answer: A

This one is a pronoun question. Just ask yourself who or what the pronoun refers to. Who wants a bag? Customers. Which pronoun is the appropriate word to replace "customers"? Clearly "they". The others are all singular.

## Problem 16

Official Answer: C

This is clearly a verb question. Start by asking what subject needs to be paired with the verb. In this case, "her writing". Now form sentences with just this subject and verb.

Her writing were ...
Her writing have been...
Her writing has been ...
Her writing are...

The correct answer should be obvious. There are three plural verbs, appropriate with "they", and only one singular verb, appropriate with "it" or "her writing".

## Problem 17

Official Answer: A

You might notice that one of the choices is a "true verb" and the other three are all modified verbs, with "to" in front of them or "-ing" at the end. This might make you suspect that the true verb is the correct answer.

To check, find the subject that need to go with this verb. What is doing the entering? The embryos. Now try simple sentences with that subject and the given verbs.

Embryos enter ...
Embryos to enter...
Embryos having entered ...
Embryos entering...

The true verb "enter" is indeed the correct answer.

## Problem 18

Official Answer: A

The whole thing is a single sentence with a blank in the middle. Ignore the conjunction for a moment and try placing a period after "value". The words before the blank and the words after the blank can both stand on their own, and we are dealing with two independent clauses ("Stuff left in the margins lowers a book's value" and "when the former owner is Walt Whitman, they can be a goldmine"). We need to mark the junction with punctuation, but a comma is too feeble to hold together two independent clauses, so we have to strengthen it with a conjunction. Answer A contains a comma plus a conjunction, and the others are all insufficient.

## Problem 19

Official Answer: C

If you try pairing the four choices with the subjects "it" or "they", you might notice that there are three plural verbs and one singular, which should make you suspect that the singular verb is the correct answer.

To confirm, find the subject that needs to be paired with this verb. What is it that is doing the outlining? The document. That is indeed a singular subject, and it only works with one of the four verbs.

The document have outlined ...
The document were outlining...
The document outlines...
The document outline ...

## Problem 20

Official Answer: B

All four answer choices could work grammatically in the sentence "they _____ an energy level." This is not a subject-verb agreement issue, it's a verb tense issue. The entire description is written in the present tense ("atoms travel", "they are diverted"), so we need to pick a present-tense verb to match, ruling out A and C. You might think that D just doesn't sound right, and you'd be correct. The simple explanation is that you should never use more words to do something that fewer words can do. The longer explanation is that D is a "continuous" or "progressive" tense. You use this tense when you want to refer to action that keeps going, as opposed to something that happens once and then it's done. In this discussion, we need the simple present tense, because they speed up "until" they reach something, "at which point" something else happens. We need a "perfect" tense to indicate a completed action, not a "continuous" tense indicating ongoing action.

## Problem 21

Official Answer: C

Notice the dash in the paragraph and the dash in the answer choices. There is only one legitimate use for a pair of dashes in SAT punctuation questions. Whenever you have "parenthetical content", or optional extra stuff stuck into the middle of a sentence, you can surround it by dashes. (For shorter, simpler comments we use commas, but we can also use dashes if we want more emphasis, or if the comment is long and messy and has commas inside of it.) If you ever see a pair of dashes on the SAT, check to see if the stuff in between them is disposable "optional extra" stuff.

In this problem, you can get rid of "in this case, ... Hot Springs", leaving "rainwater percolates downward through the earth to collect in a subterranean basin", and this is still a perfectly valid sentence. (Well, it's actually a clause within a bigger sentence here, but that doesn't matter right now.) So "in this case, ... Hot Springs" is disposable "optional extra" stuff, and answer C is a legitimate usage of a pair of dashes as "bookends" for a parenthetical comment. Answers B and D surround the parenthetical with a mis-matched pair of bookends, like pairing an open parenthesis with a close bracket, or like a mis-matched pair of socks. Answer A leaves the first bookend completely unmatched, like an open parenthesis with no close parenthesis, or like wearing only one sock.

## Problem 22

Official Answer: A

How are the two sentences related? The first states that the ANLA is impressive, and the second gives a big number and a long time frame. Specification words like "in particular" would work, but we aren't offered any of those. We could also consider the second statement to be an amplification or elaboration on the first, which makes "in fact" appropriate. The second sentence does not describe something happening after the first, making "after" inappropriate, and the two sentences do not contrast with each other, so "regardless" and "instead" are not appropriate.

## Problem 23

Official Answer: B

How are the two sentences related? The first states that something made history, and the second elaborates with more details about why it was so historical. But none of the answer choices really seem appropriate for an elaboration.

If you just run through the answer choices, you'll probably realize that "previously" is most appropriate. They've taken a detour to provide some historical context before they get to the elaboration in the final participial phrase, and we need the word "previously" to signal that we are about to take a detour into the past. The earlier event did not happen as a result of the later event, and it is not being contrasted or compared with the later event, so none of the other choices are appropriate.

## Problem 24

Official Answer: B

How are the sentences related? The sentence preceding the blank describes what Karen Konkoly did "first", and the second describes something else she did, presumably after the first thing, making a chronological word like "next" appropriate.

## Problem 25

Official Answer: B

This is almost silly. The goal is to "specify the average length of the green iguana", and only one answer choice gives a length measurement. If you want to confirm that this answer choice does in fact accurately use information from the notes, you can easily find the length measurement in the bullet points.

## Problem 26

Official Answer: A

What's the goal? To identify the year that *The Canon of Medicine* was published. You can either search the bullet points for this year, then search the answer choices to find the one that accurately states this year, or you can just notice that only one answer choice gives a date, or a number of any kind.

## Problem 27

Official Answer: C

What's the goal? To emphasize a difference between the two portraits. If you skip the bullet points and jump to the answer choices, you might notice that answer D gives a difference between two artists instead of two portraits, and answers A and B don't give any differences at all. If you decide to scan the bullet points to search for a difference between "the two portraits", you'll discover that the only two portraits about which we have any information are the two mentioned in the last two bullet points, and the differences lie in the medium, the subjects, and the dates of completion. Answer C states all of these differences.

## Problem 1

Official Answer: D

You probably haven't heard of the word "latent" before. But do any of the other three make sense? You probably know what it means to "replicate" something, for something to be "predetermined", and for something to be "operative". For the blank, we need a word that means "nonexistent" or "absent". The accessory spleen seems to be useless, but some people theorize that its role isn't ... "hidden"? "nonexistent"? If the sentence said that people hypothesize that its role *is* _____, then "operative" would be tempting, but it's the opposite of what we need here. If you know the meanings of the first three choices, hopefully you'll realize that none of them work in the blank.

If you are a fan of police procedurals, perhaps you've heard of "latent prints". The fingerprints are there, but we can't see them until we dust for them. If you've studied physics, perhaps you've heard of "latent heat". Heat must be going in to the boiling water, because it's over a flame, but the temperature isn't rising. The heat is "latent". "Latent" means present but not visible or not having any effect. It's a weird word to apply to the function of an internal organ, but it's the only choice that works.

## Problem 2

Official Answer: D

We need an adjective to describe the location of province X. Looking elsewhere for information about where X was located, we find that it was on the coast, far away from the capital, and reachable only by a long journey. At this point, you can probably rule out "approximate", but you might have more trouble with the others. "Unobtrusive" might be appropriate if being obtrusive or "getting in the way" was an important issue. Sometimes it can be annoying to have to drive right through the middle of town C on your way from town A to town B, but that isn't what's happening here. "Concealed" might be appropriate if privacy or staying hidden was an important issue, but there's no discussion of invasions or threats from abroad. So answers A-C are not ok. What about answer D?

You've probably heard of "peripheral vision", which refers to seeing things "around the edges" or "in the margins", and if so, you probably realize that "peripheral" is the best adjective (at least from among the four offerings) for a place that is far away from the capital.

## Problem 3

Official Answer: C

Who writes this stuff? The phrasing here is quite weird. Let's try looking at it in slightly clearer language. Let's try turning these fancy "qualitative nouns" back into the adjectives they came from.

"Detailed statistical analysis helped preclude claims that the event was _____.

A) inconspicuous

B) discrete

C) ambiguous

D) probable"

Could an event be inconspicuous? Discrete? You can probably rule out the first two because they don't really make sense. What about "ambiguous" or "probable"?

What's the event that we're talking about? And what are people claiming about the event? The "event" in question is the capturing of chirping sounds, and the "claims" are that these chirping sounds didn't mean anything. More precisely, the skeptics were claiming (or *would* claim, if the claims weren't "precluded") that the chirping sound did not indicate gravitational waves.

So, according to the critics, would the chirping event be inconspicuous, discrete, ambiguous, or probable? The critics would say that the chirping sound was ambiguous and didn't mean anything.

## Problem 4

Official Answer: A

This one has some pretty fancy words. You probably know what "earnest" means, but the others are relatively rare. There are a couple of fancy words in the paragraph as well, and if you don't know the meanings of those, that will cloud the issue even further. You might just have to guess on this one.

"Sanguine" means complacent or unworried. The world is falling apart, but you are not especially emotional. You are sanguine about it. "Recalcitrant" means defiant or difficult to manage. If you can identify the root "anthro-" in "misanthropic"—as in "anthropogenic" or "anthropomorphism"—you might realize that misanthropic means anti-people or anti-humanity.

Now, which word belongs in the blank? The clause before the blank says that "some commentators lauded this development", and the clause after the blank refers to "less _____ observers". We need a synonym, more

or less, for someone who is in favor of the development. "Some people approved of it, but less positive people complained about it." "Sanguine" isn't an exact synonym for "approving", but it's the best we have. None of the others are even close.

## Problem 5

Official Answer: B

With normal prose, sometimes you can just focus on the underlined sentence. With poetry, and with this passage in particular, you can't do that. So do your best to skim the entire passage and get a quick sense of what's going on, and then try to figure out what role the underlined sentence is playing in that.

If you just examine the first four lines, you see that the author is describing waves, and the underlined sentence describes how they go back and forth and "will not know defeat". That's a description of something that goes on and on, without end. At this point, you can probably pick answer B as the best description of what the underlined portion is doing.

The underlined words are not really about the surroundings, only one aspect of the natural environment. The surrounding text fills in a lot more of the scene, and might give a sense of being imposing or intimidating, but the underlined words are not doing that. So answer A isn't very accurate. Do the words convey anything about the speaker's point of view? There are no personal pronouns anywhere in the passage. The author is not describing her own thoughts and feelings; she is describing the surroundings. So answers C and D aren't very good, either.

## Problem 6

Official Answer: A

This one is a "dueling texts" question, which usually ask how the second author would respond to something mentioned in the first. In this case, they ask about "conventional wisdom". Read the first paragraph, searching for information about the "conventional wisdom", then read the second paragraph and decide if it is for or against the conventional wisdom and in what way.

**Text 1** Among many species, one should become dominant.

**Text 2** No, that's wrong. Microorganisms have different circumstances from those of normal organisms.

Now let's check the answer choices.

A — This one seems ok. If we want to dig deeper, we could ask "what's the misconception?" In this case, it was the assumption that competition among microorganisms is similar to competition among "normal" organisms, when in fact it is much harder for microorganisms in the ocean to become "crowded". So answer A is probably correct.

B — Replenishment of nutrients? Where was there any mention of this?

C — Small versus large? Where was there any mention of microorganisms competing with larger organisms?

D — Water density? Is water density different in different places? Is there such a thing as "light, fluffy water" and "heavy water"? This answer choice brings in a completely nonsensical issue.

The SAT explanation writer seems to have misunderstood the fundamental nature of water density. When Behrenfeld and colleagues referred to how the microorganisms experience the water around them, they were probably referring to the water's *viscosity*. At microscopic scales, the nature of water flow becomes completely different from normal everyday experience. There are no swirls or eddies, and all flow becomes very smooth and "laminar". At microscopic scales, water flows more like honey or molasses than like water. But that's an issue of viscosity, not density. The SAT explanation writer says "Behrenfeld and colleagues argue that water density decreases, not increases, competition between phytoplankton species." The writer seems to think that, as water becomes more dense (which it doesn't), competition decreases. But water density is water density. It never changes.

Well, actually, there is such a thing as "heavy water", but you'd only find it in a laboratory, and it is totally irrelevant to microorganisms in the ocean. You could also point out that salt water is a little denser than fresh water, but salinity has a far, far greater influence on the life within the water than the density itself does. To any organisms in the water, the density is just a given and never changes.

## Problem 7

Official Answer: D

The first sentence tells us the state of affairs before the discovery: We only know of four species, and they all lived in Laurussia. The second sentence tells us about the discovery: they discovered a new (presumably fifth) species, and it lived in Gondwana. In a casual reading,

you might miss the words "geographical distribution", but they are key. They are telling you what's new and significant. The previous four all lived in Laurussia, but the new one lived in Gondwana. The second sentence also tells us that the new species lived over 400 million years ago, but we have nothing to compare it to, so the age is useless and distracting information in this problem.

Only answers C and D mention the paleocontinents, and only answer D points out the implications for geographical distribution. The significance of the discovery is that it was the first one outside Laurussia, and that's what answer D says. Answer A might be true, but we have no way of knowing based solely on the information given. The passage never brings up the issue of whether the species were closely or distantly related, and there is no discussion of timelines, so B and C can be ruled out for these reasons.

## Problem 8

Official Answer: C

Frequently on the SAT it is much easier to find the wrong answers than the right answer. This is one of those questions. It is garbled, full of jargon, and hard to make sense of. Do your best to get the gist of what's going on, and then start to nitpick the answer choices.

A — Are the two nouns "eagle" and "jaguar" really semantically equivalent? The paragraph never says this.

B — It's amusing that they included the word "unintelligibility" in this question. One is tempted to pick this answer just because of the unintelligibility of the question. But that's not a very good reason, and the paragraph never actually discusses how intelligible or unintelligible the phrase is, so this is probably not the correct answer.

C — Apparent obscurity? No argument there.

D — There's the word "intelligibility" again, and the word "frequency". The paragraph never discusses intelligibility nor how rare or how frequent the terms are.

It's a shame that paragraphs like this have to be so awfully written, because linguistics can be so fascinating. Judging from the translated phrase, the Aztecs had invented the article ("in" in Nahuatl equals "the" in English?), which is a pretty sophisticated tool, and a comparatively late development in the evolution of many languages. Remove articles from your speech and you sound like Tarzan. But the Aztecs seem to have possessed this tool.

## Problem 9

Official Answer: B

This one's a flaming hot mess. It's long, messy, and complex. It has a complicated chart, and all of the answer choices are long. This is an example of a problem that you may want to save for last. Maybe give it a once-over glance, but then do the rest of the test and come back to this problem when you are done with everything else.

This is also an example of a problem in which a "test-taking mindset" can lead you with more confidence much more quickly to the correct answer. If you treat this problem like a normal person and try to digest all of the information, it will take forever and there will be many chances to make a mistake. So let's start by trying to find a shortcut.

**Attempting to Skip the Garbage**

The answers are long and don't contain any numbers, so let's not bother to try checking the choices for factual accuracy. We could try checking answer D, since that looks simpler than the others, but the chart presents ion ratios, not oxygenation levels, so we have no way to judge the accuracy without further investigation. (And if you assumed that the graph displayed oxygenation levels without checking, you would conclude that answer D is correct, which it isn't.)

Let's start with the question prompt, which tells us that we need to "complete the statement". From the final sentence, we see that we need to illustrate a big change in the Alboran Sea, and little to no change near the Mauritanian Coast. From the graph, we see that the Mauritanian Coast (light squares) held steady the whole time, but the Alboran Sea (black triangles) jumped around a lot, with an especially big change around 9000 years ago. Let's check the answer choices to see if any of them mention a big change in the Alboran Sea, and a constant level near the Mauritanian Coast. Both answers B and C could work, although answer C doesn't mention whether the change in the Alboran Sea was large or small. So at this point, we can guess answer B with a reasonable level of confidence.

**Direct Approach**

If you have a little more time and want to answer this question with more confidence, you can try a more thorough approach.

Oxygenation seems to be an important issue, since it is mentioned in every answer choice and several times in the paragraph, but it is nowhere to be found in the graph. The vertical axis in the graph displays an ion

ratio. So we might want to start by figuring out how they are related. The middle of the paragraph tells us that they are *inversely* correlated, meaning when one goes up the other goes down and vice versa. Oxygenation is low near the *top* of the graph, and high near the *bottom* of the graph. This is the first sneaky thing in this question. If you overlook that one word "inversely", you'll probably get this question wrong. Having discovered it, however, we can now conclusively rule out answer D. The oxygenation levels in the Alboran sea were *lower* than those near the Mauritanian coast.

The other three answer choices discuss changes over various time periods or in various events. So let's check the horizontal axis of the graph. We discover that it expresses "years before present". This is the second sneaky thing in this question. Most graphs involving time display time proceeding from left to right. But in this graph, it's *backwards*. We go further and further *into the past* as we proceed to the right on the graph. In other words, *both axes are inverted* compared to what you (or any sane person) might casually expect.

Now, having somewhat untangled this mess, let's check the three remaining answer choices.

A — Answer A claims that there were dramatic changes in opposite directions during the two events in question. The graph shows a dramatic change at one of them, but a steady lack of change at the other.

B — Answer B claims that the decline in the Alboran Sea (black triangles) corresponded to a decrease in oxygenation. Taking into account the double-inversion in the graph, we see that this is true. The second part of the answer says that oxygenation didn't change much near the Mauritanian Coast (light squares) during the event there. The graph shows us that this is also true.

C — Taking into account the double-inversion in the graph, we see that the first part of this statement is correct, but the second part is not. Oxygenation near the coast was *high* the whole time.

So we can rule out the three wrong answers by comparing their claims to the data in the graph, but we had to go through a painful process of sorting through a mess in order to do it.

Incidentally, where are the Alboran Sea and the Mauritanian Coast? The Alboran Sea is the westernmost lobe of the Mediterranean Sea, between Spain and Morocco. Mauritania lies on the Atlantic Coast of Africa. So the researchers were comparing coral die-off events inside and outside the Mediterranean Sea.

## Problem 10

Official Answer: A

What's the claim? Apparently, being "awestruck" can make us more "altruistic". (One would think that most people who feel better about their own lives will tend to feel more benevolent towards others. But whether a psychological study makes sense or not is totally irrelevant to your answer on the SAT. Also, technically, the "claim" mentioned in the second sentence is that the researchers have found evidence for the "argument" mentioned in the first sentence. But again, that is not something you want to waste time pondering during a timed test. And as long as we're making parenthetical comments, have you ever wondered why the adjective for "full of awe" is not "awful"?) Anyway, given the nature of the experiment, let's just take the hypothesis to be something along the lines of "the people who saw the trees will help pick up more pens".

Answer A says exactly what we just said, so it's probably the correct answer.

Answers B and C are garbled. If an answer choice seems all mixed up and makes no sense, there's a pretty good chance that it's the wrong answer. If you want to rule these two out more conclusively, notice that answer B doesn't draw any distinctions between the tree-viewers and the building-viewers, which is where the difference in "awesomeness" was suppose to come from, and answer C makes it sound as if *not* helping people makes you more ... awe-full?

If the participants who had been looking at the *trees* were more likely to notice the fumbling of the pens, option D might be halfway to a decent answer. But this says that the participants who had been looking at the *wall* were more likely to notice.

## Problem 11

Official Answer: B

What's the conclusion? Spray coatings good. To refine this a bit, let's look at the graph. It shows the "power conversion efficiency", which is presumably a good thing, for both spray coatings and spin coatings. Do we need to know what these things are? We can search the paragraph later if we need to, but for now it doesn't matter. It is obvious from the graph that the spray coatings are better than the spin coatings. (The gray bars are higher than the black bars.) Since we are trying to support the conclusion that spray coatings are better, the correct answer will probably refer somehow to the gray bars being higher than the black.

Now let's check the answer choices. Let's check them for factual accuracy first, since that's often a quick way to rule answers in or out.

A — Crudely interpreted, this one amounts to "they're both good", which is not what we want.

B — In a nutshell, this one says, "the spray coating is so good, that the worst spray coating is better than the best spin coating". The graph shows that this is true, and it supports the conclusion, so this is probably the correct answer.

C — You can stop reading halfway through this one, because it is factually wrong.

D — This compares the best spray coating to the worst spray coating, not spray coatings to spin coatings.

## Problem 12

Official Answer: C

Let's start by trying to clarify what this confusing paragraph is trying to say. The idea is apparently that if you vote in a certain election, that will prejudice you towards or against the candidate that you voted for *in the future*. Apparently, if you vote in an election, you become blind to anything that happens after the election, and you like the candidate that you voted for no matter what. And apparently, the researchers tried to test this idea by asking a group of young people what they thought about former candidates two years after the election. The writers spent several lines of text telling us that some were old enough to vote and some weren't, but the key variable of interest is probably not the age but who (if anybody) the young people voted for. Presumably, those who voted for a candidate would think more highly of the candidate, and those who didn't would think less highly.

What's "the claim" that we need to weaken? We are evidently supposed to weaken the view that voting doesn't change your attitude. In other words, we need to see people who voted having a different attitude from people who didn't vote. Now, let's examine the answer choices one by one and see which one shows voters having a different attitude from non-voters.

A — The clue here is "regardless of whether subjects were old enough to vote at the time of the election". This one doesn't make any distinction between whether people voted or not.

B — This shows the *non-voters* having more positive attitudes later than they did earlier. We need to compare voters to non-voters, not non-voters later to non-voters earlier.

C — This one compares voters to non-voters and notes a difference, so it's probably the "correct" answer.

D — This one compares positive to negative attitudes, not voters to non-voters.

## Problem 13

Official Answer: B

If tortoise hatchlings like an image that resembles a face, what does that suggest? They're behaving like mammals? Tortoises like faces, too?

Notice that B and C both refer to assumptions. Answer B warns against making an assumption, and answer C says that an assumption is ok. The education industry likes to warn people about the potential catastrophes of making assumptions, so if one answer warns against making assumptions, there's a good chance that that one is the correct answer. Let's put answer B at the top of our priority list, but let's scrutinize each of the choices to be sure.

A — This is a non sequitur. Tortoises do not engage in parental care, so how would a tortoise hatchling liking a face suggest that it views the face as hostile?

B — If tortoises like faces, but tortoises also don't engage in parental care, this means we shouldn't assume that the two things are necessarily linked. This answer makes sense.

C — This one distinguishes between learned and innate behavior, and learned behavior was never discussed.

D — You can probably rule this one out pretty easily. There was no discussion of hatchlings versus adults.

So answer B is indeed the best answer.

## Problem 14

Official Answer: A

The "criteria" being used to "judge" the performances are unspecified. A mind desiring clarity cries out for more details. We aren't given any more, so we'll have to do the best we can.

The gist of the passage seems to be that the researchers made a mistake in their procedure. They failed to make an important distinction in the context when making measurements. The results of the study, therefore, .... are flawed? Oversimplified? Could be misleading?

A — This seems ok. It says basically that the results could be misleading.

B — Huh? Where did "identifying tasks" come from?

C — This is probably true as a general rule, but different species of monkey were not part of the discussion, and this conclusion does not flow from the given material.

D — Like "identifying tasks" and "other monkey species", the issue of laboratory versus wilderness was not part of the discussion.

## Problem 15

Official Answer: C

We have a long series of words with a blank in the middle, and the answer choices are identical except for the punctuation. This is a "boundary" question. Start by checking for independent clauses. If you imagine placing a period after "*Gingerbread*", you'll see that neither the stuff before nor the stuff after makes sense. Often you'll find an independent clause on both sides of the blank, but here there isn't an independent clause on *either* side of the blank. The blank actually comes in the middle of a clause: "Her novel *Gingerbread* offers a twist." All of the punctuation marks that we are being offered are being placed between the subject and the verb of this clause, and subjects and verbs should never be separated. "Marks of separation" need to go *between* the major "chunks" of a sentence, not *inside* of them. So the correct answer here is to remove all the separators and pick C.

## Problem 16

Official Answer: D

With comma questions, always start with the answer containing no commas (or the fewest commas). If the sentence sounds ok without commas, the answer with no commas is probably the correct one. So search for a specific rule, a need, an important function for the commas to have, and if you can't find any, choose the answer with no commas.

In this instance, the only possible rule would be to surround "aluminum oxide" with commas to set it off from the rest of the sentence. But this is only proper when the stuff between the commas is "optional extra" stuff. It would be appropriate if you were just saying "oh, by the way, it happens to be aluminum oxide in this case". However, in this sentence the words "aluminum oxide" are necessary to identify the subject of the sentence. We aren't talking about just any old compound, we are talking specifically about aluminum oxide. (This is technically known as a "restrictive appositive", and restrictive appositives should not be set off by any punctuation marks.)

So, as is often the case, the answer with no commas is the correct one. (By the way, did you notice what we did there with the commas? "As is often the case" is *not* restrictive, and is a true parenthetical, so it is set off by commas.)

## Problem 17

Official Answer: A

Here's another "boundary" question...complicated by a conjunctive adverb. Answer C has a period in it, so start with that one and see if it works. Leaving aside the "though", we see that the rest of the words form two independent clauses: "Hopper's subsequent career would involve more than just equations" and "as a pioneering computer programmer, Hopper would help usher in the digital age." Those are both perfectly valid sentences, meaning that we need something stronger than a mere comma to join them, and meaning that B and D are both wrong. Distinguishing between the other two has to do with the placement of the adverb "though".

We use "though" to contrast the sentence (or clause) that contains it with the *previous sentence* (or clause). In this case, we need to contrast "she was recruited to help solve equations" with "her career would involve more than just equations". This means that the "though" needs to go with "her career would involve more than just equations". If we choose answer C, the "though" contrasts "her career would involve more than just equations" with "she would help usher in the digital age". Those two clauses do not contrast, so that's a misplacement of the contrasting word "though". We need the "though" to attach to "her subsequent career would involve more than just equations", so it needs to go before the break, and answer A is correct.

The colon is appropriate here, because it passes the two colon checks: the words before the colon form a valid independent clause, and they work as an introduction for the words after the colon.

## Problem 18

Official Answer: D

Try pairing the four verbs with "it" or "they" as the sub-

ject. You might notice that three of the verbs are singular and one is plural, suggesting that the only plural verb ("attest") is the correct answer. To confirm, find the subject that needs to be paired with this verb. Who or what is doing the attesting? Be careful, because they stuck a short prepositional phrase and a long parenthetical in between the subject and the verb. Throw them away and you find the true subject: accomplishments. "The accomplishments attest to the value." That's a plural subject, and it requires a plural verb.

## Problem 19

Official Answer: A

You might notice that three of the choices are "true verbs", and one is a modified verb or "verbal" (more precisely a participle), suggesting that "suggesting" is the correct answer. Is it?

If you just read the first line of the sentence, you might think that a verb like "suggests" makes perfect sense. "This hypothesis suggests that certain trees survived...." But if you keep reading, you discover another verb before you reach the end of the sentence: "cannot stand". The spine of the sentence needs to be this: "this hypothesis cannot stand", and the rest of the verbiage needs to be demoted to supplementary or parenthetical stuff. It need to look like this: "This hypothesis (the one suggesting that trees survived) cannot stand." We need the participle "suggesting" to form the participial phrase describing the hypothesis.

Technically, what is going on is this: The words "suggesting that certain trees survived without interruption or human intervention throughout the Holocene" form a participial adjective phrase describing the hypothesis, and this cumbersome phrase has an additional parenthetical ("such as *P. sylvestris*") embedded within it. And all of this gunk is just extra distracting commentary inserted between the subject and the verb in order to confuse you. All of the clutter at the end (everything after "cannot stand") is even more commentary, although this stuff is already properly punctuated.

## Problem 20

Official Answer: B

All four answer choices could work grammatically in the sentence "they _____ an energy level." This is not a subject-verb agreement issue, it's a verb tense issue. The entire description is written in the present tense ("atoms travel", "they are diverted"), so we need to pick a present-tense verb to match, ruling out A and C. You might think that D just doesn't sound right, and you'd be correct. The simple explanation is that you should never use more words to do something that fewer words can do. The longer explanation is that D is a "continuous" or "progressive" tense. You use this tense when you want to refer to action that keeps going, as opposed to something that happens once and then it's done. In this discussion, we need the simple present tense, because they speed up "until" they reach something, "at which point" something else happens. We need a "perfect" tense to indicate a completed action, not a "continuous" tense indicating ongoing action.

## Problem 21

Official Answer: D

This is a "Standard English" question with long answer choices that look like reworded versions of each other. Look for "dangling modifiers". The subject of this sentence needs to be something that could be compared to alumina glass. More accurately, it needs to be compared to an analogous property or aspect of alumina glass. In other words, the subject of the sentence needs to be an aspect or property of silica glass.

Answers A and B make "silica glass" itself the subject of the sentence. You can't say "compared to that of alumina glass, silica glass is different." Answer C makes a "disadvantage" the subject of the sentence. It doesn't make sense to say "compared to that of alumina glass, a disadvantage of silica glass is..."

Answer D makes "atomic arrangement" the subject of the sentence, resulting in an appropriate parallel construction: Compared to the atomic arrangement of alumina glass, the atomic arrangement of silica glass is more dispersed.

## Problem 22

Official Answer: C

Why do so many of the artists presented by the SAT seem to be creating entertainment for children?

How are the two sentences related? The sentence before the blank makes a claim about an experience. The sentence after the blank provides some particular details to back up that claim. Example words like "for instance" might be ok, but we aren't offered any of those. The second half of the sentence also stops giving details and returns to general claims, making "for instance" less appropriate. We could also view the second sentence

as amplifying or strengthening the first, which makes "indeed" appropriate.

The second sentence does not clash or contrast with the first, so "instead" and "nevertheless" are inappropriate, and it does not give the second step in a sequence, so "second" doesn't work, either.

## Problem 23

Official Answer: D

You'll have to answer this one by ruling out the inappropriate answers, because the SAT writers botched the "correct" answer.

The second sentence is an extension or elaboration of the first sentence, or perhaps a consequence of it. It does not contrast with the first sentence, so "by contrast" and "that said" are inappropriate, and it does not provide a specification or a particular example, so "for example" is inappropriate. That rules out answers A-C and leaves D.

The SAT writers might have been thinking that the second sentence flows logically from the previous sentence, and that it is ok to use "as such" in the sense of "therefore". But this usage is sloppy and many grammarians frown on it. The SAT should, too. "As such" needs an answer to the question "such *what*?" The "such" refers to "such a thing" as was previously mentioned. It needs an antecedent noun. It's a *pronoun*. If you want to use it in the blank, you should be able to find an antecedent noun in the previous sentence, and the sentence should make sense if you replace "such" with the antecedent noun. But in this problem, the most plausible contender for an antecedent is "studies". "Her studies demonstrated that resources can be managed. As {studies}, her work is a repudiation of the common view." That makes no sense. This would have been more appropriate: "Her studies resulted in a conclusive demonstration that resources can be managed. As {a conclusive demonstration}, her work is a repudiation of the common view."

Perhaps the SAT writers should review the issue of pronoun ambiguity.

## Problem 24

Official Answer: D

What's the goal? To emphasize a similarity between the two books. Answers B and C only give contrasts, with no similarities at all. Answer A *implies* that they both contained short stories, but the emphasis is on the difference in number. Only answer D emphasizes things that the two books have in common.

If you want to cross-check answer D against the bullet points, you can find the similarities by pairing up the second and fourth and the third and fifth bullet points. Both books contain short stories, and they both describe "surreal events" occurring in "otherwise ordinary" places. Answer D doesn't mention short stories, but the prompt just said that we had to emphasize *a* similarity.

## Problem 25

Official Answer: B

What's the goal? To present the Quanhucun study and its conclusions. Whenever the SAT asks you to present conclusions, pay attention. One could argue about what it means to "present the study", but the conclusions are usually pretty specific, easy to identify, and necessary in the correct answer. Searching the bullet points for the conclusions of the study, we find them in the last two bullet points: The cats ate lots of grain, and this was evidence that they were probably domesticated. Answer B doesn't mention the grain, which was the quantitative result of the research, but it does present the ultimate conclusion that the cats may have been domesticated, and none of the other answers give conclusions.

## Problem 26

Official Answer: C

What's the goal? To introduce the artist's poetry collection. Scanning the notes, we see that there were two poetry collections, so we'd better refine that: To introduce the artist's 1983 poetry collection, namely *Precario/Precarious*. Answer choices B and D fail to mention this collection at all, so we can rule those out right away. Answer A mentions the collection, but only in a dependent clause, and the main idea of the sentence is about something else. Answer C gives several details about the collection, including the author, making it the best "introduction" to the collection.

## Problem 27

Official Answer: A

What's the goal? To emphasize the aim of the research study. What's the aim? Searching the notes, we find it in the second bullet point: To investigate which factors

influence lizard clutch size. The first half of answer A is almost a verbatim copy of bullet point number 2, and the second half elaborates by repeating bullet point number 1, so answer A is probably the correct answer. Answers B and C are all about the conclusions instead of the aim, and answer D is all about the methods.

## Problem 1

Official Answer: D

The second parenthetical expression is being added, not subtracted, so we don't have to worry about signs. We can just remove the parentheses and then combine like terms:

$$\begin{aligned}&(2x^2+x-9)+(x^2+6x+1)\\=&2x^2+x-9+x^2+6x+1\\=&3x^2+7x-8\end{aligned}$$

## Problem 2

Official Answer: C

All four answer choices give a linear term, a constant term, and a sum of 165. So these are all attempts to express in a formulaic way where the total price of $165 came from. The down payment of $37 must be the constant term, and that allows us to rule out B and D right away. If you realize that the down payment must be added, not subtracted, you can also rule out A.

If $p$ stands for the number of monthly payments, then the coefficient on $p$ must stand for the amount of each monthly payment, or $16. So to calculate the total price of the microscope we need to add 16p to 37, and that's answer choice C.

## Problem 3

Official Answer: A

We need to isolate $m$. It is almost isolated already, and all we need to do is divide by 7.

$$\begin{aligned}7m&=2(n+p)\\m&=\frac{2(n+p)}{7}\end{aligned}$$

## Problem 4

Official Answer: C

$$\begin{aligned}g(x)&=\sqrt{8x+1}\\g(3)&=\sqrt{8(3)+1}\\&=\sqrt{25}\\&=5\end{aligned}$$

## Problem 5

Official Answer: C

The introduction is poorly worded. They meant to say "the table gives the distribution of votes for a new school mascot *by* grade level..." or "... *for each* grade level..." The students were not voting for grade levels. They should have had some of the proofreaders for the reading and writing questions look over the math questions as well.

In any case, we just need to look up the correct numbers and form the correct fraction:

$$\begin{aligned}\text{Votes for Lion:}&\quad 20\\\text{Total Votes:}&\quad 80\\\text{Fraction:}&\quad \tfrac{20}{80}=\tfrac{1}{4}\end{aligned}$$

## Problem 6

Official Answer: 224

$$\begin{aligned}p(x)&=5x-220\\900&=5x-220\\5x&=900+220=1120\\x&=1120/5=224\end{aligned}$$

## Problem 7

Official Answer: B

Whenever they give you a graph and ask you to match it to the correct equation, always start with a simple sign check. In this case, that's all you *can* do, since all of the numbers are identical. The graph clearly has a positive $y$-intercept and a negative slope, and only one answer choice has these things.

## Problem 8

Official Answer: 1

The two $x$ terms are identical, so this can easily be solved by elimination. Subtracting the second equation from the first gives this:

$$\begin{aligned}3x+6&=4y\\3x+4&=2y\\6-4&=4y-2y\\2y&=2\\y&=1\end{aligned}$$

## Problem 9

Official Answer: 14

The only thing you have to do here is to be careful not to confuse the *maximum data value* with the *maximum frequency* or the *data value with the maximum frequency*. The maximum data value is 14, the maximum frequency is 11, and the data value with the maximum frequency is also 11. They ask for the maximum data value, so the answer is 14.

## Problem 10

Official Answer: D

We want the sum of two areas, and one of the areas is given. All we need to do is figure out the other area, i.e. the area of circle $K$, and then add them together. If the radius of circle $K$ is 4, then the area must be $\pi(4)^2 = 16\pi$. (If you've forgotten how to calculate the area of a circle, the formula is on the reference page.) Finally, the total area is $16\pi + 100\pi = 116\pi$.

You might also have noticed that the sum of $100\pi$ and something else must be greater than $100\pi$, and there is only one answer choice that is greater than $100\pi$.

## Problem 11

Official Answer: D

Whenever the SAT gives you expressions with multiple parentheses, the parenthetical expression is usually the same, and they usually ask you for the value of the parenthetical expression. So just treat the parenthetical expression as if it were a variable on its own, and solve for this parenthetical expression:

$$\begin{aligned} 9(\text{stuff}) + 2 &= 8(\text{stuff}) + 18 \\ 9(\text{stuff}) - 8(\text{stuff}) &= 18 - 2 \\ (\text{stuff}) &= 16 \end{aligned}$$

## Problem 12

Official Answer: B

Whenever they give you two triangles in the same problem, they are probably similar, and the problem will probably involve matching up corresponding angles. In this case, they tell us directly that the triangles are similar, they give us the sine of one angle, and they ask us for the sine of the corresponding angle. Just repeat back the only number that was given:

$$\sin(J) = \sin(F) = \frac{308}{317}$$

## Problem 13

Official Answer: D

Let's summarize what we know in symbols:

$$\begin{aligned} x + y &= 106 \\ x &= 4y + 6 \end{aligned}$$

There aren't any brief methods for solving this system. The most straightforward approach might be to subtract the second equation from the first, solve for $y$, and then substitute this value for $y$ into the second equation to figure out $x$.

$$\begin{aligned} x + y - x &= 106 - 4y - 6 \\ y &= 100 - 4y \\ 5y &= 100 \\ y &= 20 \\ x &= 4(20) + 6 = 86 \end{aligned}$$

## Problem 14

Official Answer: A

$$5x + 24y = 4529$$

This is a summation equation summing up the number of trees in two land areas to give a grand total of 4529 trees. The two terms on the left side are clearly the partial sums giving the number of trees in each of the two land areas. If 5 is the area of the industrial park and 24 is the area of the neighborhood, then $x$ must represent the tree density in the industrial park, i.e. the number of trees per hectare, and $y$ must represent the tree density in the neighborhood.

## Problem 15

Official Answer: B

In real life you often need to simplify things. Making complicated things simpler is an important part of dealing with life as a human being. In much of your school homework, you were probably asked to express things

"in simplest form". But in this question, you need to do the opposite and make something that was simple into something unnecessarily more complex.

If you know how fractional exponents work, you may have noticed that all four answer choices involve radicals, and your first instinct was probably to rewrite the fractional exponent as a radical. (If you don't know how fractional exponents work, here it is in a nutshell: Write the numerator as a normal power, and the denominator as a root. So for example, $x^{3/4}$ would be rewritten in radical form as $\sqrt[4]{x^3}$.) In our problem, we are given $a^{11/12}$, so we think it should be rewritten as $\sqrt[12]{a^{11}}$. But that's not one of the answer choices. So what are we to do?

It often helps to notice when all of the answer choices have something in common. In this case, they all have $a^{132}$ inside the radical. And 132 equals $11 \cdot 12$. In other words, it's the numerator we wanted, scaled up by a factor of 12. In other words, we are being asked to rewrite the fractional exponent in radical notation, but using a *larger equivalent fraction* instead of the given fraction. If we scale 12 up by the same factor of 12, we obtain 132/144, which is an equivalent fraction for 11/12, and rewriting this in radical notation produces the unnecessarily bloated expression $\sqrt[144]{a^{132}}$.

By the way, they often place domain restrictions on the functions they give you, but you can usually just ignore them. In this case, stating that $a > 0$ is just their way of saving you from having to worry about roots of negative numbers.

And incidentally, do we ever meet twelfth roots in real life? Often the SAT makes up arbitrary and unrealistic stuff just to test your symbol-manipulation skills. But twelfth roots are actually easy to find. Just look at the frets on the neck of a guitar. Each one is $\left(\frac{1}{2}\right)^{1/12} = 94.4\%$ as far from the base as the next one up. You can find a similar relationship in most musical instruments with pipes or strings. It's a geometric progression with a growth factor of $\left(\frac{1}{2}\right)^{1/12} = 0.944...$.

## Problem 16

Official Answer: 76

Whenever they give you a function in factored form, don't try expanding it, because that will almost surely not be helpful. In this case, they ask for $g(0)$. If they had asked for $f(0)$, could you calculate it? Just substitute $x = 0$ into the given function, and discover that $f(0) = -6 \cdot -2 \cdot 6 = 72$. Now, they tell us that $g$ is what we get after sliding $f$ up by 4 units. So all we have to do is add 4 to our value of $f(0) = 72$ to get $g(0) = 76$.

## Problem 17

Official Answer: 35

We are probably too far from the beginning of the test for them to give us a system in which one of the equations is as simple as $x = 5$. Both of these equations actually involve both variables. But at least they are presented in parallel form with the terms lined up, and one of them is already solved for $y$, so neither substitution nor elimination should be very hard. If you can multiply by 4 and subtract in your head, at least term-by-term, elimination might be the easier method in this case, although either way should work. Multiplying the first equation by 4 gives this system:

$$4y = 16x + 4$$
$$4y = 15x - 8$$

Now, subtracting the second equation from the first gives $0 = x + 12$, or $x = -12$. Substituting this into the first equation gives $y = 4(-12) + 1 = -48 + 1 = -47$. Since they ask us for the difference between the two values (for some strange reason), we'll have to subtract: $x - y = -12 -^{-} 47 = 35$.

## Problem 18

Official Answer: D

Apart from compound interest formulas, exponential functions are not often useful in economics, and when they are, only over very short time intervals. This is presumably why they said that $0 \leq t \leq 5$. This is another example of the SAT giving you domain restrictions that have absolutely no bearing on your solution. This is also an example of an exponential function problem that you can answer simply by remembering that the coefficient in front represents the starting value...which is also the $y$-intercept of the function when you graph it. So in this case, the coefficient of 8000 must be the number of coupons sent out at the end of the first year, i.e. the end of 1998. This problem is classified as "hard", but if you remember how to interpret the coefficient of an exponential function, it's pretty easy.

## Problem 19

Official Answer: D

You can set this up as a proportion. $88x$ is to $5y$ as

what is to $9y$?

$$\begin{aligned}\frac{88x}{5y} &= \frac{?}{9y}\\ ? &= \frac{9y}{5y}88x\\ &= \frac{9}{5}88x\\ &= \frac{792x}{5}\end{aligned}$$

You could also think of this as a rate problem, but you'll get a very weird rate. Not that this problem isn't weird to begin with. $88x$ ounces in $5y$ minutes is a rate of $88x/5y$ ounces per minute. Multiplying this rate by $9y$ minutes gives

$$\frac{88x}{5y} \cdot 9y = \frac{792x}{5}\text{ounces}$$

## Problem 20

Official Answer: -3

If you ever have to solve an equation on the SAT that is neither linear nor quadratic, you will have to transform it somehow into a linear or quadratic equation. If the equation involves roots, try squaring both sides of the equation. In this case, that gives us a quadratic equation.

$$\begin{aligned}\sqrt{(x-2)^2} &= \sqrt{3x+34}\\ (x-2)^2 &= 3x+34\\ x^2-4x+4 &= 3x+34\\ x^2-7x-30 &= 0\end{aligned}$$

You can try the quadratic equation if you want to, but quadratic equations on the SAT are usually factorable. If the leading coefficient is 1, as it is in this case, factoring will almost surely be faster and more error-proof than the quadratic formula. In this case, what are factors of 30 that add up to -7?

$$\begin{aligned}x^2-7x-30 &= 0\\ (x-10)(x+3) &= 0\end{aligned}$$

The two solutions are therefore 10 and -3. They ask for the smallest solution, so the answer is -3.

## Problem 21

Official Answer: C

They tell us that there are two similar triangles, they tell us how big one of the corners is, and they ask us how big the corresponding corner is. In similar figures, all corresponding angles are equal, so we only have to repeat the given measurement. $T = Z = 20°$.

The fact that $2XY = RS$ is useless. It's a red herring. If we had to deduce any linear measurements, then we would have needed to know the scale factor, but all this question asks for is one of the angles.

This problem is classified as "hard", but apart from the red herring, it's a piece of cake. You don't even have to calculate anything.

## Problem 22

Official Answer: B

Translating an exponential function sideways will change the initial value, but not the growth factor. The growth factor still has to be 4, so we can rule out C and D. None of the answer choices contain a constant that is smaller than 9, which is a clue that we need to find the new coefficient by multiplying 9 by something. Translating sideways by two units is the same as multiplying by the growth factor twice, and $9 \cdot 4 \cdot 4 = 144$.

The direct way to do this would be to replace the exponent in the given function by $x + 2$.

$$\begin{aligned}g(x) = f(x+2) &= 9(4)^{x+2}\\ &= 9(4)^2(4)^x\\ &= 144(4)^x\end{aligned}$$

## Problem 1

Official Answer: B

Subtracting 12 from both sides of the equation gives $k = 336 - 12 = 324$.

## Problem 2

Official Answer: C

If there are 100 centimeters in every meter, then there must be 51·100=5100 centimeters in 51 meters.

## Problem 3

Official Answer: B

Just read the coordinates of the intersection. It lies at (2,2).

## Problem 4

Official Answer: 3

Just read the position of the dot on the number line. It sits at 3.

## Problem 5

Official Answer: A

Judging from the heights of the bars, there are 40 students in drama and 30 in chess, so the difference is 10.

## Problem 6

Official Answer: B

They give us a mess, and all four answer choices are relatively simple, so let's try to simplify the given expression and see if we obtain one of the four answer choices. As always, pay special attention when subtracting stuff inside of parentheses. They often make you subtract parentheses, to see how many people they can catch in hasty errors. Just remember to "distribute the subtraction" to all terms inside the parentheses.

Wait, did you notice that we have two terms in the numerator, both involving a factor of $(x - 7)$? And did you notice that the denominator is just twice this factor? So we could expand the terms in the numerator and then simplify everything, but instead, let's factor out the common factor, and then cancel it from both the numerator and denominator.

$$\frac{8x(x-7) - 3(x-7)}{2x - 14} = \frac{(8x-3)(x-7)}{2(x-7)} = \frac{8x-3}{2}$$

If you don't notice the common factor, you can still arrive at the same answer, it will just take you longer and there will be more steps for you to possibly make a mistake.

## Problem 7

Official Answer: 240

If you like decimals, 80% of 300 is $0.80 \cdot 300 = 240$.

If you like fractions, 80% of 300 is $\frac{4}{5} \cdot 300 = 240$.

## Problem 8

Official Answer: B

This is classified under "Inequalities", but it's really just basic arithmetic. To cover 24 km at a rate of 4 km per hour, you need to walk for 24/4=6 hours.

## Problem 9

Official Answer: A

Answer A is clearly the correct answer. Every number in the $y$ column is four greater than the corresponding number in the $x$ column.

Answer D gives values for $y = x$, and in answers B and C, the values for $y$ go down as $x$ goes up, which can't be right.

## Problem 10

Official Answer: 9

You can probably do this in a few seconds by looking for the number that gives 54 when you multiply it by 6. More formally:

$$g(x) = 6x = 54$$
$$x = 54/6 = 9$$

## Problem 11

Official Answer: C

To calculate the total cost, we need to start with the onetime fee and then add the daily cost. i.e. the daily

rate multiplied by the number of days. Translating this into symbols, we have $c = 10 + 11d$, or $c = 11d + 10$, which is answer choice C.

## Problem 12

Official Answer: D

The two angles are supplementary. They are adjacent angles against a straight line, and they add up to a "straight angle", or 180. Line $p$ is completely irrelevant.

## Problem 13

Official Answer: 986

$$\begin{aligned}\text{Area} &= \text{Length} \cdot \text{Width} \\ &= 34 \cdot 29 = 986\end{aligned}$$

## Problem 14

Official Answer: 45

You might be able to reason this out in your head. If you want to keep track of your steps with a pencil, it should look something like this:

$$\begin{aligned}h(x) &= x + b \\ h(0) = 45 &= 0 + b \\ b &= 45\end{aligned}$$

## Problem 15

Official Answer: B

All four answer choices are given in slope-intercept form (although two of them have an intercept of zero), so if we can figure out the slope and the intercept of our line, we can tell which of the four choices is correct. They give us the intercept directly ($y = 5$), and only one answer has a $y$-intercept of 5, so we are already done.

If you want to check the slope, they tell us that our line is parallel to $y = 7x + 4$, which has a slope of 7. Since our line is parallel, it must also have a slope of 7, and only answer choices B and C have a slope of 7.

## Problem 16

Official Answer: D

Just locate the four coordinate pairs and see which one is in the shaded region. Since the line is pretty steep and the shaded region is on the right side, you could start by checking the answer choice containing the largest $x$-value, which turns out to be the correct answer.

## Problem 17

Official Answer: D

Check the coefficient: Remembering that the coefficient of an exponential expression represents the initial value, we can immediately rule out A and B for not giving the correct initial value.

Check the base: If the bacteria double every day, and $t$ is measured in days, then the growth factor must be 2. Only answer D has a growth factor of 2. (Answers A and B have ridiculously large growth factors, and answer C has a growth factor less than one, representing a *decay* instead of growth.)

## Problem 18

Official Answer: B

You could try searching for factors that are 8 apart and that give a product of 180. It's pretty easy to discover that they are 18 and 10. Since $x$ represents the smaller of the two factors, the answer is 10.

If you wanted to set this up as a formal equation and then solve it, it would look something like this:

$$\begin{aligned}x(x + 8) &= 180 \\ x^2 + 8x - 180 &= 0 \\ (x + 18)(x - 10) &= 0 \\ x &= -18 \text{ or } 10\end{aligned}$$

This tells us that the possible number pairs are -18 and -10, or 10 and 18. Both of these pairs have a difference of 8 and a product of 180. But they said that the numbers have to be positive, so we can ignore the negative pair, and conclude that the answer is 10.

## Problem 19

Official Answer: C

The equation is given in factored form, so we can see that the two solutions are -4/5 and 5/2, and only one of these is listed among the choices.

## Problem 20

Official Answer: C

The number 32 represents the total number of cups of broth, so the equation must represent a summation of cups of broth, each of the two terms ($3x$ and $5y$) representing the cups of broth in the two different kinds of jars. They tell us that $x$ corresponds to small jars and $y$ to large jars, so $3x$ must represent the number of cups of broth in the small jars and $5y$ must represent the number of cups of broth in the large jars. (Since $x$ and $y$ represent the numbers of jars, the numbers 3 and 5 must represent the number of cups of broth in each jar.)

## Problem 21

Official Answer: D

$$\begin{aligned}\text{Area} &= \text{Width} \cdot \text{Length} \\ &= w(w+9)\end{aligned}$$

If $w$ is the width, then $w+9$ must represent the length, making D the correct answer.

## Problem 22

Official Answer: C

This is messy, but straightforward. You need add two quantities and convert to degrees. You can perform the two steps in either order, and you can either use a calculator or pencil and paper. Perhaps the most straightforward thing to do would be to use your calculator. If you use paper and add first, then you should get $\frac{2\pi}{3} + \frac{5\pi}{12} = \frac{13\pi}{12}$. This is $\frac{1}{12}\pi$ greater than 180, and $\frac{1}{12}\pi$ equals 15 degrees, so the measure of angle T is 195. If you convert first, then you have 120+75=195.

## Problem 1

Official Answer: 79

If you remember the definition of median (and you should), this is a breeze. You don't even have to organize the data, because they're already in order from least to greatest. So all you have to do is find the middle number. It's 79.

## Problem 2

Official Answer: B

Whenever you have two triangles in the same problem, they are almost certainly similar, and you need to match up corresponding angles. In this case, they give us the measure of one angle, and they ask for the measure of the corresponding angle in the other triangle. Just repeat the only number that appears anywhere in the problem. The answer is 53.

## Problem 3

Official Answer: B

In other words, what is $y(3)$? We can figure this out simply by evaluating the given expression for $x = 3$. The first two rows of the table are irrelevant, and the third row is merely a weird way of asking you to evaluate the function.

$$\begin{aligned} y &= 4(2)^x + 3 \\ y(3) &= 4(2)^3 + 3 \\ &= 4 \cdot 8 + 3 \\ &= 32 + 3 \\ &= 35 \end{aligned}$$

## Problem 4

Official Answer: C

Any equation that has identical expressions on both sides of the equals sign is always true regardless of the variables, and it has "infinitely many" solutions. Notice that you can plug in anything you want for $x$ (like $x = 2$), and you will obtain a uselessly obvious equation (like 132=132).

## Problem 5

Official Answer: D

The coefficient has to represent the initial value (15,000 in this case), which rules out A and B. Answers A and B put the coefficient where the base should be. The population is increasing, meaning the base must be greater than 1, which rules out C and leaves only D.

A base of 0.96 would correspond to a *decrease* of 4% per year. A base of 15,000 would mean that every year the population increases by a factor of 15,000.

## Problem 6

Official Answer: A

The $y$-intercept is easy to find. The function $h(x)$ is already given in slope-intercept form, so you can read it right from the equation: the $y$-intercept is 28. The $x$-intercept is a little harder to find, but not much. You have to set $h(x)$ equal to 0, and then solve for $x$:

$$\begin{aligned} 0 &= 4x + 28 \\ x &= -28/4 = -7 \end{aligned}$$

Finally, the sum of the two values is 28-7 or 21.

## Problem 7

Official Answer: B

They give us a mess, and all four answer choices are relatively simple, so let's try to simplify the given expression and see if we obtain one of the four answer choices. As always, pay special attention when subtracting stuff inside of parentheses. They often make you subtract parentheses, to see how many people they can catch in hasty errors. Just remember to "distribute the subtraction" to all terms inside the parentheses.

Wait, did you notice that we have two terms in the numerator, both involving a factor of $(x - 7)$? And did you notice that the denominator is just twice this factor? So we could expand the terms in the numerator and then simplify everything, but instead, let's factor out the common factor, and then cancel it from both the numerator and denominator.

$$\frac{8x(x-7) - 3(x-7)}{2x - 14} = \frac{(8x-3)(x-7)}{2(x-7)} = \frac{8x-3}{2}$$

If you don't notice the common factor, you can still arrive at the same answer, it will just take you longer and there will be more steps for you to possibly make a mistake.

## Problem 8

Official Answer: D

This is one of those annoying problems where they don't let you work with familiar numbers. They make you work with unknown quantities in the abstract. One way of dealing with problems like this is to just invent your own numbers, thus turning the problem from algebra into arithmetic. Suppose we just pretend that $n = 1$. That would give circle A a radius of 3 and an area of $\pi(3)^2$, and would give circle B a radius of 129 and an area of $\pi(129)^2$. (If you've forgotten the formula for the area of a circle, it's on the reference page.) This gives circle B an area that is $129^2/3^2 = 43^2 = 1849$ times as large as circle A.

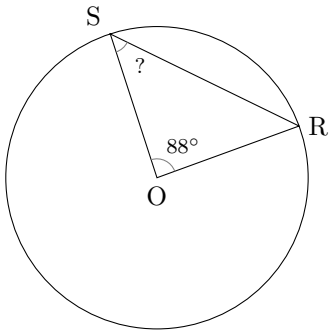
If you're comfortable reasoning abstractly, you could also have solved this by putting the two area formulas into a ratio and then simplifying:

$$\frac{\text{Area B}}{\text{Area A}} = \frac{\pi R_B^2}{\pi R_A^2} = \left(\frac{R_B}{R_A}\right)^2 = \left(\frac{129n}{3n}\right)^2 = \left(\frac{129}{3}\right)^2 = 43^2 = 1849.$$

## Problem 9

Official Answer: 46

Start by drawing a sketch to help you keep the information straight. It should look something like this:




They ask us about triangle $ORS$, which we know must be isosceles, since two of the sides are both radii of the same circle. Therefore the two base angles must be equal to each other. We also know that the sum of angles in a triangle must equal 180, so we can subtract 88 from 180 to obtain 92, and then divide this in half to find 46.

## Problem 10

Official Answer: B

Always be careful when working percents backwards. You need to divide, not multiply.

$$\begin{aligned} \text{Price Per Chair} \cdot 81 + 7\% &\leq 14,000 \\ 81x + 0.07(81x) &\leq 14,000 \\ 1.07(81x) &\leq 14,000 \\ x &\leq \frac{14,000}{1.07(81)} \\ &\leq \$161.53 \end{aligned}$$

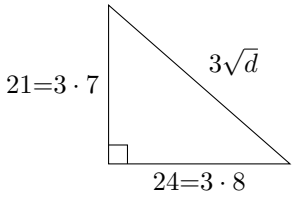
## Problem 11

Official Answer: 113

We are given the lengths of the legs of a right triangle, and the length of the hypotenuse is in question, so of course this will involve the Pythagorean Theorem. One way to solve this problem would be to get out your calculator, sum the squares of the legs, take the square root, divide by 3, and then square it again to give you $d$. This will give you

$$d = \left(\frac{\sqrt{24^2 + 21^2}}{3}\right)^2 = \frac{24^2 + 21^2}{3^2} = \frac{1017}{9} = 113$$

Another way would be to notice that 21, 24, and $3\sqrt{d}$ all contain factors of 3.




We can scale down our triangle by a factor of 3, giving legs of 8 and 7, and a hypotenuse equal to $\sqrt{8^2 + 7^2}$. Now $d$ can come directly from the Pythagorean Theorem: It's simply the sum of the squares of 8 and 7, i.e. 64+49=113.

## Problem 12

Official Answer: D

Try translating all of the percents into decimals and the words into simple equations. With percent problems, you need to be very careful about the difference between a percent *of* something and a percent *greater than* or

*less than* something. But in this case, the percents are all percents *of* something, so you can simply turn the percents into decimals and then multiply.

$$\begin{aligned} a &= 2.3b \\ a &= 0.6c \\ c &= \frac{1}{0.6}a = \frac{1}{0.6}(2.3b) \\ &= \frac{23}{6}b = 3.83\bar{3}b \end{aligned}$$

So $c$ is approximately 383% of b.

## Problem 13

Official Answer: D

One is tempted to think of exponential functions, but this is really a direct proportion. Exponential functions are often expressed using percentages, but linear functions usually aren't, which may make this seem a bit unfamiliar. If they had said "every time $x$ increases by ... $y$ increases by 201%", then it would have been exponential. That would translate to something like $f(x) = A(2.01)^x$. But they just said "$f(x)$ equals 201% of $x$", which translates to $y = 2.01 \cdot x$, which is clearly an increasing linear function.

## Problem 14

Official Answer: 33

They put some numbers and letters in a blender for this one, but we can at least figure out the value of $k$ without any difficulty. The $y$-intercept has to lie on the $y$-axis, i.e. at $x = 0$, and they tell us that they have named the coordinates of this point $(k - 5, b)$, for some reason, so we can easily conclude that $k - 5 = 0$ and thus $k = 5$. Knowing the value of $k$, we can also easily rewrite the table of coordinates:

| $x$ | $y$ |
|---|---|
| 5 | 13 |
| 12 | 15 |

Now we can extrapolate backwards to the y-axis to find out the value of $b$. The rise and run of the two given points are -28 and 7, so the slope must be $-28/7 = -4$. At this rate, extrapolating backwards from $x = 5$ to $x = 0$ gives a y-value of $13 + 4 \cdot 5 = 33$.

To extrapolate the value of the $y$-intercept in a more formal way, you could also plug the slope and one of the coordinates into the slope-intercept form of the equation and then solve for the slope. Using the first row in the table and the known values of $k = 5$ and $m = -4$, that would look like this:

$$\begin{aligned} y &= mx + b \\ 13 &= -4 \cdot 5 + b \\ b &= 13 + 20 = 33 \end{aligned}$$

## Problem 15

Official Answer: C

The number 32 represents the total number of cups of broth, so the equation must represent a summation of cups of broth, each of the two terms ($3x$ and $5y$) representing the cups of broth in the two different kinds of jars. They tell us that $x$ corresponds to small jars and $y$ to large jars, so $3x$ must represent the number of cups of broth in the small jars and $5y$ must represent the number of cups of broth in the large jars. (Since $x$ and $y$ represent the numbers of jars, the numbers 3 and 5 must represent the number of cups of broth in each jar.)

## Problem 16

Official Answer: B

For a system to have "no solution" means that the two lines are parallel. More precisely, they must have the same slope but different $y$-intercepts. You could rewrite every equation in slope-intercept form and compare slopes and intercepts, but that would involve lots of fractions.

Another method would be to multiply all of the answer choices by 3 or 9 to produce $3x$ on all of the left sides and then compare the right sides to the right side of the given equation. Scaling all four answer choices appropriately produces these equations:

A: $3x = 12y$
B: $3x = 36y$
C: $3x = 36y - 45$
D: $3x = 108y - 135$

The first and last equations have the wrong slope, so we can rule those out. The third choice has the constant term, i.e. the same intercept, as the given equation, which means that the two equations are equivalent and a system formed from these two equations would have

"infinitely many solutions", not no solutions. Answer B has a $y$-intercept of zero, meaning it has the same slope but a different $y$-intercept as the given equation, and thus forms a system with no solutions.

## Problem 17

Official Answer: C

They give us three possible solutions to check, and the given equation is easy to check by substitution, so let's just test the three possibilities one by one. Substituting $x = 29$ obviously works, since that reduces the equation to 0=0. Substituting $x = a$ does not work, since that reduces the equation to "Positive Number=0". We don't even need to check $a + 1$, since we know option I does not work, and only answer C does not include option I.

If you have a few moments to spare and you want to confirm that option II does in fact work, you can substitute $a + 1$ into the equation, and find that it reduces to $(a - 28) = (1)(a - 28)$, so II does indeed work, confirming that C is the correct answer.

## Problem 18

Official Answer: D

Whenever you meet a problem near the end of the test that seems like a simple calculation, beware of sneaky tricks. In this case, be careful not to overlook the word "twice" loitering at the very end of the problem. We need to cover $2w$ square feet, not $w$ square feet.

You can think of this as a rate problem, with a coverage rate of 170 square feet per gallon, and then divide $2w$ square feet by 170 square feet per gallon to obtain $w/85$ gallons. Or you might find that it makes more sense as a proportion problem.

$$\frac{170}{1} = \frac{2w}{?}$$
$$? = \frac{2w}{170} = \frac{w}{85}$$

## Problem 19

Official Answer: C

What does the equation $y = -x^2 + 9x - 100$ look like when you graph it? It's a parabola. What does the line $y = c$ look like when you graph it? It's a horizontal line. How is it possible for a parabola and a horizontal line to "intersect" at exactly one point? This is only possible if the line just touches (or "is tangent to") the parabola at the vertex. In other words, they are asking you to find the $y$-coordinate of the vertex of the given parabola. If you remember the vertex formula for a parabola, this should be a breeze. If you don't, you should review it, because it is fairly useful when taking SATs.

Given a parabola in the form $y = ax^2 + bx + c$, you can find the $x$-coordinate for the vertex simply by plugging the coefficients into the vertex formula:

$$\begin{aligned} x &= -\frac{b}{2a} \\ &= -\frac{9}{2(-1)} = \frac{9}{2} \end{aligned}$$

(You could express this as 4.5 if you wanted to, but you might notice that all of the answer choices are fractions, so it may be better to leave the $x$-value in fraction form.)

We still need the value of $c$, i.e. the $y$-coordinate of the vertex, but we can find this by plugging our $x$-value back into the given formula for $y$:

$$\begin{aligned} y &= -\left(\frac{9}{2}\right)^2 + 9\left(\frac{9}{2}\right) - 100 \\ &= -\frac{81}{4} + \frac{162}{4} - \frac{400}{4} \\ &= -\frac{319}{4} \end{aligned}$$

Another method would be to substitute $c$ for $y$ in the quadratic function, and then set the discriminant equal to zero (since there must be exactly one solution). If you want to try this method, it should look something like this:

$$c = -x^2 + 9x - 100$$
$$0 = -x^2 + 9x + (-100 - c)$$

The SAT has unhelpfully named the constant in this problem $c$, which risks mixing up this $c$ with the $c$ in the discriminant formula. However, the risk of confusion is minimal, as long as we are careful to keep our $c$'s straight.

$$\begin{aligned} b^2 - 4ac &= 0 \\ (9)^2 - 4(-1)(-100 - c) &= 0 \\ (9)^2 - 4(100 + c) &= 0 \\ 81 - 400 - 4c &= 0 \\ 4c &= -319 \\ c &= -\frac{319}{4} \end{aligned}$$

The official solution rewrites the equation into vertex form by completing the square, from which you can read the vertex coordinates directly. The amount of work involved is roughly the same.

## Problem 20

Official Answer: 168

Since they give us the time and depth at the deepest point, it would be easy to plug these values into the template formula for a parabola in vertex form:

$$\begin{aligned} y &= a(t-h)^2 + k \\ &= a(t-6)^2 + 302.4 \end{aligned}$$

(The seal is not technically following a parabolic trajectory, since the independent variable is time, not horizontal position. The mathematical seal is apparently moving vertically with a constant upward acceleration, like a weight attached to a spring descending and then bouncing back up again. But we can think of it as a "parabola" for calculation purposes.) We can deduce the value of $a$ using the other piece of information that they give us, namely that the seal reached the surface (where depth=0) after 12 minutes.

$$\begin{aligned} 0 &= a(12-6)^2 + 302.4 \\ a &= \frac{-302.4}{6^2} = -8.4 \end{aligned}$$

Now all we have to do is evaluate the function for $x = 10$.

$$\begin{aligned} y &= -8.4(t-6)^2 + 302.4 \\ &= -8.4(10-6)^2 + 302.4 \\ &= -8.4 \cdot 16 + 302.4 \\ &= 168 \end{aligned}$$

## Problem 21

Official Answer: A

The method of unit multipliers is unnecessarily formal and complicated for simple distance or time conversions. But in this problem we have to convert multiple components of compound units, and it is harder to keep the units straight. This is exactly what the method of unit multipliers was designed for. Applying the method of unit multipliers to this problem looks like this:

$$\frac{250 \text{ ft}^2}{1 \text{ hour}} \cdot \left(\frac{1 \text{ meter}}{3.28 \text{ ft}}\right)^2 \cdot \frac{1 \text{ hour}}{60 \text{ min}} = \frac{250}{3.28^2 \cdot 60} = 0.387...$$

## Problem 22

Official Answer: B

Welcome to the world of SAT math. Here's another twisted, abnormal, unfamiliar, needlessly complicated problem. (If you are allowing yourself one or two "throw-away problems" to save time for proofreading easier problems with better odds, this particular problem is clearly a good candidate to throw away.)

They have given us a system of equations, one of them with unknown coefficients, and they've told us that the graphs of these equations are perpendicular. All four answer choices are also systems, similar to but not the same as the given system, and they all involve the same two unknown coefficients as in the given system.

We have two options here: We can ponder the situation for a while and hope to uncover a shortcut or trick of some kind, or we can press forward with the "brute force" approach, deducing new things step by step until we arrive at one of the four answer choices.

If we opt for the first approach, we can try comparing the four answer choices to the given equation set, looking for similarities and differences. We might notice that the fourth set has an identical second equation, but the first equation in this set has the sign flipped, so that can't be right. Now we are down to three choices. We might also notice that like the fourth pair of equations, the first pair also has only one sign flipped, so that probably isn't right, either. If we flip a sign in one equation, we need to also flip a sign in the other equation to preserve the perpendicular relationship. At this point, it will help to remember that when an equation is expressed in standard form, the slope of the line is contained or expressed in the ratio of the two coefficients. Reflecting on the ratios of coefficients, we might notice that in answer choice B, they've doubled the coefficient on $x$ in the first equation, and doubled the coefficient on $y$ in the second equation, thus preserving the reciprocity and the perpendicularity. In answer C, they've doubled the coefficient on $x$ in both equations, effectively halving the slope of both of them, which does not preserve the perpendicular relationship. So B must be the correct answer.

If we opt for the second, "brute-force" approach, we will have to rewrite all of the equations into slope-intercept form, and then compare slopes. If we want to check all four answer choices, we will have rewrite a total ten equations. (This is the approach taken in the official answer manual, but they realize how lengthy and time-consuming that would be, so they "cheat" and only illustrate the procedure for the correct answer.)

Assuming you are comfortable with rewriting equations, you should find that the given system looks like this after you rewrite it:

$$\begin{aligned} y &= -\frac{5}{7}x + \frac{1}{7} \\ y &= -\frac{a}{b}x + \frac{1}{b} \end{aligned}$$

This is not enough to tell us the values of either $a$ or $b$ by themselves, but at least we can deduce their ratio. Since the lines are perpendicular, the slopes must be opposite reciprocals, and

$$\frac{a}{b} = -\frac{7}{5}$$

Now we face the onerous task of rewriting all of the answer choices, plugging in this ratio, and checking whether this makes them perpendicular or not. We can save a little time if we realize that the intercepts are irrelevant, and we can just calculate the slope for each equation. After getting out a blank piece of scratch paper and scribbling for a minute, we find these slopes:

Answer A:

$$\begin{aligned} m &= -\frac{10}{7} \\ m &= \frac{a}{2b} \end{aligned}$$

Answer B:

$$\begin{aligned} m &= -\frac{10}{7} \\ m &= -\frac{a}{2b} \end{aligned}$$

Answer C:

$$\begin{aligned} m &= -\frac{10}{7} \\ m &= -\frac{2a}{b} \end{aligned}$$

Answer D:

$$\begin{aligned} m &= \frac{5}{7} \\ m &= -\frac{a}{2b} \end{aligned}$$

Since $a/b$ is negative, and we need the two slopes to have opposite signs, we can rule out A and D. If we plug the ratio $a/b = -7/5$ in to these, we obtain a system whose slopes have the same sign. Finally, if we substitute the known ratio of $a/b$ into B and C, we find that only B gives opposite reciprocal slopes.