Passage I

Question 1. The best answer is D because the phrase "Liv Arnesen of Norway and Ann Bancroft of Minnesota" forms the compound subject of the sentence, and there is no reason to put any punctuation between the two parts of this compound subject.

The best answer is NOT:

A because the comma after "Liv Arnesen of Norway" puts unnecessary and inaccurate punctuation between the two parts of the compound subject.

B because the commas after the women's names and after "of Norway" are unnecessary and break up the compound subject. If there were commas after both "of Norway" and "of Minnesota," this could be a correct alternative that treats the points of origin as extra information, but with the comma only before the prepositional phrase "of Minnesota" and not at the end, the sentence isn't correctly punctuated.

C because, as in B, the commas after the women's names are unnecessary and break up the compound subject. Additionally, the two prepositional phrases both have commas at the beginning and not at the end, creating an incorrectly punctuated sentence.

Question 2. The best answer is F because the previous sentence states that the women "became the first women to climb and ski across the continent of Antarctica," which means that they did finish the journey. This is the only choice that clearly indicates that the trip was finished (in 96 days).

The best answer is NOT:

G because "achieve" isn't the same thing as "complete." *Achieve* means to accomplish something or bring it about, but the word doesn't fit in this context; it is not an idiom in standard English to "achieve a trip."

H because *finalized* is similar in meaning to *complete*, but *finalize* is ordinarily used in the context of completing a transaction or a business deal and isn't used idiomatically in the context of "finalizing a trip" (unless it means finalizing the planning of a trip rather than the making of a trip). Also, "finalizing" takes place at the end of something, rather than over the course of 96 days.

J because *implemented* can mean to put a plan into effect, but it omits the information that the trip was necessarily finished or completed and so isn't an appropriate word choice in this context.

Question 3. The best answer is B because the comma after *Runway* sets off what follows it as an appositive (a word or phrase that refers to or explains the noun or noun phrase it follows). In this case, "Blue One Runway" is explained by the appositive "a solid-ice airstrip on the Atlantic coast of Antarctica."

The best answer is NOT:

A because the additional words *it is* make a second independent clause rather than the appositive described above, and the comma thus incorrectly joins two independent clauses and creates a comma splice.

C because when there is no comma after *Runway*, there is no punctuation to set off the appositive from the word that it explains or describes, which makes the sentence confusing.

D because the word *being* is unnecessary and not appropriate in standard written English; *which is*, or nothing at all (as in B), is appropriate at this point.

Question 4. The best answer is J because only a comma should be there to separate the introductory participial phrase, "Hiking unassisted up the 10,0000-foot-high Sygyn Glacier," and the main clause, "each woman pulled a sled that weighed more than 260 pounds." For clarity, the introductory phrase must be next to, or adjacent to, the subject of the clause that it modifies, "each woman."

The best answer is NOT:

F because the coordinating conjunction *and* is inappropriately placed between the introductory participial phrase, "Hiking unassisted up the 10,0000-foot-high Sygyn Glacier," and the main clause, "each woman pulled a sled that weighed more than 260 pounds." Coordinating conjunctions typically join two like structures (two phrases, two main clauses) rather than a phrase and a clause.

G because the subordinating conjunction *when* makes the main clause into a dependent clause. The resulting combination of introductory phrase and dependent clause is a sentence fragment (an incomplete sentence).

H because the subordinating conjunction *while* creates a sentence fragment in the same way as in G.

Question 5. The best answer is B because the details that are included in Sentence 5 expand on Sentence 4 by explaining what the things are that make the women's supplies weigh so much, and the list of supplies also gives an idea of what sort of things the women used on their trip, as B suggests.

The best answer is NOT:

A because there is no indication in the essay that each woman, though she pulled 260 pounds on her sled, was limited to this weight.

C because there is no indication in the passage that the women brought along more than they thought they would need; even though the sleds were heavy, the implication is that they brought what they needed.

D because the list of supplies in Sentence 5 in no way contradicts the information in Sentence 4 about the weight of the sleds. Rather, the information in Sentence 5 expands on what is said in Sentence 4.

Question 6. The best answer is J because "stretching for 1,000 miles" logically follows and continues the description of "a high, frozen desert." The underlined phrase makes sense in this location but not in the other locations.

The best answer is NOT:

F because although the phrase could be in this location to describe "the Polar Plateau," the phrase "stretching for 1,000 miles a high, frozen desert" makes no logical sense, at least without additional punctuation.

G because when the phrase "stretching for 1,000 miles" is placed at the beginning of the sentence, it would seem to modify the subject of the sentence "the adventurers" and imply that the adventurers stretched for 1,000 miles.

H because when the phrase is placed after the subject ("the adventurers stretching for 1,000 miles"), the sentence once again illogically implies that the adventurers stretched for 1,000 miles.

Question 7. The best answer is C because *blew* is the correct past tense form of the verb that correctly fits into the sentence and is parallel to the other past tense verb in the sentence, *sailed*. The rest of the paragraph is also written in the past tense.

The best answer is NOT:

A because *had blew* is an ungrammatical form of the verb. If it were an accurate past perfect verb form, it would say *had blown*, using the past participle *blown* rather than the past tense *blew*.

B because *blow* is the present tense form of the verb and doesn't fit logically into either the sentence or the paragraph, both of which are written in the past tense.

D because *blown* is the past participle, which cannot be used alone as a main verb but must be part of a verb phrase such as "had blown" or "was blown."

Question 8. The best answer is J because *these* is the only one of the four responses that, within the context of this sentence, doesn't logically refer to the two women. When *these* is placed into the sentence, it appears to refer to the strong winds ("The . . . strong winds blew daily, and these sailed 210 miles in just five days."). Therefore this is the LEAST acceptable alternative to *the team*.

The best answer is NOT:

F because *the two*, meaning Arnesen and Bancroft, is an acceptable alternative to *the team*.

G because the names of the two women, *Arnesen and Bancroft*, are also an acceptable alternative to *the team*.

H because *the women* also refers to Arnesen and Bancroft and is an acceptable alternative to *the team*.

Question 9. The best answer is D because the conjunctive adverb *however* appropriately sets up a contrast between the first week, when the wind blew daily, and the next five days, when there was very little wind.

The best answer is NOT:

A because *accordingly* suggests that one thing is a consequence of another. The wind ceasing to blow isn't a consequence of the wind blowing for a week, but rather a contrast with the previous week.

B because *otherwise* is used to imply that something might be the case under different circumstances (It's raining; otherwise, I would go with you), rather than to set up a contrast with a previous statement. It would not be idiomatic, or sound natural to a native speaker of English, to say, "For the next five days, otherwise, there was almost no wind."

C because *consequently*, just like *accordingly*, implies a cause-and-effect relationship between the wind blowing and the wind ceasing to blow, a relationship that makes no logical sense.

Question 10. The best answer is F because there is appropriately no punctuation between the two parts of the compound verb ("visited . . . and replenished") and the word *their* is the correct form of the third-person plural possessive pronoun (the food belonging to them).

The best answer is NOT:

G because the comma after *and* both separates the two parts of the compound verb and also is in an ungrammatical place following a coordinating conjunction. The correct form of the possessive pronoun is used, however.

H because the word *there* is the adverb meaning a place, rather than the required form of the third-person plural possessive pronoun.

J because the comma after *scientists* also separates the two parts of the compound verb. Additionally, the adverb form *there* is inappropriately used instead of the plural possessive *their*.

Question 11. The best answer is C because only the present participle *climbing* is needed to form an adjective phrase that relates back to the subject of the sentence, *they*.

The best answer is NOT:

A because the coordinating conjunction *and* ordinarily connects two similar structures, but this *and* inappropriately connects a main clause with a phrase ("while climbing over a 10,200-foot-high glacier named Titan Dome"), leaving the phrase as a dangling modifier separated from the subject it is supposed to modify.

B because adding the words *they climbed* after the comma creates a second main clause, thus creating a comma splice between two independent clauses.

D because although *to climb* almost works here—the women were outside in order to climb the glacier—it doesn't quite make sense because they weren't in bitter cold for the purpose of climbing the dome; rather, they were outside to climb the dome and it happened to be bitterly cold. C is a much clearer answer; D makes the reader stop to try to figure out what the writer meant.

Question 12. The best answer is J because only the coordinating conjunction *and* is needed here to join the two independent clauses.

The best answer is NOT:

F because "and during those last miles of the trip" is redundant (repetitive of a phrase already in the sentence, "the final few miles").

G because "and during those fortunate moments" refers generally to the wind being with the women for the last several miles, but this phrase is both somewhat redundant and unnecessarily wordy. The implication that the wind was fortunate because it enabled them to complete their trip and reach their goal is clearly there without being stated this explicitly.

H because the clause "so the wind carried them and" is redundant; it merely restates the idea in the words "the wind was with them."

Question 13. The best answer is B because although all the sentences are true and could work in the context of this paragraph, the women's main accomplishment, explained in the introductory paragraph and described throughout the essay, was to cross the Antarctic landmass. So B is the answer that most effectively and specifically emphasizes their accomplishment.

The best answer is NOT:

A because while it's true that this had been a long journey, this sentence is merely a comment on the trip rather than a description of the women's main accomplishment.

C because though the women were no doubt relieved to have safely descended Titan Dome, this additional information about how the women felt does not emphasize their main accomplishment as the question asks.

D because although mention of the women's last miles going by quickly is an interesting addition, this sentence fails to refer to the women's main accomplishment as the question asks.

Question 14. The best answer is J because the adverb *prudently* expresses the idea that it was prudent, or thoughtful and wise, for the women to call for a ski plane.

The best answer is NOT:

F because with the underlined portion in this location before "to airlift," *prudently* seems to refer to the ski plane as prudent, whereas only living beings can be prudent.

G because if the underlined portion is placed before *becoming*, it creates the phrase "prudently becoming stranded," which makes little sense. Becoming stranded would probably never be prudent.

H because if placed before the word *stranded*, the underlined portion would create the phrase "becoming prudently stranded," which is confusing in basically the same way as G.

Question 15. The best answer is **A** because if the final paragraph were deleted from the essay, the reader would not learn that the winds kept the women from safely skiing the last 460 miles to McMurdo Station.

The best answer is NOT:

B because the last paragraph doesn't explain why skiing to McMurdo Station was part of the women's original plan but only states that it was part of the original plan.

C because the final paragraph doesn't describe the weather conditions on the Ross Ice Shelf at various times of the year but only mentions the weather conditions at the particular time the women arrived there.

D because the last paragraph makes no mention of Arnesen and Bancroft's reaction to having to change their plan and be airlifted to McMurdo Station rather than skiing there.

Passage II

Question 16. The best answer is **H** because the word *but* sets up a contrast between the first independent clause and the second one, indicating that the narrator arrives thirty minutes earlier than the shop opens. It is grammatically correct to use a coordinating conjunction between two independent clauses.

The best answer is NOT:

F because having just a comma between the first independent clause and the second one creates a comma splice (two or more complete sentences separated only by a comma).

G because though it is often correct to set off a conjunctive adverb such as *however* with commas, when *however* comes between the two independent clauses in this sentence, it would need either a semicolon before it or else a period before it and a capital letter on *However* to create two separate sentences; the punctuation in G creates a comma splice.

J because when there is no punctuation at all following *morning*, the two independent clauses create a fused, or run-together, sentence.

Question 17. The best answer is **B** because it isn't logical to say that the sky becomes colorful "in order that" (so that) the sun begins to rise. Rather, the colorful sky happens simultaneously with the rising sun. So B is the LEAST acceptable alternative to the underlined portion, in which the word *as* indicates that the events described are simultaneous.

The best answer is NOT:

A because *at the same time* is a logical alternative to *as*, meaning simultaneously.

C because *while* is also a logical alternative to *as*, also meaning happening at the same time.

D because the coordinating conjunction *and* connects the clauses in a logical way, making this a reasonable alternative to *as* in the underlined portion. The comma is appropriate here after *ribbons* because the conjunction joins two independent clauses.

Question 18. The best answer is **J** because *orange* is the choice that is most consistent with the description elsewhere in this sentence, namely the "peach-and-melon-colored ribbons" in the sky. Both descriptions use color names that also are the names of fruit.

The best answer is NOT:

F because *solar* is both redundant—since *sun* and *solar* refer to the same thing, though one word is a noun and the other word is an adjective—and inconsistent with the other descriptions in the sentence.

G because though *luminous* can accurately be used to describe the sun, this description isn't consistent with the other descriptions in the sentence.

H because *radiant*, meaning "shining" or "glowing," could describe the sun but isn't similar to any other description in the sentence.

Question 19. The best answer is **C** because it is the only choice that provides the main subject and verb for the sentence, "I watch," and avoids creating a dangling modifier that doesn't refer logically to the subject of the sentence.

The best answer is NOT:

A because by creating a dangling modifier it inaccurately suggests that the seagulls, rather than the narrator, are "walking toward the docks."

B because it makes the subject of this sentence "their high-pitched cries," and both "walking toward the docks" and "watching the seagulls" would have to refer to "their high-pitched cries." Since high-pitched cries can neither walk nor watch, this would not be a logical choice. Once again, the problem is a dangling modifier.

D because it creates the same illogical and dangling modifier as in A, implying that the seagulls are walking toward the docks even as they are wheeling and swooping.

Question 20. The best answer is **F** because the noun phrase "the night security guard at the marina" is a nonrestrictive appositive that must be set off by commas from the noun it refers to, *Carney*.

The best answer is NOT:

G because it is missing the comma at the end of the appositive and creates an ambiguous and confusing sentence, with the name *Carney* seemingly just stuck into the middle of the sentence.

H because the comma between *Carney* and the appositive is missing, again creating a confusing sentence.

J because both commas around the appositive are missing, leaving a run-together subject that is confusing.

Question 21. The best answer is C because the most logical comparative description of the smell of the shop is "like the bay itself," with this phrase set off by commas. There is no need for a comma anywhere within the phrase.

The best answer is NOT:

A because, although the first part of the sentence could work ("The shop smells salty, like the bay,"), the rest of the sentence, "itself and the creaky oak floor is gritty with sand," becomes nonsensical.

B because there is no reason to set off the reflexive pronoun *itself* with commas.

D because since there is a comma at the beginning of the parenthetical phrase "like the bay itself," there must also be a comma at the end, following *itself*.

Question 22. The best answer is G because it appropriately divides the sentence into two complete sentences.

The best answer is NOT:

F because the lack of punctuation creates a fused, or run-together, sentence.

H because the comma after *lights* creates a comma splice.

J because, as in F, the lack of punctuation creates a fused, or run-together, sentence.

Question 23. The best answer is D because *sit* is the appropriate present tense plural verb to go with the plural subject *bins* and to match the other present tense verbs in the paragraph (for example, *smells*, *is*, *turn*, *straighten*).

The best answer is NOT:

A because *sits* is a singular verb, which doesn't agree with the plural subject, *bins*.

B because *is sitting* is a singular verb rather than a plural one; *are sitting* would be needed to agree with the subject. Also, there are no other present progressive verbs in the paragraph.

C because *sets* is a singular verb and because it is the wrong verb. *Set* is a transitive verb (a verb that takes a direct object), as in "Set the book on the table," whereas *sit* is an intransitive verb (one that doesn't need an object), as in "The book sits on the table."

Question 24. The best answer is G because it is the only choice that tells specifically what can be found for sale in the shop, as the question asks: fishing rods, reels, hooks, nets, and fishing line.

The best answer is NOT:

F because it refers to the equipment for sale only generally as "the wide variety of fishing equipment."

H because it describes the walls but not the merchandise, referring only to walls that are "jam-packed with equipment" but not mentioning anything specific.

J because it refers, again generally and not specifically, to "gear for a range of different purposes."

Question 25. The best answer is A because *straighten* is the appropriate present tense verb and *it* is the appropriate pronoun to refer to the singular noun *merchandise*. *Merchandise* is a collective noun, one that may seem to be plural since it can refer to many different things at the same time but that operates as a singular noun in English, as in "All the merchandise we have is new."

The best answer is NOT:

B because the verb *straightened* is in the past tense, whereas the rest of the paragraph is in the present tense, and the plural pronoun *them* doesn't refer correctly to the singular noun *merchandise*.

C because the verb *straightened*, as in B, is inappropriately in the past tense, and *those* is a plural pronoun instead of a singular one needed to refer to *merchandise*.

D because although *straighten* is the correct present tense verb, *them* is an inaccurately used plural pronoun.

Question 26. The best answer is J because it is the only choice that provides a subject and verb and creates a complete sentence.

The best answer is NOT:

F because it creates a sentence fragment. It has no main clause, but only a subordinate clause that begins with the subordinating conjunction *when*.

G because it creates a sentence fragment like that in F, except with the subordinating conjunction *as*.

H because it, too, creates a sentence fragment; this time there is a participial phrase where there should be a main clause.

Question 27. The best answer is A because it correctly punctuates the three items in a series ("live herring, mullet, and shrimp").

The best answer is NOT:

B because *live* is an adjective rather than an item in a series of nouns; the comma after *live* confusingly makes *live* appear to be a fourth item in the series.

C because it adds the same inappropriate comma between *live* and *herring* as does B.

D because the unpunctuated words *live herring mullet* (with a comma at the end of the phrase) are confusing and unclear; the lack of a comma between *herring* and *mullet* makes this seem to be one item rather than the first two items in a series.

Question 28. The best answer is **H** because Sentence 5 fits most logically and coherently after Sentence 2 and before Sentence 3. Sentence 5 first mentions the flat full of worms to be sold, and Sentence 3 refers to packing those worms into containers of thirteen worms apiece.

The best answer is NOT:

F because Sentence 5 is illogical in its original location. In this sentence order, the worms aren't brought out until after they have been divided into containers for sale back in Sentence 2.

G because although Sentence 5 could logically follow Sentence 1, it isn't logical to have Sentence 2, about herring, mullet, and shrimp, intervene between the introduction of the worms in Sentence 5 and their division into containers in Sentence 3.

J because it puts Sentence 3 and Sentence 5 adjacent to each other but in the wrong logical order. Sentence 5 needs to precede Sentence 3 for the sake of logic and coherence.

Question 29. The best answer is **B** because the phrase "with a smile," as B says, gives a detail that shows the narrator's attitude toward the customers.

The best answer is NOT:

A because the phrase characterizes only the narrator's attitude and contains no information that differentiates the narrator's mood from that of the customers.

C because the mention of the narrator's smile doesn't refer back to anything in the previous paragraph, which focuses on listing some of the things the narrator does to prepare the shop each morning.

D because it suggests that nothing would be lost if "with a smile" were deleted because this detail is clearly stated elsewhere in the paragraph; however, there is no other mention in the paragraph of the narrator's smile.

Question 30. The best answer is **F** because the sentence "I work at Stoney's Bait & Tackle Shop" fits logically at the end of Paragraph 1. The first sentence notes that most people in the narrator's town work in a job that has something to do with fishing and that the narrator is no different. The new sentence to be added explains what the narrator means in the first sentence and provides key information that helps all the rest of the essay to make sense.

The best answer is NOT:

G because the sentence to be added doesn't fit logically at the end of Paragraph 2, which describes how a typical early morning looks when the narrator is on the way to work.

H because the sentence to be added doesn't belong at the end of Paragraph 3, which tells about the night security guard and the narrator greeting each other as one leaves work and the other arrives. For the essay to make sense, the reader needs to know the information in the added sentence at a point earlier than this.

J because the sentence also doesn't fit well at the end of Paragraph 5, where it interrupts the description, given in both Paragraphs 5 and 6, of the many things the narrator does each morning to prepare the shop for its daily business.

Passage III

Question 31. The best answer is B because *its* is the correct singular possessive pronoun to agree with the noun phrase "The movie *Dracula*."

The best answer is NOT:

A because although the word *featuring* works fine in this context, the word *it's* is a contraction meaning "it is" rather than the singular possessive form *its* that is needed here.

C because while *based on* works in this context, the form of the word *its'* is incorrect (there is no plural possessive of the singular pronoun *its*).

D because *who's* is a contraction meaning "who is," which fits neither the meaning nor the sentence structure here.

Question 32. The best answer is H because it provides the clearest sentence structure.

The best answer is NOT:

F because its structure makes it ambiguous; it seems to imply that the bats, rather than the ideas, are flawed.

G because it is awkward and confusing; it could easily be clarified to "mistaken ideas about bats."

J because "people's mistaken ideas they have" is awkward and redundant.

Question 33. The best answer is A because it uses the correct comparative form "more interesting," and it uses the preposition *than* to introduce the second part of a comparison.

The best answer is NOT:

B because although "of more interest" works in this context, the adverb *then* is inaccurately used in place of the preposition *than*.

C because the comparison "the most interesting than" is grammatically flawed, using the superlative form *most* where the comparative form *more* is required.

D because although it uses the correct comparative words "more interesting," it includes the word *then* incorrectly.

Question 34. The best answer is J because the colon used in this choice appropriately introduces the list of the three most common misconceptions about bats.

The best answer is NOT:

F because the semicolon after *bats* leaves a long sentence fragment (the list of misconceptions about bats). Semicolons are appropriately used between two independent, closely related clauses and not to introduce a list.

G because the comma after *bats* runs the elements of this sentence together in a confusing manner and doesn't appropriately introduce the list of misconceptions.

H because the lack of any punctuation after *bats* makes this sentence confusing by failing to set off the list of misconceptions from the rest of the sentence.

Question 35. The best answer is B because its structure makes it the clearest choice, unambiguously stating that the cattle and horses are sleeping when the bats bite them.

The best answer is NOT:

A because the sentence is ambiguous in this form; it is unclear whether the cattle and horses or the bats are sleeping.

C because this sentence is ambiguous for the same reason as A; *they* in "when they are asleep" could refer either to the bats or to the cattle and horses.

D because, even more directly than A and C, this choice implies, illogically, that while the bats are asleep they bite cattle and horses.

Question 36. The best answer is F because separating two independent clauses or sentences that are closely related in content is an appropriate and effective use of a semicolon.

The best answer is NOT:

G because the comma after *rodents* creates a comma splice between two independent clauses and because the comma after *others* separates the subject of a main clause (*others*) and the verb in that clause, *think*.

H because the lack of any punctuation between the two independent clauses creates a run-together, or fused, sentence.

J because although using the coordinating conjunction *and* would be acceptable here, the apostrophe in *others'* introduces the plural possessive form, which is not appropriate here.

Question 37. The best answer is C because *and* is a coordinating conjunction used appropriately to connect the first independent clause ("bats are not related to birds") with the second independent clause ("bats are not rodents either"), and because *although* sets up the contrast expressed in the subordinate clause that introduces the second independent clause.

The best answer is NOT:

A because it creates an unclear sentence saying that bats are not related to birds because bats, although they appear mouselike, are not rodents.

B because *whether* doesn't fit logically into this sentence, making the meaning hard to interpret.

D because "seeing as" is too casual an expression for the context and does not connect the ideas here logically, and because the lack of the conjunction *and* creates a comma splice.

Question 38. The best answer is F because the comma after *Chiroptera* appropriately sets off the descriptive noun phrase that is in apposition to *Chiroptera*.

The best answer is NOT:

G because adding the words *they are* makes the part of the sentence following *Chiroptera* into an independent clause, and thus the comma after *Chiroptera* creates a comma splice.

H because the addition of the words *so they are* after *Chiroptera* creates an invalid claim of cause and effect; it isn't logical to say that because bats are called Chiroptera, they are the only mammals that can truly fly.

J because the phrase *Chiroptera being* makes the sentence unclear and confusing.

Question 39. The best answer is C because the verb *can . . . fly* agrees with the plural subject, *mammals*.

The best answer is NOT:

A because the singular verb *flies* doesn't agree with the plural subject, *mammals*.

B because the singular verb *is* doesn't agree with the plural subject, *mammals*.

D because the singular verb *has* doesn't agree with the plural subject, *mammals*.

Question 40. The best answer is J because it provides present tense main verbs (*send* and *use*) that are consistent with the rest of the paragraph.

The best answer is NOT:

F because participial verb forms (*sending* and *using*) result in a sentence fragment.

G because the two verb forms *sending* (participle) and *use* (present tense) are not parallel and create an ungrammatical sentence.

H because it places a past tense verb (*sent*) in the middle of a paragraph using present tense and because it confusingly uses the infinitive form of the verb *to use*.

Question 41. The best answer is **B** because to a paragraph about the ways in which bats are useful to humans, this sentence adds another relevant example: bats pollinate plants, including fruits that humans eat.

The best answer is NOT:

A because the fact that bats can bite when handled doesn't fit into a paragraph about how bats are useful to humans.

C because plants' development of mechanisms to attract bats is interesting information but not relevant at this point in the essay.

D because bats' eyes being adapted to poor lighting is information that isn't relevant to the discussion of bats' usefulness to humans.

Question 42. The best answer is **J** because the sentence that the writer is considering deleting contains specific examples (evidence) of ways that humans are destroying bat habitat, as claimed in the previous sentence—namely, by building highways and housing developments. If the sentence were deleted, this information would be lost.

The best answer is NOT:

F because the sentence under consideration identifies how bat habitat is being destroyed; the sentence adds to, rather than distracts from, the message about the possible extinction of some bat species.

G because the sentence under consideration contains no direct examples of ways readers can stop the destruction of bat habitats.

H because the sentence under consideration identifies ways that bat habitat is being destroyed but gives no scientific proof.

Question 43. The best answer is **A** because the opening paragraph discusses people's fears of and misconceptions about bats, so the phrase "though they might seem threatening" is the choice that best ties the conclusion of the essay to its beginning.

The best answer is NOT:

B because the phrase "though they mostly come out at night" doesn't relate as well as **A** to the opening of the essay about people's fears and misconceptions about bats.

C because the phrase "though their habitats are vanishing" doesn't relate to the fears and misconceptions that people have about bats that are mentioned at the beginning of the essay.

D because the phrase "even if we rarely see them" has little connection to the opening paragraph about people's fears and misconceptions about bats.

Question 44. The best answer is F because the last sentence of the essay's first paragraph lists three of the most common misconceptions humans have about bats, and each misconception is the topic of one of the following three paragraphs in the essay.

The best answer is NOT:

G because the last sentence of the first paragraph is introducing new ideas, not summarizing points made earlier.

H because listing misconceptions about bats, rather than kinds of creatures bats have been compared to, is the purpose of the last sentence of the first paragraph.

J because the last sentence of the first paragraph, listing misconceptions about bats, contains no humor.

Question 45. The best answer is C because the goal of focusing the essay on the various ways in which people are causing the extinction of some bat species was NOT met in this essay. There is a brief mention of the extinction of some species of bats in one paragraph, but the focus of the essay is on the mistaken ideas people have about bats.

The best answer is NOT:

A because it suggests inaccurately that the goal was met by the essay explaining in detail that humans pose the greatest threat to bats. However, the human threat to bats is only a small part of the essay.

B because it suggests inaccurately that the goal was met by the essay's focus on people's misconceptions about bats; but that is a different focus than the extinction of some bat species.

D because, although it states correctly that the goal of focusing on the various ways that humans cause the extinction of bats was NOT met in this essay, the reason given is inaccurate. The essay does indicate that not all bat species are at risk of becoming extinct, but there is no mention of the relationship between bats' extinction and their feeding on livestock, and this point is only tangential to the goal.

Passage IV

Question 46. The best answer is G because the question asks for the choice that introduces the sentence by describing the Free Speech Movement and G explains that the Free Speech Movement was composed of "a coalition of civil rights groups and other political organizations."

The best answer is NOT:

F because it mentions a different campaign occurring in the United States at this time, but it doesn't explain what the Free Speech Movement was.

H because it mentions the conflict between the Free Speech Movement and university officials but fails to describe the Free Speech Movement.

J because it hints at what caused the formation of the Free Speech Movement but doesn't describe what it was.

Question 47. The best answer is D because the only piece of relevant information given here is the location, Mississippi.

The best answer is NOT:

A because the fact that Mississippi was the twentieth state admitted to the Union is irrelevant in this essay.

B because Mississippi's being known as the Magnolia State is irrelevant in this essay.

C because it is irrelevant in the essay that Mississippi was admitted to the Union in 1817.

Question 48. The best answer is F because there is no need for any punctuation in this underlined portion. The four prepositional phrases in a row in this sentence work together to describe how Savio had spent his time: "in Mississippi during the Freedom Summer of 1964 before returning to classes that fall." Sometimes no punctuation is necessary.

The best answer is NOT:

G because *before* is confusingly and ungrammatically set off by commas from the preceding and following phrases, becoming kind of a floating word attached to nothing.

H because a comma is incorrectly placed between the preposition *before* and the object of the preposition, *returning*.

J because a semicolon is incorrectly placed between *1964* and *before*, leaving a sentence fragment following the semicolon.

Question 49. The best answer is B because the words *That ban* clearly refer to the ban, mentioned in the previous sentence, that the university had imposed on civil rights groups. This is the most specific choice, while all the other choices are unclear.

The best answer is NOT:

A because *That stuff* is vague and is too informal in tone.

C because beginning with *Which* turns the sentence into a relative clause and so into a sentence fragment rather than a complete sentence.

D because there is no clear referent for the pronoun *it* (nothing that explains exactly what *it* stands for in the sentence).

Question 50. The best answer is F because the coordinating conjunction *and* appropriately joins the two elements of the compound object in the sentence: "a student strike" and "a sit-in protest."

The best answer is NOT:

G because adding the words *it became* creates a second main clause that, because of the lack of punctuation, produces a fused, or run-together, sentence.

H because the statement created by the addition of H, "That ban led to a student strike and was a sit-in protest," doesn't make sense, saying that the ban *was* a sit-in protest.

J because the word *than* does not join the sentence elements meaningfully; "That ban led to a student strike than a sit-in protest" makes no sense.

Question 51. The best answer is B because Sentence 4 does return the discussion to Savio himself and shifts away from the emphasis in Sentence 3 on the Free Speech Movement.

The best answer is NOT:

A because although Sentence 4 is the right place to begin a new paragraph, the resulting paragraph doesn't focus on Savio's childhood but only mentions it briefly.

C because although Sentence 5 does discuss Savio's experience as a civil rights worker, that fact is noted as just one more step in his life story, not a shift in the focus of the essay. And beginning the new paragraph with Sentence 5 would leave Sentence 4, about Savio's being the son of working-class parents, stuck onto the end of paragraph that discusses the Free Speech Movement rather than at the beginning of a paragraph focused on Savio's life leading up to his involvement with the Free Speech Movement.

D because Sentence 5 doesn't shift the essay's focus from Savio's childhood to his adult life. One prior sentence (Sentence 4) mentions Savio's childhood, but with this one exception, the entire essay up to this point has already been about Savio's adult life. And, as in C, beginning the new paragraph with Sentence 5 strands Sentence 4.

Question 52. The best answer is H because *compellingly* means "convincingly," so this word choice most clearly suggests that Savio was successful in his appeal to the protesters. Also, this is the only choice that refers to Savio's effect on the listeners rather than on how he himself spoke or felt.

The best answer is NOT:

F because *insistently* would indicate that Savio spoke with persistence, but it doesn't imply that he was successful.

G because *emphatically* would indicate that Savio spoke forcefully and with lots of emphasis, but it doesn't imply success.

J because *excitably* would indicate that Savio was excited about what he was saying but would not imply he succeeded in his appeal.

Question 53. The best answer is D because *large crowd* is the most clear and logical way to say that many people were there.

The best answer is NOT:

A because *countless*, meaning "too many to be counted," is usually used with a plural noun, as in "she has countless friends" or "there are countless answers to this question." It doesn't fit with "group"—though it would be possible to say "there were countless people in the group."

B because *numerous group* doesn't work for the same reason as A; *numerous* means "many," and it too usually accompanies a plural noun, as in "he made numerous friends" or "they had planned numerous activities."

C because *high volume* means "holding a large capacity," and it usually refers to a container or a room or a space that can hold a lot of things or people; it isn't used to refer to the size of a group.

Question 54. The best answer is G because *Besides* is the only choice that doesn't refer to time. Customarily, *besides* is used to set up a contrast with something else, and here there is no contrast. The purpose of the introductory adverb or adverbial phrase is to locate the time at which this event happened, as the underlined portion, *That day*, does. Therefore, *Besides* is the LEAST acceptable alternative to *That day*.

The best answer is NOT:

F because *Not long after* refers logically to the time that Savio and others were taken to jail, so it is an acceptable alternative to *That day*.

H because *Soon* is another logical way to refer to how much time passed before Savio and others were taken to jail.

J because *Then* is also a time word, implying "next" or "soon," so it also works as a logical alternative to *That day*.

Question 55. The best answer is D because when the words *ban that* are inserted into the sentence, it becomes illogical; it would read, "Days later, the California Board of Regents voted to override the university ban that granted full speech rights on the Berkeley campus." We know from the first paragraph that the university had restricted free speech activities, so it makes no sense to suggest that the ban had *granted* full speech rights. This alternative makes no sense in the context of the essay and therefore is the LEAST acceptable.

The best answer is NOT:

A because it puts a comma after *ban* and adds a subject ("this action") to go with the second verb, thus creating two independent clauses joined by a coordinating conjunction; this choice keeps the original meaning, and so is an acceptable alternative.

B because it adds a subject ("an action") and a relative pronoun, *that*, to explain what it meant for the Regents to override the ban ("an action that granted full speech rights on the Berkeley campus"). B both maintains the original meaning and is grammatically correct, so it is an acceptable alternative.

C because it adds a conjunctive adverb, *thus*, properly set off by commas, for emphasis.

Question 56. The best answer is H because the sentence should not be added here. If it were added, it would distract readers from the main point of this paragraph, about how the protests led by Savio helped bring about a change in the speech rights policy at the Berkeley campus. It is already clear from the current last sentence in the paragraph that the California Board of Regents makes decisions regarding the Berkeley campus; it isn't necessary, in this context, to know that they are appointed by the governor or that they oversee other universities in California as well.

The best answer is NOT:

F because it says that the sentence should be added here to provide important background information. But the necessary information is already in the paragraph, and the extra information the sentence provides about the appointment and duties of the California Board of Regents is distracting and not important to this essay.

G because it says that the sentence should be added here to explain the makeup of the California Board of Regents. But the sentence does not do so, and even if it did, such an explanation would be irrelevant here.

J because although it notes correctly that the sentence should not be added here, the reason it gives isn't accurate. A sentence that gave even more specific information about the California Board of Regents would be even more distracting to the reader.

Question 57. The best answer is A because the past tense verb *made* is necessary to fit in with the rest of the paragraph and the essay, to relate a series of events that happened in the past.

The best answer is NOT:

B because *made for* is an expression meaning "had or caused an effect on" (for example, "The storms made for a long night"). Here, the expression is awkward and redundant ("It made for a powerful case for").

C because *makes for* has the same problems as B and is in the present tense, which isn't appropriate in this paragraph.

D because *makes* is in the present tense, which isn't appropriate in this paragraph.

Question 58. The best answer is F because the sentence mentions one additional effect of the Free Speech Movement, and therefore *also* is an appropriate word to use.

The best answer is NOT:

G because there is no reason given in this paragraph for why the Free Speech Movement popularized the sit-in, just a mention of the fact that it did so.

H because *however* is a word used to set up a contrast with something previously mentioned, and there is no contrast here, just some additional information.

J because the phrase *it thus* implies that a conclusion is being expressed on the basis of the previous text. But here, the popularization of the sit-in does not follow as a conclusion from the preceding sentence.

Question 59. The best answer is B because this is a case where no punctuation is best. The phrase "as a protest tactic" is necessary to define the sense in which the sit-in was popularized, and so the phrase should not be set off by commas as merely descriptive information would be. Also, the coordinating conjunction *and* is necessary to coordinate the compound predicate (*popularized* and *became*) in this sentence.

The best answer is NOT:

A because it sets off the defining phrase "as a protest tactic" by commas as though it were unnecessary information and because it omits the necessary coordinating conjunction *and*.

C because it has the same problem as A and, by adding the subject *it* to go with the verb *became*, creates a comma splice.

D because it appropriately leaves out commas around the phrase "as a protest tactic" but lacks a conjunction to connect the second part of the sentence to the first part, leaving a confusing and ungrammatical result.

Question 60. The best answer is F because this phrase needs no punctuation. There is no reason to follow the adverb *then* with a comma, to separate the verb *taught* from its direct object by a comma, or to break up the compound direct object, *mathematics and physics*, with a comma.

The best answer is NOT:

G because it contains two inappropriate commas, one after the adverb *then* and one between the verb (*taught*) and its direct object (*mathematics and physics*).

H because it has an inappropriate comma between two elements of the compound direct object.

J because it has an inappropriate comma after the adverb *then*.

Passage V

Question 61. The best answer is D because the possessive form of *baseball* (*baseball's*) is needed so that the phrase means "one of the most gifted athletes of baseball."

The best answer is NOT:

A because the plural *baseballs* rather than the possessive *baseball's* is used.

B because although the correct form of *baseball's* is used, there should not be a comma between a noun and the prepositional phrase that follows it and explains it ("one of baseball's most gifted athletes").

C because the plural *baseballs* instead of the possessive *baseball's* is used and because an inappropriate comma intervenes between the pronoun *one* and the adjoining prepositional phrase.

Question 62. The best answer is **H** because *named* is the only choice that fits exactly into this context. Clemente was "named the National League Batting Champion."

The best answer is NOT:

F because "he was entitled the National League Batting Champion" makes no sense. Clemente could be entitled *to* the championship, but he can't be "entitled the Champion."

G because Clemente could not be "awarded the National League Champion"; it would make sense to say he was awarded a championship, but not that he was awarded a champion.

J because Clemente could not be "given the Champion" (though he could be "given a championship").

Question 63. The best answer is **A** because the phrase "in 1971" is all that is needed to be parallel to the rest of the sentence. The verb in the sentence, *named*, applies to all three titles that Clemente won (National League Batting Champion, Nation League MVP, and World Series MVP).

The best answer is NOT:

B because the sentence already says that Clemente was named World Series MVP, so "was awarded to Clemente" is redundant and out of parallel with the rest of the sentence.

C because the information that the "World Series MVP award in 1971 went to Clemente" is redundant and out of parallel.

D because the information that the "World Series MVP award was given to him in 1971" is redundant and out of parallel.

Question 64. The best answer is **J** because the comma between *impressive* and *his* correctly separates the introductory subordinate clause from the main clause.

The best answer is NOT:

F because the period between *impressive* and *His* incorrectly punctuates the introductory clause beginning with *While* as though it were a complete sentence, resulting in a sentence fragment, "While Clemente's achievements in the sport of baseball are impressive."

G because the subordinator *While* and the coordinating conjunction *but* conflict, producing an uncoordinated sentence.

H because the subordinator *While* and the coordinating conjunction *and* conflict, producing an uncoordinated sentence that is further damaged by the lack of a comma after the introductory subordinate clause.

Question 65. The best answer is B because the word *him* is the appropriate pronoun to refer to Clemente.

The best answer is NOT:

A because the reflexive pronoun *himself* is incorrectly used here. Reflexive pronouns are used when the same person is doing and receiving the action (for example, "he gave himself a haircut"). In this case, the subject (charity work) is what marked Clemente; he did not "mark" himself.

C because *them* is the third-person plural pronoun, which doesn't have a logical antecedent here.

D because *itself* is a reflexive pronoun that should refer to a thing rather than to a person, and therefore does not work grammatically or logically here.

Question 66. The best answer is F because "died in a plane crash" is the most clear and concise way to give this information to the reader.

The best answer is NOT:

G because "perished in a deadly plane crash" is wordier than necessary and is redundant; if someone perishes in a plane crash, the crash is, by definition, "deadly."

H because "fatally perished" is redundant, with *fatally* and *perished* both referring to death.

J because the phrase "died in a lethal plane crash" is redundant.

Question 67. The best answer is C because the relative clause "that was delivering" grammatically refers to *crash*, making the sentence illogically say that the plane crash was delivering the relief supplies. This sentence structure is NOT an acceptable alternative to the underlined portion.

The best answer is NOT:

A because it is an acceptable alternative to the underlined portion: the addition of the words *he was* does not change the meaning nor disrupt the structure of the sentence.

B because *as he was* works equally well as *while* in the sentence structure.

D because using the simple past tense (*delivered*) here produces a grammatically correct and logical alternative to the underlined portion.

Question 68. The best answer is J because only the word *projects* is needed here. All the information in the other answers is repetitious.

The best answer is NOT:

F because "which were designed to last for years" pointlessly repeats the idea already expressed by *long-term*.

G because "that would help others" pointlessly repeats the idea already expressed by *humanitarian*.

H because "of benefit to others" pointlessly repeats the idea already expressed by *humanitarian*.

Question 69. The best answer is B because it appropriately sets off the introductory phrase with a comma and is correctly punctuated to indicate that Clemente's wife was named Vera (by setting the name off with commas).

The best answer is NOT:

A because it fails to set off the name *Vera* (here, a nonrestrictive appositive) from the noun *wife*.

C because it leaves out the comma after the name *Vera*, creating a confusing sentence: "A few years later, his wife, Vera fulfilled this dream" leaves unclear how the name *Vera* and *his wife* are related.

D because, by omitting a comma before *Vera* to indicate apposition, it ungrammatically separates the subject from the verb by a comma.

Question 70. The best answer is H because the logic of this sentence is to point out that one of the long-term projects Clemente's wife had established was "a sports complex for children," the one referred to in Sentence 3, and the sentence structure in H conforms to this logic.

The best answer is NOT:

F because "for children" in the phrase "was for children a sports complex" makes little sense and isn't standard English word order.

G because although the resulting clause almost makes sense ("One of them for children was a sports complex"), it is less clear than "a sports complex for children."

J because making the ending phrase of the sentence "in his homeland for children" indicates it is the homeland rather than the sports complex that is for children, which doesn't make sense.

Question 71. The best answer is C because the logic of the paragraph is that Sentence 4 should follow Sentence 1; Sentence 1 mentions the long-term humanitarian projects Clemente had been planning, and the pronoun *them* in Sentence 4 refers directly to these long-term humanitarian projects ("One of them was a sports complex for children in his homeland"). Then Sentence 2 appropriately follows Sentence 4 by describing this sports complex in more detail.

The best answer is NOT:

A because there is no logical referent for the pronoun *them* in Sentence 4 or in the previous two sentences, and the reader has to return to Sentence 1 to discover what is being referred to. With Sentence 4 where it is now, following Sentence 3, it sounds as though *them* refers to Puerto Rican youths, but this makes no sense in the context of Sentence 4.

B because beginning the paragraph with Sentence 4 would start with "One of them was a sports complex," leaving the reader wondering, "One of what?"

D because placing Sentence 4 after Sentence 2 puts Sentence 4's general statement of what was built after Sentence 2's specific description, exactly the opposite of how the paragraph should logically be organized.

Question 72. The best answer is G because it uses the correct form and placement of the adverb *annually*.

The best answer is NOT:

F because it places the adjective after the noun it would modify rather than in its correct position in front of the noun.

H because it places the adverb form *annually* illogically in front of the noun *basis*; this phrase, if correct, would use the adjective form and read "on an annual basis."

J because it uses the adverb form *annually* where the adjective form *annual* is required.

Question 73. The best answer is D because of the two often confused words *principals* and *principles*, the word that should be used here is *principles*, meaning fundamental rules. The preposition *of* is the one that is used most often with *principles*.

The best answer is NOT:

A because it uses *principals* in place of *principles*. *Principals*, in its plural form, can refer to important people, including principals of schools, or to sums of money that are invested. It cannot be used to mean the fundamental rules. The preposition *of* would be correct if used with the word *principles*.

B because it uses *principals* in place of *principles* and because the preposition *for* isn't idiomatic English.

C because although the correct word *principles* is used here, the phrase *principles in* is less idiomatic than the phrase *principles of*.

Question 74. The best answer is G because it best summarizes the effects of Clemente's generosity discussed in the essay: Clemente inspired ballplayers and improved the lives of young people.

The best answer is NOT:

F because although it is probably true that the effects of Clemente's generosity continue to spread as more people learn about his life, this choice doesn't summarize any key points made in the essay.

H because although we can learn more about Clemente in the Baseball Hall of Fame, this choice fails to summarize any of the points in the essay.

J because it is irrelevant to the points made in the essay.

Question 75. The best answer is **C** because the sentence to be added gives examples of people who have won an award, and Paragraph 5 is about the Roberto Clemente Award.

The best answer is NOT:

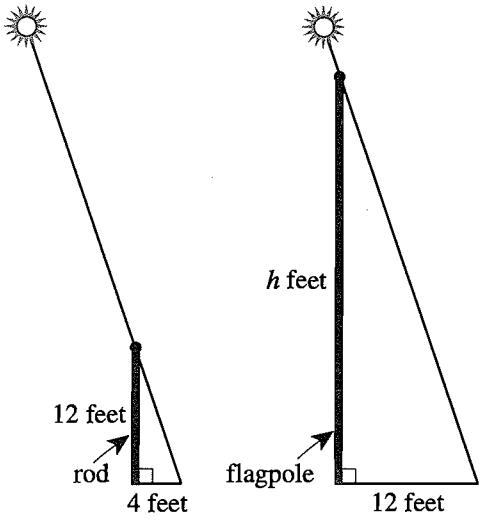
A because if this list of people were added at the end of Paragraph 2, they would be illogically listed for winning an award just after we learn that Clemente died in a plane crash.

B because Paragraph 4 is about the establishment of the Roberto Clemente Foundation and there is no mention of an award of any sort, so this would not be a logical place to add a list of award winners.

D because Paragraph 6 summarizes the legacy of Roberto Clemente, but it isn't a reasonable place to list the names of people who won an award not mentioned in this paragraph.

MATHEMATICS ▪ PRACTICE TEST 4 ▪ EXPLANATORY ANSWERS

Question 1. The correct answer is E. You may want to make a sketch of this situation in your mind, or better yet, in the space in your test booklet. A sample sketch is shown below.



The vertical rod and the vertical flagpole each form a right angle with the level ground, resulting in 2 right triangles. The smaller right triangle (at left) is composed of the rod, the rod's shadow, and the line of sight of the Sun through the top of the rod. The larger right triangle (at right) is composed of the flagpole, the flagpole's shadow, and the line of sight of the Sun through the top of the flagpole. Since the angle of elevation of the Sun is the same for each triangle, the 2 triangles are similar by the *Angle-Angle Similarity* property. Using the ratios of corresponding sides of the similar triangles, the proportion $\frac{12}{h} = \frac{4}{12}$ is solved to find the height of the flagpole, $h = 36$ feet.

Common errors in this problem result from relying on an incorrect mental image or labeling the dimensions on the sketch incorrectly. If you chose A, you might have set up and solved the proportion $\frac{h}{12} = \frac{4}{12}$.

Question 2. The correct answer is H. After subtracting the onetime fee from the amount on Brendan's check ($500 – $140), the remaining $360 goes toward the amount spent on monthly fees. You can find the number of months of membership covered by the check by dividing the remaining $360 by the monthly fee of $40 per month, giving 9 months as the result.

You could also solve this problem by setting up and solving the equation $140 + 40m = 500$, where the expression $140 + 40m$ represents the cost of a gym membership for m months.

Question 3. **The correct answer is A.** Substituting –5 for x produces a numerator equal to $(-5)^2 - 1 = 25 - 1 = 24$ and a denominator equal to $-5 + 1 = -4$. Therefore, $\frac{x^2-1}{x+1} = \frac{24}{-4} = -6$. The most common wrong answer is C, which comes from forgetting the negative sign in the given x-value: $\frac{5^2-1}{5+1} = \frac{24}{6} = 4$.

Question 4. **The correct answer is J.** The group of 27 people paid a total of \$249.75 (27 × \$9.25 per person) in advance. Since the group consisted of more than 25 people, the actual cost was \$229.50 (27 × \$8.50 per person). The refund is the difference between the amount paid and the actual cost, which is \$249.75 – \$229.50 = \$20.25. If you chose **H**, you could have failed to read the problem carefully and figured the refund for a group of 25 people.

Question 5. **The correct answer is C.** The number of possible outcomes (that is, the total number of members eligible to be chosen as representative) is 13 – 3 = 10, and the number of favorable outcomes (choosing Samara only) is 1. The probability of the favorable outcomes is equal to $\frac{\text{the number of favorable outcomes}}{\text{the number of possible outcomes}}$. So, the probability of Samara being chosen as representative would be $\frac{1}{10}$. Careful reading is essential; if you chose **B**, you may have overlooked the words CANNOT and NOT.

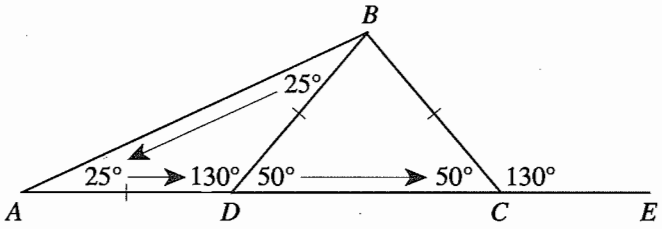
Question 6. **The correct answer is H.** A rectangle has 2 pairs of congruent sides. So, the rectangle has 2 side measures of 15 cm and 2 side measures of 6 cm. The perimeter of the rectangle is equal to the sum of the 4 side measures, which is 15 + 15 + 6 + 6, or 2(15 + 6) = 42 cm. If you confused the formula for perimeter with the formula for area, you probably chose J, which was the most common incorrect answer.

Question 7. **The correct answer is B.** The amount collected from the sale of 142 tickets bought in advance is equal to (\$6 per ticket)(142 tickets) = \$852. The amount collected from the sale of d tickets bought at the door is equal to (\$8 per ticket)(d tickets) = \$8d. The total amount collected from all ticket sales is $852 + 8d$. To determine the minimum number of tickets to produce \$2,000 in ticket sales, you can set up an inequality: $852 + 8d \geq 2{,}000$. Subtracting 852 from both sides and then dividing by 8 produces the equivalent inequality $d \geq 143.5$. Keep in mind, however, that d must be a whole number of tickets, so you must select the whole number d to satisfy the inequality. This means you must round 143.5 *up* to obtain the correct answer. If you chose **A**, you probably rounded *down* to 143. If you chose **D**, you might have divided 2,000 by 8 without thinking carefully about what the numbers represent. If you chose **C** or **E**, you probably set up the inequality incorrectly.

Question 8. The correct answer is J. The proportion $\frac{8}{12} = \frac{10}{r}$ is true provided that the *cross product equation* $8r = 12(10)$ is true. Therefore, $r = \frac{120}{8} = 15$.

Question 9. The correct answer is E. Use of the *Distributive Property* gives the equivalent equation $12x - 132 = -15$. Adding 132 to both sides of the equation results in the equation $12x = 117$, implying that the solution is $x = \frac{117}{12}$, or $\frac{39}{4}$ when reduced to lowest terms. If you distributed 12 to *only* the first term, x, but forgot to distribute 12 to the second term, you probably got an answer of $-\frac{1}{3}$.

Question 10. The correct answer is J. The figure below illustrates the progression of angle measures found in determining the measure of $\angle BCE$.



Because $\overline{BD} \cong \overline{AD}$, $\triangle ABD$ is isosceles, so its base angles are congruent. Therefore, $m\angle BAD = m\angle ABD = 25°$. Because the sum of the angle measures in $\triangle ABD$ must equal 180°, $m\angle ADB = 180° - (25° + 25°) = 130°$. Since $\angle ADB$ and $\angle BDC$ are a linear pair, $m\angle BDC = 180° - 130° = 50°$. Since $\overline{BD} \cong \overline{BC}$, $\triangle DBC$ is isosceles, so *its* base angles are congruent: $m\angle BCD = m\angle BDC = 50°$. Finally, $\angle BCD$ and $\angle BCE$ are a linear pair, so $m\angle BCE = 180° - 50° = 130°$.

Question 11. The correct answer is C. When you substitute -2 for x, you get $9(-2)^2 + 5(-2) - 8 = 9(4) + (-10) - 8 = 18$. If you chose **A**, you probably evaluated $9(-2)^2$ as -36. If you chose E, you probably evaluated $5(-2)$ as 10.

Question 12. **The correct answer is J.** One efficient way to solve this problem numericall is by listing the multiples of the largest of the 3 numbers (70) as a sequence and determinin whether or not each succeeding term in the sequence is a multiple of *both* 20 and 30.

70 (multiple of neither)
140 (multiple of 20 only)
210 (multiple of 30 only)
280 (multiple of 20 only)
350 (multiple of neither)
420 (multiple of both 20 and 30)

The first term in the sequence that is a multiple of both 20 and 30 is 420, which is the least common multiple of 20, 30, and 70. You can also find the least common multiple by expressing each of the 3 numbers as a product of primes (with exponents), listing all bases of exponential expressions shown, and choosing for each base listed the highest-valued exponent shown.

$30 = 2^1 \times 3^1 \times 5^1$
$20 = 2^2 \times \quad 5^1$
$70 = 2^1 \times \quad 5^1 \times 7^1$

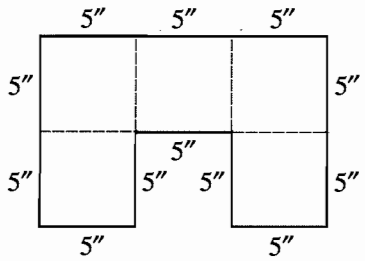
The least common multiple is $2^2 \times 3^1 \times 5^1 \times 7^1 = 420$.

Question 13. **The correct answer is E.** You may want to choose an even integer as Tom's initial number, follow his steps in obtaining the *incorrect* answer, and then determine *what* operation using *what* number is needed to obtain the desired number. For example:

1) Choose the integer "6" as the initial number.
2) When Tom "accidentally multiplies the number by 2," he obtains an incorrect answer of 12.
3) Had Tom correctly divided the initial number by 2, he would have obtained 3 as the answer.
4) To convert his incorrect answer of 12 to the desired answer of 3, he must divide by 4.

You may want to confirm that E is the correct answer by choosing a different initial number and repeating the steps above.

Question 14. The correct answer is G. The 8-sided figure in the problem consists of 5 congruent squares whose areas total 125 square inches. Therefore, each congruent square has an area of $125 \div 5 = 25$ square inches, so each side of each square is $\sqrt{25} = 5$ inches long. The perimeter of the 8-sided figure is composed of 12 of these sides, each of length 5 inches, as shown in the figure below. Therefore, the 8-sided figure has a perimeter of $12 \times 5 = 60$ inches.



Question 15. The correct answer is E. You can solve this problem using the *Triangle Sum Theorem*. For any triangle, the sum of the measures of the 3 interior angles is 180°. So, for $\triangle ABC$, $m\angle A + m\angle B + m\angle C = 180°$. You are given that $m\angle B = 90°$. So $m\angle A + m\angle C = 90°$. Since $m\angle A > 43°$, that means that $m\angle C < 90° - 43° = 47°$.

You can also solve this problem using the following steps.

1) Choose a measure for $\angle A$ that is greater than 43°, say 44°.
2) This implies that $m\angle B = 180° - 90° - 44° = 46°$.
3) This answer fits E.
4) Choose a different measure for $\angle A$ (greater than 43°) to verify that E is the correct answer.

Question 16. The correct answer is G. For each operation given, you can determine whether the equation is true or false by substituting the operation symbol for ◊.

I. Addition: $(2 + 1)^4 + (6 + 3)^2 = 3^4 + 9^2 = 81 + 81 = 162 \neq 10$ (false)
II. Subtraction: $(2 - 1)^4 + (6 - 3)^2 = 1^4 + 3^2 = 1 + 9 = 10$ (true)
III. Division: $(2 \div 1)^4 + (6 \div 3)^2 = 2^4 + 2^2 = 16 + 4 = 20 \neq 10$ (false)

The equation is true only when the subtraction sign is substituted for ◊.

Question 17. The correct answer is E. Each answer choice is a linear equation in *slope-intercept form*; that is, $y = mx + b$, where the value of m gives the slope of the line and the value of b gives the y-intercept of the line. Only the equation shown in E represents a line having a y-intercept ($b = 5$) that matches the value of the y-intercept indicated by the given graph.

Question 18. The correct answer is F. Translating sentences expressed in the English language into sentences expressed in the mathematical language of numbers and symbols is no unlike translating from, say, the English language to the Spanish language. English words, given in a certain context, can be represented by mathematical symbols as shown below.

1) "An integer, n, is *added* to 4" translates into "$4 + n$."
2) "That *sum* is then *multiplied* by 8" translates into "$(4 + n) \times 8$" or, equivalently, "$8(n + 4)$."
3) "*twice* the original integer" translates into "$2n$."
4) "10 *less than* twice the original integer" translates into "$2n - 10$." Note: The word *than* reverses the order in appearance of the terms "10" and "$2n$" when translated into the mathematical language. If you did not recognize this, you probably chose **H**, which was the most common incorrect answer.
5) "This result *is* ("equals") 10 less than twice the original integer" translates into "$8(n + 4) = 2n - 10$."

Question 19. The correct answer is A. For x years of full years' employment after being hired, Worker A's starting salary ($20,000) increases by $800 per year and Worker B's starting salary ($15,200) increases by $2,000 per year. After x years, Worker A's salary has increased by 800x$ and Worker B's salary has increased by $2,000$x$. So, for x years of full years' employment after being hired, Worker A's yearly salary is represented by the expression $20,000 + 800x$ and Worker's B's salary is represented by the expression $15,200 + 2,000x$. These 2 yearly salaries are equal at the value of x for which the equation $20,000 + 800x = 15,200 + 2,000x$ is true.

Question 20. The correct answer is J. The figure shows a right triangle with 2 given side measures. To find the length of the third side, use the Pythagorean theorem, given below.

$$(\text{length of the hypotenuse})^2 = (\text{length of one side of the triangle})^2 + (\text{length of the other side of the triangle})^2$$

In this problem, the 13-foot measure represents the length of the hypotenuse. So the formula above gives the equation $13^2 = 12^2 + x^2$, where x feet is the length of the missing side. To find x^2, subtract 12^2 from each side of the equation. The subtraction results in the equivalent equation $25 = x^2$, resulting in the solution $x = \pm 5$. Since the side length of a triangle must be positive, you can ignore the negative solution. If you chose **F**, you probably took the length of the hypotenuse and subtracted the length of the given leg, without applying the Pythagorean theorem at all. If you chose **G**, you probably *doubled* the lengths, rather than *squaring* them.

Question 21. The correct answer is E. To simplify this expression, use the *Distributive Property*: $7(x + 3) - 3(2x - 2) = 7x + (7)(3) + (-3)(2x) + (-3)(-2) = 7x + 21 + (-6x) + 6$. Then combine like terms to obtain $x + 27$. If you chose **B**, perhaps you forgot that $a - b = a + (-b)$, and so distributed 3 rather than -3 to the -2 term in $(2x - 2)$. If you chose **A**, perhaps you forgot to distribute the 7 and the -3 to the second term in each set of grouping symbols, setting $7(x + 3)$ equal to $7x + 3$ and $-3(2x - 2)$ equal to $-6x - 2$.

Question 22. The correct answer is G. Two common methods are often used in solving this system of equations.

Using the Substitution Method, you can convert the second equation into the equivalent equation $x = y + 12$, and then substitute $y + 12$ for x in the first equation to obtain $(y + 12) + y = 32$. From this it follows that $2y + 12 = 32$, so $2y = 20$, and $y = 10$.

Using the Addition Method, you can vertically align the 2 equations and add down, eliminating y.

$$\begin{array}{rr} x + y = & 32 \\ x - y = & 12 \\ \hline 2x \quad = & 44 \end{array}$$

So $x = 22$, which implies that $22 + y = 32$, so $y = 10$.

Question 23. The correct answer is C. This problem tests your knowledge of how to square a binomial. The expression $(2x - 3)^2$ can be expanded into the $ax^2 + bx + c$ form using the *Distributive Property* as shown below.

$$(2x - 3)^2 = (2x - 3)(2x - 3) = (2x)(2x) + (2x)(-3) + (-3)(2x) + (-3)(-3) = 4x^2 - 6x - 6x + 9 = 4x^2 - 12x + 9$$

When the coefficients of $4x^2 - 12x + 9$ are matched with the coefficients of $ax^2 + bx + c$, you can see that $a = 4$, $b = -12$, and $c = 9$, and $a + b + c = 4 + (-12) + 9 = 1$.

When you square a binomial, you must multiply 2 binomial expressions using the distributive property. Common errors result from reasoning that $(2x - 3)^2$ is equivalent to $(2x)^2 + (-3)^2$ or $(2x)^2 - (3)^2$, resulting in **B** or **D**.

Question 24. **The correct answer is H.** Two common approaches are often used in solving this problem.

In the first approach, the polygon can be divided into a 15 ft by 15 ft square and a 10 ft by 5 ft rectangle (see Figure 1 below). The area of the polygon is equal to the sum of the areas of the rectangle and the square, (15)(15) + (10)(5) = 275 square feet.

In the second approach, you take the rectangle formed by the 15 ft and 25 ft sides of the polygon and "cut away" a 10 ft by 10 ft square (see Figure 2 below). In this case, the area of the polygon is equal to the difference of the areas of the rectangle and the square (15)(25) – (10)(10) = 275 square feet.

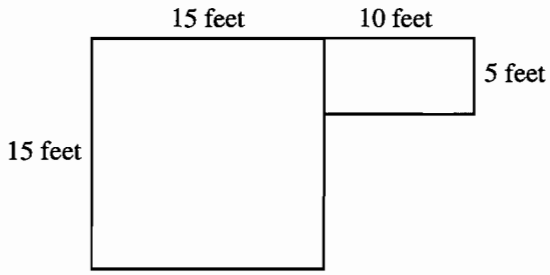


Figure 1

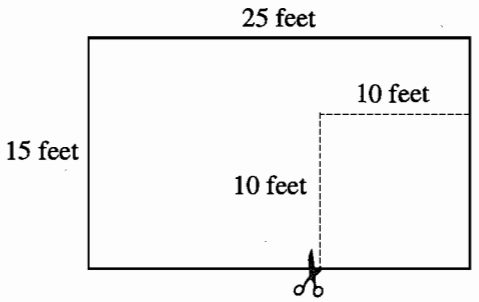


Figure 2

Question 25. The correct answer is A. You can solve this problem using a numerical approach. First, you must determine which of the 2 functions expresses a linear relationship, or equivalently, which of the 2 functions has a rate of change (slope) that is constant.

Between the x-values of -2 and -1, the rate of change for $f(x)$ is $\frac{1.2 - 1.4}{-1 - (-2)} = -0.2$, and the rate of change for $g(x)$ is $\frac{0.9 - 0.6}{-1 - (-2)} = 0.3$ (see the table below). Next, the possible values for $f(0)$ and $g(0)$ can be found by adding the respective rates of change to $f(-1)$ and $g(-1)$, respectively. The resulting values, $1.2 + (-0.2) = 1.0$ and $0.9 + 0.3 = 1.2$, are shown in boldface in the table.

By examining the rates of change of the 2 functions between the x-values of 0 and 1 (using the possible values for $f(0)$ and $g(0)$), you will find that the rate of change remains constant for $f(x)$, but the rate of change is not constant for $g(x)$. Therefore, $f(x)$ must be the function that expresses a linear relationship. When you add the rate of change for $f(x)$ to $f(2)$, and then to $f(3)$, you obtain the value of $f(\mathbf{4})$.

x	$f(x)$	$g(x)$
-2	1.4 } rate of change = -0.2	0.6 } rate of change = 0.3
-1	1.2	0.9
0	1.0 } rate of change = -0.2	1.2 } rate of change = 0.1
1	0.8	1.3
2	0.6 } rate of change = -0.2	1.6
3	**0.4**	
4	0.2	

Question 26. The correct answer is H. To find the slope, you can manipulate the equation $6y - 14x = 5$ algebraically in order to find its equivalent equation expressed in *slope-intercept form*, which is $y = mx + b$, where m is the slope and b is the y-intercept. The manipulations are shown below.

$$6y - 14x = 5 \Rightarrow 6y = 14x + 5 \Rightarrow y = \frac{14}{6}x + \frac{5}{6}$$

The slope of the line equals $\frac{14}{6}$, or $\frac{7}{3}$ when reduced to lowest terms.

Question 27. The correct answer is C. Three common techniques come to mind to solve this quadratic equation: factoring, completing the square, or the quadratic formula. If the expression opposite zero (in this case, $x^2 + x - 12$) looks simple, you should try factoring, as this method is generally quicker and less prone to calculation errors. (**Note:** Not all quadratic expressions will factor, so a minimal amount of time should be spent on factoring. If factoring is unsuccessful, you should move on to one of the other two techniques.) In this problem, factoring works easily. Since $x^2 + x - 12 = (x + 4)(x - 3)$, the quadratic is equal to 0 when $x + 4 = 0$ or $x - 3 = 0$, so $x = -4$ or $x = 3$. Therefore, the sum of the 2 solutions of the equation is $-4 + 3 = -1$.

Question 28. The correct answer is J. Similar triangles are triangles whose corresponding sides are proportional. The solution, x, is found by setting up the following proportion:

$$\frac{\text{the perimeter of the smaller triangle}}{\text{the perimeter of the larger triangle}} = \frac{3}{5} = \frac{(3 + 5 + 7)\text{ cm}}{x\text{ cm}}$$

To solve $\frac{3}{5} = \frac{15}{x}$ for x, cross multiply to obtain the equivalent equation $3x = 75$, and divide by 3 to obtain $x = 25$.

Question 29. The correct answer is A. To find the median, first rank the given data values from least to greatest (see the table below). When the number of data values is odd, the median is the middle-ranking value. Since there are 7 values given, the middle-ranking value is –2, shown in the shaded region of the table. If you forgot to rank the data, you probably chose C.

Rank	1st	2nd	3rd	4th	5th	6th	7th
Temperature (°F)	–6	–5	–3	–2	1	2	4
	←3 values→				←3 values→		

When the number of data values is even, the median is the average of the 2 middle-ranking data values. For example, the median of a list of 18 data values is the average of the 9th-ranking and 10th-ranking data values. In either case, even or odd, the number of data values less than or equal to the median equals the number of data values greater than or equal to the median.

Question 30. The correct answer is G. As in Question 18, you can use translation skills to set up an algebraic equation that, when solved, yields the solution to the problem.

1) Let the variable a represent the teacher's age.
2) "If you *square* my age" translates into "a^2."
3) "23 *times* my age" translates into "$23a$."
4) "then *subtract* 23 times my age" translates into "$a^2 - 23a$." Because the words *than* and *from* do not appear in the sentence, the order of the terms "a^2" and "$23a$" is NOT reversed when translated into mathematical language.
5) "the result is 50" translates into "$= 50$."

Therefore, the translation gives the equation $a^2 - 23a = 50$, which you may solve by subtracting 50 from both sides and factoring.

The equation $a^2 - 23a - 50 = 0$ is true, provided that $(a + 2)(a - 25) = 0$, which happens if $a = -2$ (but age cannot be negative) or $a = 25$.

Question 31. The correct answer is B. "If a car accelerates from a stop at the *rate* of 20 meters per second per second" implies that $a = 20$, and "travels a *distance* of 80 meters" implies that $d = 80$. Substituting these values into the equation $d = \frac{1}{2}at^2$ gives the equation $80 = \frac{1}{2}(20)t^2$, or equivalently, $80 = 10t^2$, or $8 = t^2$. Therefore $t = \sqrt{8} \approx 2.8$ seconds.

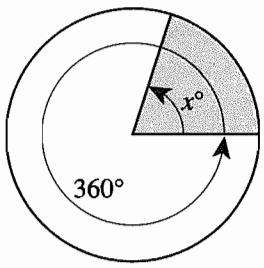
Question 32. The correct answer is F. Let r equal the common ratio for the geometric sequence. This means that each term is produced from the preceding one by multiplying by r. To determine r for this sequence, you may use the fact that the 1st term times r equals the 2nd term: $(bcd)r = abc^2d$. Therefore $r = \frac{abc^2d}{bcd} = ac$. The 4th term of the sequence is equal to the 3rd term times r: $(a^2bc^3d)r = (a^2bc^3d)ac = a^3bc^4d$.

Question 33. The correct answer is D. You must first determine from the frequency bar graph the number of students in the class responding that they spent 0, 1, or 2 hours studying on the previous evening. The bars in the graph indicate that 2 students studied 0 hours, 5 students studied 1 hour, and 6 students studied 2 hours. Therefore, the fraction of students in the class that responded they had spent less than 3 hours studying is equal to

$$\frac{\text{the number of students studying less than 3 hours}}{\text{the number of students in the class}} = \frac{2+5+6}{20} = \frac{13}{20}$$

If you chose B (the most common incorrect answer), perhaps you overlooked the phrase "less than" and selected the number of students studying exactly 3 hours as the numerator, obtaining the fraction $\frac{4}{20}$, or $\frac{1}{5}$.

Question 34. **The correct answer is J.** In the figure below, the shaded sector represents the 3-hour group.



For this circle graph, the ratio $\frac{\text{the area of the shaded sector}}{\text{the area of the circle}}$ is equivalent to the ratio $\frac{\text{the number of students in the 3-hour group}}{\text{the number of students in the class}}$. These ratios, in turn, are equivalent to the ratio $\frac{\text{the measure of the central angle of the sector representing the 3-hour group}}{\text{the measure of the angle covered by 1 complete circle}}$. Letting the numerator of this last ratio equal $x°$, and using the fact that the denominator of this ratio is 360°, you obtain the proportions $\frac{4}{20} = \frac{\text{the number of students studying 3 hours}}{\text{the number of students in the class}} = \frac{x°}{360°}$, so $x = 72$.

Question 35. **The correct answer is B.** Since this frequency bar graph gives the number of times each response was given, the frequency bar graph was constructed from the 20 data values below.

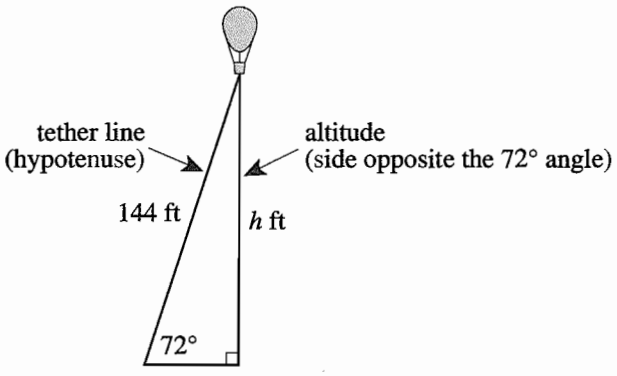
0, 0, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 4, 4, 5

The average number of hours for the 20 responses is equal to the average of the data values, which is defined to be $\frac{\text{the sum of the data values}}{\text{the number of data values}}$.

This is equal to $\frac{0+0+1+1+1+1+1+2+2+2+2+2+2+3+3+3+3+4+4+5}{20}$, or equivalently, $\frac{2(0)+5(1)+6(2)+4(3)+2(4)+1(5)}{20} = \frac{42}{20} = 2.1$.

Question 36. **The correct answer is F.** Because $(x^2 + 8x + 7) = (x + 7)(x + 1)$, you can factor the numerator further, into the product $(x + 1)(x + 7)(x - 3)$. Similarly, since $(x^2 + 4x - 21) = (x + 7)(x - 3)$, you can factor the denominator further, into the product $(x + 7)(x - 3)(x + 1)$. Then, as long as the denominator is not zero (that is, as long as x is not equal to -7, 3, or -1, which is guaranteed by the requirement that $x > 21$), you can write the given rational function as $\frac{(x+1)(x+7)(x-3)}{(x+7)(x-3)(x+1)}$. Using the *Commutative Property for Multiplication*, the factors in the numerator can be reordered, producing the equivalent expression $\frac{(x+7)(x-3)(x+1)}{(x+7)(x-3)(x+1)}$. Since the numerator and denominator are equal, this rational expression is equal to 1.

Question 37. **The correct answer is E.** As shown in the figure below, the tether line, the level ground, and a line segment representing the altitude of the bottom of the basket form a right triangle.



Let the length of the altitude equal h feet. You can use a trigonometric ratio to find h. The tether line forms the hypotenuse of the right triangle, and the line segment representing the altitude is the side opposite the 72° angle. Therefore the trigonometric ratio to be used with respect to the 72° angle is the sine ratio, which gives the equation below.

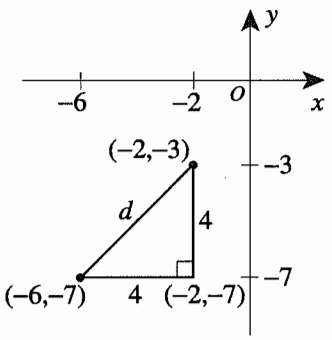
$$\sin 72° = \frac{\text{the length of the side opposite the 72° angle}}{\text{the length of the hypotenuse}} = \frac{h}{144}$$

Multiplying both sides of the equation $\frac{h}{144} = \sin 72°$ by 144 yields the value of h, which is $144 \sin 72°$.

Question 38. The correct answer is G. The midpoint of a line segment is the point halfway between the 2 endpoints of the line segment. A formula for finding the midpoint (x_m,y_m) of 2 points (x_1,y_1) and (x_2,y_2) in the standard (x,y) coordinate plane is $(x_m,y_m) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$. The x-coordinate of the midpoint, x_m, is the *average* of the x-coordinates of the endpoints of the line segment. In the case of $\overline{GH}$, $x_m = \frac{x_1+x_2}{2} = \frac{-8+2}{2} = -3$.

Question 39. The correct answer is B. You can find the distance, d, in coordinate units, between the 2 towns by using the *distance formula*. The distance between (–2,–3) and (–6,–7) is $d = \sqrt{(-2-(-6))^2+(-3-(-7))^2} = \sqrt{4^2+4^2} = \sqrt{32}$ coordinate units.

You can also find d geometrically by envisioning the right triangle shown below in the standard (x,y) coordinate plane. Since (–6,–7) and (–2,–7) lie on the same horizontal line, the distance between them is equal to the positive difference of the x-coordinates: (–2) – (–6) = 4 coordinate units. Similarly, since (–2,–3) and (–2,–7) lie on the same vertical line, the distance between them is equal to the positive difference of the y-coordinates: (–3) – (–7) = 4 coordinate units. The length of the hypotenuse, d, can be found by using the Pythagorean theorem. Since $d^2 = 4^2 + 4^2$, $d = \sqrt{4^2+4^2} = \sqrt{32}$ coordinate units.



Since each unit on the map represents an actual distance of 10 miles, one can find the actual distance between the 2 towns by evaluating the expression ($\sqrt{32}$ coordinate units) × (10 miles per coordinate unit) ≈ 57 miles.

Question 40. The correct answer is K. In this problem, you are asked to choose the statement that is *always* true. You can approach this problem by attempting to find a *counterexample* for each statement: a specific example (such as a choice of values) for which the statement is false. You can find counterexamples for 4 of the 5 answer choices. Since the answer choices are statements about rational and irrational numbers, you will want to use irrational and rational numbers as counterexamples.

For F, the irrational numbers $\sqrt{2}$ and $\sqrt{8}$ are counterexamples because $(\sqrt{2})(\sqrt{8}) = \sqrt{16} = 4$, a *rational* number.

For G, the irrational numbers $\sqrt{14}$ and $\sqrt{2}$ are counterexamples because $\frac{\sqrt{14}}{\sqrt{2}} = \sqrt{7}$, an *irrational* number.

For H, the rational numbers 3 and 4 are counterexamples because $(3)(4) = 12$, a *rational* number.

For J, the irrational numbers 15 and 5 are counterexamples because $\frac{15}{5} = 3$, a *rational* number.

This leaves K as the one statement remaining. To be sure that it *must* be true, you may want to prove it.

The statement in K says that the sum of 2 rational number must a rational number. A rational number is any number that can be expressed as a fraction whose numerator and denominator are both integers. Testing simple examples may help you satisfy yourself that this is true: adding the rational numbers $\frac{1}{2}$ and $\frac{2}{3}$ produces $\frac{1(3)+7(2)}{(2)(3)}$, or $\frac{7}{6}$, which is rational. In general, whenever a, b, c, and d are integers and b and d are nonzero, $\frac{a}{b} + \frac{c}{d} = \frac{ad+bc}{bd}$, which is rational since $ad + bc$ and bd are integers.

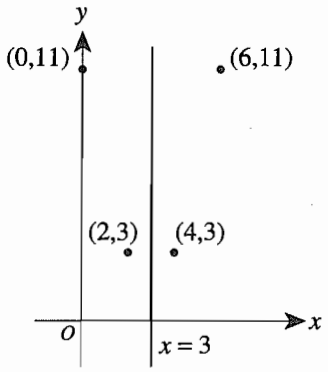
Question 41. The correct answer is B. By definition, $i^2 = -1$, so $i^4 = (i^2)^2 = (-1)^2 = 1$. Therefore, $i^x = 1$ for $x = 4$, so 1 is a possible value of i^x when x is an integer. More generally, when x is an integer, the only values of i^x possible are i, -1, $-i$, and 1, as shown in the table below.

...	i^{-3}	i^{-2}	i^{-1}	i^0	i^1	i^2	i^3	i^4	i^5	i^6	i^7	i^8	i^9	i^{10}	i^{11}	i^{12}	...
...	i	-1	$-i$	1	i	-1	$-i$	1	i	-1	$-i$	1	i	-1	$-i$	1	...

This rules out A, C, D, and E.

Question 42. The correct answer is H. The graph in the standard (x,y) coordinate plane that represents an equation of the form $y = a(x - h)^2 + k$ is a parabola. The minimum point of the parabola is at (h,k) when a is positive, and the maximum point is at (h,k) when a is negative. Here, $a = 1$, so a is positive. The graph representing $y = (x - 3)^2 + 2$ is a parabola with minimum point at $(3,2)$. So the minimum value of y is at $x = 3$.

You can also determine the correct answer by using the table shown in the problem. All parabolas represented by equations of the form $y = a(x - h)^2 + k$ have a vertical line of symmetry that contains the minimum (or maximum) point. Close examination of 2 pairs of points—(0,11) and (6,11), and (2,3) and (4,3)—in the table (and on the parabola) show that each pair is symmetric with respect to the line $x = 3$, as shown in the figure below.



Question 43. The correct answer is C. The volume in cubic meters, V, of a right circular cylinder of radius r meters and height h meters is given by the formula $V = \pi r^2 h$. For the cylinder in this problem, $r = 5$ and $h = 6$. Therefore, $V = \pi(5^2)(6) = 150\pi$ cubic meters.

Question 44. The correct answer is F. The 3 triangles in the given figure ($\triangle ABC$, $\triangle ADE$, and $\triangle AFG$) can be shown to be similar by use of the *AA Similarity* property.

Since $\triangle ABC \sim \triangle AFG$, the phrase "The ratio of the perimeter of $\triangle ABC$ to the perimeter of $\triangle AFG$ is 1:3" implies that the ratio of AC to AG is 1:3. So if $AC = 1$ unit, then $AG = 3$ units (see Figure 1 below).

Since $\triangle ADE \sim \triangle AFG$, the phrase "The ratio of DE to FG is 2:3" implies that the ratio of AE to AG is 2:3. So if $AG = 3$ units, then $AE = 2$ units (see Figure 2 below).

This means that $AE = 2$ units when $AC = 1$ unit, implying that $CE = 1$ unit (see Figure 3 below). Therefore, the ratio of AC to CE is 1:1.

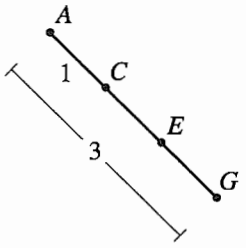


Figure 1

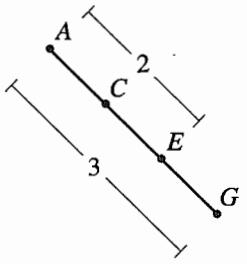


Figure 2

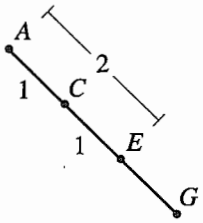


Figure 3

Question 45. **The correct answer is E.** Figure 1 below shows the 1st phase, when the rocket traveled vertically 30 kilometers.

Figure 2 below shows the 2nd phase, when the rocket traveled 40 km at 30° from the vertical. The 3 distances shown in Figure 2 are in the ratio $1:\sqrt{3}:2$, a characteristic of 30°-60°-90° triangles. The vertical distance covered in the 2nd phase is $20\sqrt{3}$ km.

Figure 3 below shows the 3rd phase, when the rocket traveled 100 km at 45° from the vertical. The 3 distances shown in Figure 3 are in the ratio $1:1:\sqrt{2}$, a characteristic of 45°-45°-90° triangles. The vertical distance covered in the 3rd phase is $50\sqrt{2}$ km.

Taking the sum of the vertical distances covered by each of the 3 phases gives the vertical distance of the rocket above the launch pad after the 3rd phase.

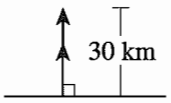


Figure 1

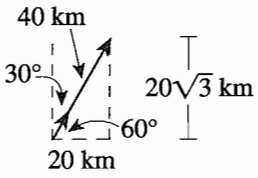


Figure 2

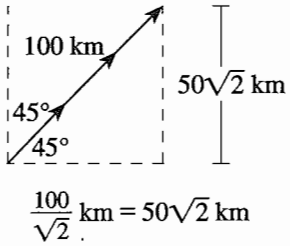
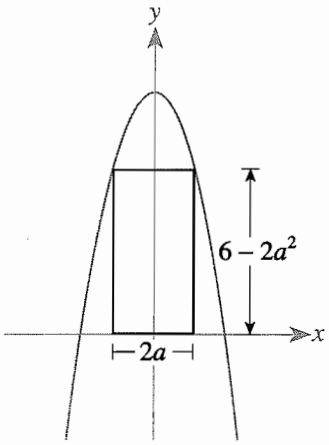


Figure 3

Question 46. **The correct answer is H.** The general equation of a circle with radius r and center at (h,k) in the standard (x,y) coordinate plane is $(x-h)^2+(y-k)^2=r^2$. The area A of this circle is given by the formula $A=\pi r^2$. The equation $(x-0)^2+(y-0)^2=4^2$ is equivalent to $x^2+y^2=16$, meaning that the circle has a radius equal to 4 coordinate units. Therefore, $A=\pi(4^2)=16\pi$ square coordinate units.

Question 47. The correct answer is A. Because the parabola is symmetric about the y-axis, the variable a represents the distance of each of the 4 vertices of the rectangle from the y-axis. As a result, the rectangle will have a width of $a + a = (2a)$ coordinate units and a height of $(6 - 2a^2)$ coordinate units (see the figure below). The area of the rectangle is the product of the width and height: $(2a)(6 - 2a^2) = 12a - 4a^3 = (-4a^3 + 12a)$ coordinate units.



The most common incorrect answer to this problem was C, which results from using the formula for the perimeter of a rectangle.

Question 48. The correct answer is F. You can solve this problem by finding counterexamples for 4 of the expressions, and then proving that the remaining expression must always be odd.

To find counterexamples, pick a positive integer value for n, like $n = 4$. When $n = 4$, G and H are *even* integers and J is not an integer. If you pick $n = 5$, K is an *even* integer.

For F, you can use the fact that the product of 2 odd integers is an odd integer. So, the product of any number of odd integers is an odd integer.

Since 3 is odd and $3^n = \underbrace{3 \times 3 \times 3 \times \ldots \times 3}_{n \text{ times}}$, 3^n is the product of n odd integers. Therefore, the value of 3^n is an odd integer.

Question 49. The correct answer is D. The value of $\log_5(5^{\frac{13}{2}})$ is found by solving the equation $\log_5(5^{\frac{13}{2}}) = x$. By definition of logarithm to the base 5, this equation is equivalent to the equation $5^x = 5^{\frac{13}{2}}$. The equation $5^x = 5^{\frac{13}{2}}$ is equivalent to the equation $x = \frac{13}{2}$, whose value is between 6 and 7.

Question 50. The correct answer is J. When comparing 2 values, an earlier value and a later value, finding the *percent increase* is equivalent to finding the percent of the earlier value that should be added to the earlier value to obtain the later value. In other words, you can first find the difference between the 2 values, and then answer the question, What percent is this difference of the earlier value? This procedure is summarized by the formula below.

$$\text{percent increase} = \frac{\text{later value} - \text{earlier value}}{\text{earlier value}} \times 100\%$$

Applying the formula to the problem gives percent increase $= \frac{156-144}{144} \times 100\% \approx 8.3\%$.
The most common incorrect answer was F, a choice that results from misinterpreting the percent increase as being the ratio of the later value to the earlier value $\left(\frac{156}{144} \approx 1.1\right)$.

Question 51. The correct answer is D. Let s = the meat sales, in thousands of dollars, for Week 6. You can find the correct answer by setting up and solving the algebraic sentence below. Note that because the problem asks for a *minimum*, this sentence is an inequality.

(Average weekly meat sales, in thousands, for Weeks 3 through 6) ≥ 150

So $\frac{\text{the sum of meat sales, in thousands, for Weeks 3, 4, 5, and 6}}{\text{the number of weeks}} \geq 150$

and $\frac{156+145+140+s}{4} \geq 150$.

Multiplying both sides of the inequality by 4 gives $156 + 145 + 140 + s \geq 4(150)$, or equivalently, $441 + s \geq 600$. Subtracting 441 from both sides gives $s \geq 159$. The minimum possible value of s is 159.

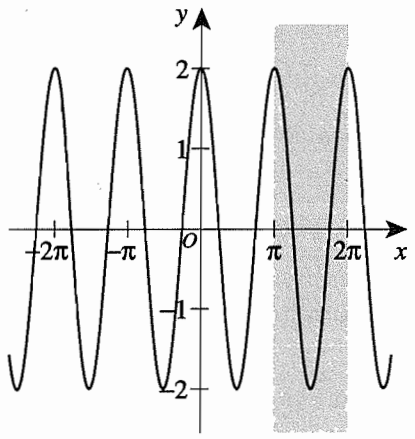
To quickly verify the solution, you can calculate the average meat sales for the 4 weeks when the meat sales for Week 6 are \$159 thousand: $\frac{156+145+140+159}{4} = 150$.

Question 52. The correct answer is G. Increasing a value by 10% is the same as multiplying that value by (1 + 0.10) = 1.10. You can use this fact to calculate weekly produce department sales for Weeks 2 through 5, based upon a 10% increase from the previous week.

Week	Produce department sales (thousands of dollars)
2	30(1.10) = 33
3	33(1.10) = 36.3
4	36.3(1.10) = 39.93
5	39.93(1.10) = 43.923

The closest choice to produce department sales for Week 5 is 44. If you obtained the most common incorrect answer, **H**, you may have assumed that the weekly *dollar increase* (as opposed to the *percent increase*) was constant from week to week. Under this assumption, the increase from Week 1 to Week 2 would be 3 thousand dollars, and sales for the following weeks would increase as follows: 33 + 3 = 36 for Week 2 to Week 3, 36 + 3 = 39 for Week 3 to Week 4, and 39 + 3 = 42 for Week 4 to Week 5.

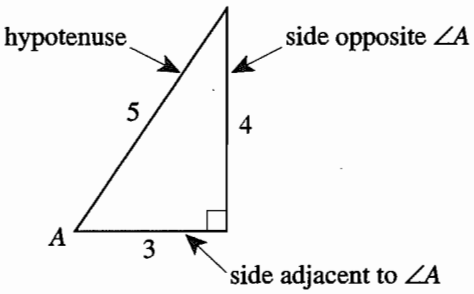
Question 53. The correct answer is B. The graph of any trigonometric function of the form $y = a \sin(bx + c)$ is cyclical. That is, the graph is composed of repeating, identical *cycles*. The shaded region in the graph below shows one such cycle. The *period* of the function is the width of the smallest interval of x on which one of these cycles appears. In the graph below, the period is the width of the shaded region, given by $2\pi - \pi = \pi$.



The period of $y = \sin x$ is 2π, which is **C**, the most common incorrect answer. If you chose **E**, you may have confused *period* with *amplitude*.

Question 54. The correct answer is K. In this problem, the sine of the angle of elevation is given, suggesting that you should use the hypotenuse (the distance from the tip of the shadow to the top of the building) to find the length of the side opposite the angle of elevation (the height). What makes this problem more complex than the typical right-triangle trigonometry problem, however, is that the length of the side adjacent to the angle of elevation (and not the hypotenuse) is given. Therefore, the tangent ratio (the ratio using the opposite and adjacent sides) for the angle of elevation must be found.

Designate the angle of elevation as $\angle A$. Using the 3-4-5 right triangle shown below, you can see that $\sin(\angle A) = \frac{4}{5} = \frac{\text{the length of the side opposite } \angle A}{\text{the length of the hypotenuse}}$, so that $\tan(\angle A) = \frac{\text{the length of the side opposite } \angle A}{\text{the length of the side adjacent to } \angle A} = \frac{4}{3}$.



Therefore, $\tan(\angle A) = \frac{\text{the height of the building}}{\text{the length of the shadow}}$, so $\frac{4}{3} = \frac{\text{the height of the building}}{24}$, so that the height of the building is $\frac{4}{3}(24)$, or 32 yards.

Question 55. The correct answer is C. You should notice that $|x^2 - 12| - 4 = 0$ can be written as $|x^2 - 12| = 4$; so $x^2 - 12 = \pm 4$. Thus, either $x^2 = 12 - 4 = 8$, or $x^2 = 12 + 4 = 16$. Now $x^2 = 16$ when $x = \pm 4$, but both of these solutions are *rational*. When $x^2 = 8$, then $x = \pm\sqrt{8} = \pm 2\sqrt{2}$, and both of these solutions are *irrational*; of these, only $2\sqrt{2}$ is given as a choice.

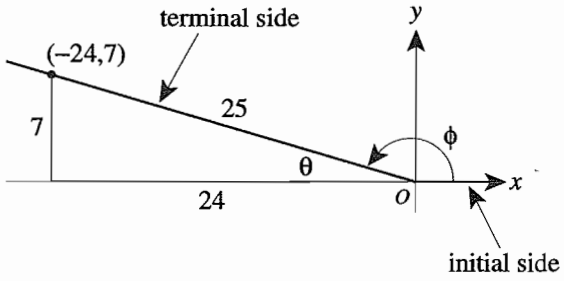
Question 56. The correct answer is K. The graph indicates there are changes of action at 4 seconds and 9 seconds. The endpoints on the graph and the points at which each change of action occurs can be used to calculate Malika's rates of movement in the time intervals 0 to 4 seconds, 4 to 9 seconds, and 9 to 10 seconds. The calculations are shown in the table below.

Time (seconds)	Distance from detector (feet)		
0	10	average rate $= \frac{(10-2) \text{ feet}}{(0-4) \text{ seconds}} = -2$ feet per second $\Rightarrow$	The distance between Malika and the detector is decreasing at a rate of 2 feet per second (Action V).
4	2		
4	2	average rate $= \frac{(2-2) \text{ feet}}{(4-9) \text{ seconds}} = 0$ feet per second $\Rightarrow$	The distance between Malika and the detector remains constant (Action I).
9	2		
9	2	average rate $= \frac{(2-6) \text{ feet}}{(9-10) \text{ seconds}} = 4$ feet per second $\Rightarrow$	The distance between Malika and the detector is increasing at a rate of 4 feet per second (Action II).
10	6		

Therefore the order of actions is V, I, II. In calculating the rates, be careful with the order of placement of the coordinates in the fractions, as this will affect the sign (positive or negative) of the rate. One such sign error results in H (the most common incorrect answer choice).

Question 57. The correct answer is D. The distance traveled by the tip of the minute hand in 1 hour is equal to the circumference of the circle formed by the path of the tip, which is $2\pi \times \text{radius} = 2\pi \times (5 \text{ cm}) = 10\pi$ cm for this clock. The distance traveled by the tip in 20 minutes (or $\frac{20}{60} = \frac{1}{3}$ hour) is $\frac{1}{3} \times 10\pi = \frac{10}{3}\pi$ cm. Therefore the distance traveled by the tip of the minute hand in 3 hours and 20 minutes equals $\left(3(10\pi) + \frac{10}{3}\pi\right) \approx 105$ cm.

Question 58. The correct answer is K. The figure below shows the standard position of ϕ in the standard (x,y) coordinate plane. Note that since ϕ has a measure between 90° and 180°, the terminal side of the angle will be in Quadrant II. The angle θ shown in the figure is the *reference angle* for ϕ. The relationship between the tangent of ϕ and the tangent of its reference angle θ is given by $\tan \theta = |\tan \phi| = \frac{7}{24}$. By similarity, any right triangle having one vertical side, one side along the x-axis, and one side along the terminal side of ϕ will have a side length ratio of 7:24:25 and 1 angle measure of θ (as shown in the figure).



The right triangle having 1 vertex at (–24,7) is shown in the figure. From this you can see that $\tan \theta = \frac{7}{24} = \frac{\text{the length of the side opposite } \theta}{\text{the length of the side adjacent to } \theta}$, and $\sin \theta = \frac{\text{the length of the side opposite } \theta}{\text{the length of the hypotenuse}} = \frac{7}{25}$. As in the case of the tangent, $\sin \theta = |\sin \phi|$, so $|\sin \phi| = \frac{7}{25}$. Since the sine values of all angles with measures between 90° and 180° are positive, $\sin \phi = \frac{7}{25}$.

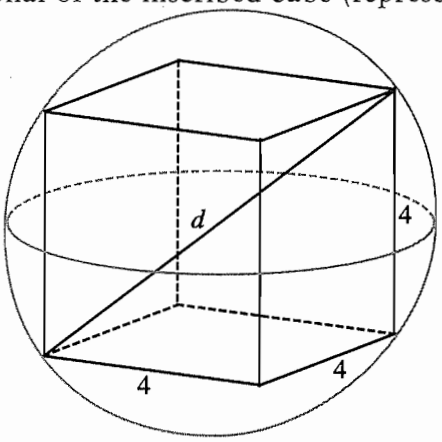
Question 59. The correct answer is B. A numerical approach to the problem is shown in the table below. The table shows all possible pairs of values for w and z.

w	z	$2^w = x$	x^z
1	4	$2^1 = 2$	$2^4 = 16$
2	3	$2^2 = 4$	$4^3 = 64$
3	2	$2^3 = 8$	$8^2 = 64$
4	1	$2^4 = 16$	$16^1 = 16$

The shaded region in the table shows the 2 values of w (2 and 3) that satisfy both conditions.

You can also approach this problem analytically. If x, w, and z are positive integers such that $w + z = 5$, $2^w = x$, and $x^z = 64$, then $64 = (2^w)^z = 2^{wz}$. But $64 = 2^6$, so it must be true that $wz = 6$. So you need to find all pairs of positive integers w and z whose sum is 5 and product is 6. Substituting $5 - w$ for z in the product yields $w(5 - w) = 6$, or equivalently, $0 = w^2 - 5w + 6 = (w - 2)(w - 3)$. So, there are 2 solutions for w, $w = 2$ and $w = 3$.

Question 60. The correct answer is F. First, find the diameter of the sphere, which is equal to the length of the diagonal of the inscribed cube (represented by d in the figure below).



The length of the diagonal of any rectangular prism equals $\sqrt{(\text{the length})^2 + (\text{the width})^2 + (\text{the height})^2}$. In the case of the cube shown in the figure, $d = \sqrt{4^2 + 4^2 + 4^2} = \sqrt{3(4^2)} = 4\sqrt{3}$ cm. If you stopped at this point in the calculation, you probably chose H, which was the most common incorrect answer. But the problem asks for the *radius* of the sphere, which is $\frac{1}{2}(4\sqrt{3}) = 2\sqrt{3}$ cm.

Passage I

Question 1. The best answer is **A** because the passage identifies Shades Bowen as one of the other local musicians in the "bullpen" (lines 5–6) and goes on to state that, of those local musicians, Everett Payne "was the one being invited to sit in" (line 15) and play with the band that night. In this context, "the one" indicates that only Everett was sitting in, and no mention is made in the passage of any other musician sitting in.

The best answer is NOT:

B because while the passage indicates that Everett Payne is "not long out of the army" (lines 14–15), the passage makes no mention of Shades Bowen having been in the army as well.

C because while the passage refers to all the people in the "bullpen" as "young locals" (line 9), the passage makes no mention of Shades Bowen's age.

D because the passage states that Everett Payne joined Shades Bowen in the "bullpen" (lines 5–7) where "young locals gathered . . . each Sunday evening, hoping for a chance to perform" (lines 9–10). This indicates that Shades Bowen was a local musician himself, and there is no indication in the passage that Shades Bowen had any role in deciding which other local musicians were allowed to play with the band.

Question 2. The best answer is **G** because the statement in question (line 62) describes the audience's physical reaction to Everett Payne's performance. This performance is described in great detail in lines 48–61 as being impressive enough to warrant such a reaction.

The best answer is NOT:

F because the statement in question (line 62) refers to the audience's physical reaction to the improvisational passages that Payne played after he had taken his time "paying his respects to the tune as written" (lines 48–49). This indicates that the audience reaction was not based on "initial expectations" but rather on later developments in the playing of the song "Sonny Boy Blue."

H because the statement in question (line 62) supports, rather than counteracts, the narrator's description of Payne's performance.

J because there is no mention in the passage that anyone other than the narrator knows who Payne is.

Question 3. The best answer is **A** because the passage describes the jazz show as "winding down" (line 1) near the end of the second set. This implies the second set is the show's final set.

The best answer is NOT:

B because there is no description in the passage of the first set or of the length of either the first or the second set.

C because the narrator mentions that the show is "winding down" (lines 1–2), which suggests that there will be no third set.

D because the passage states that the jazz show is "nearing the end of the second set" (lines 1–2) when the musicians in the "bullpen" were called up to play. If the *entire* second set was performed solely by musicians from the "bullpen," then they would not be "called up to play" only toward the end of that set.

Question 4. The best answer is **H** because the passage states that when the purists first heard Payne's choice of music, they "slouched deeper in their chairs in open disgust" (lines 36–37).

The best answer is NOT:

F because while the passage mentions the silence following Payne's performance (lines 81–83), there is no specific mention of the audience reacting to Payne's choice of music with silence.

G because the audience's in-suck of breath (line 62) is in response to Payne's performance, not to his choice of music.

J because the purists stood up at the end of Payne's performance "in languid praise" (line 88) of Payne, not as a reaction to Payne's choice of music.

Question 5. The best answer is **C** because the narrator describes how she watched as Payne "slowly mounted the bandstand and conferred with the bassist and drummer" (lines 26–27).

The best answer is NOT:

A because Payne did not move quickly to the bandstand. Rather, the narrator describes him as moving with "a deliberate pause between each step" (lines 18–19).

B because the narrator describes Payne as sitting down to play "without in any way acknowledging the audience" (line 30).

D because the narrator says that Payne sat down at the piano "without announcing the name of the tune he intended playing" (lines 28–29).

Question 6. The best answer is **G** because the purists are described as reacting negatively to Payne because of his choice of song before even hearing him play (lines 35–37), suggesting intolerance. They are also described as normally refusing "to applaud even genius" (line 87), implying snobbishness.

The best answer is NOT:

F because while the term "purist" in the context of a jazz audience suggests that they may be knowledgeable about jazz music, the purists in this audience are described as reacting negatively to Payne because of his choice of song before even hearing him play (lines 35–37), suggesting that they are intolerant rather than open-minded.

H because the passage makes no mention of whether or not the purists are educated. Additionally, the purists are not portrayed as rational, as they normally refuse to acknowledge a praiseworthy performance (lines 86–87).

J because while the purists may be "uninhibited" in that they visibly react or do not react to performances as they please, the passage makes no mention of their "inexperience" regarding jazz. In fact, the opposite impression is created by the purists' initial disgust at the prospect of hearing a "hokey" (line 38), or old-fashioned, tune like "Sonny Boy Blue." Moreover, the term "purist" in general denotes someone devoted to the most essential or "pure" expression of a particular idea or practice, and such devotion usually indicates a deep familiarity with the object of their devotion rather than "inexperience."

Question 7. The best answer is **B** because the narrator refers to Bach and the blues as being the "bedrock" on which Payne had been trained (lines 76–77).

The best answer is NOT:

A because there is nothing in the passage to suggest that Everett did anything to avoid representing Bach and the blues when he played piano.

C because the narrator describes Bach and the blues as being "earthbound" (line 76) and "the bedrock" (line 76) of Payne's musical inspiration. Moreover, the narrator contrasts these influences, which Payne hears through "his other ear" (line 75) with "the true music of the spheres" (lines 72–73), which he hears through "his right ear directed skyward" (line 68).

D because the passage does not imply that Everett is limited to "Tin Pan Alley" tunes. Rather, the passage states that Everett "recast" and "reinvented" the Tin Pan Alley tune "Sonny Boy Blue" "in an image all his own" (lines 60–61).

Question 8. The best answer is **F** because the passage indicates that Payne first played the song "at a slower tempo than was called for" (line 41).

The best answer is NOT:

G because there is no indication in the passage that Payne spoke with anyone other than the bassist and the drummer.

H because while the passage states that Payne conferred with the bassist and the drummer (line 27), there is no mention in the passage that either the bassist or the drummer had any reaction to what Payne said to them.

J because when Payne first played "Sonny Boy Blue," he played the song "straight through as written" (line 39). The passage also states that throughout Payne's performance, he "continued to acknowledge the little simple-minded tune" (lines 59–60).

Question 9. The best answer is **A** because Hattie speculates that Payne's talent "had to do . . . with the way he held his head. . . tilted" (lines 65–67).

The best answer is NOT:

B because the narrator never mentions the simplemindedness of the tune as being related to Payne's musical ideas and feelings. Rather, the characterization of "Sonny Boy Blue" as a "little simple-minded tune" (lines 59–60) creates a contrast between Payne's elaborate and inventive improvisations and the simple and overly familiar song that he chooses as a vehicle for those improvisations.

C because while the narrator mentions Payne's formality in playing through the parts of "Sonny Boy Blue" the first time (lines 42–43), the narrator does not identify this formality as the source of the musical ideas and feelings showcased in Payne's improvisations.

D because the passage makes no mention of any connection Payne feels with his audience. Rather, the passage states that Payne does not even acknowledge his audience before playing (line 30).

Question 10. The best answer is **J** because the passage states that Payne's performance seemed to Hattie "a joyous, terrifying roller coaster of a ride" (lines 78–79).

The best answer is NOT:

F because while the passage states that Payne's rendition of the song began slowly and formally (lines 41–43), the passage goes on to contrast this beginning with a lengthy improvisational section described in terms that indicate that Hattie found the performance as a whole anything but formal (lines 49–61).

G because there is no indication in the passage that Hattie considers Payne's musical performance absent-minded. Instead, she describes his body "moving absentmindedly through space" as he approaches the bandstand to play (lines 20–21).

H because the narrator does not describe Payne's performance of "Sonny Boy Blue" as resembling a song played in church. Rather, she describes the audience reacting to Payne's performance "as if they were in church and weren't supposed to clap" (lines 82–83).

Passage II

Question 11. The best answer is **A** because the passage as a whole presents a cohesive argument that sprawl is both unpleasant and harmful (lines 9–10, 25–27, 33–37, 44–47, 59–61, 74–79), that its destructive effects are too often ignored (lines 11–16), that characterizations of sprawl as either inevitable or desirable are flawed (lines 17–19, 52–54, 62–66), that policies currently in place encourage sprawl to continue (lines 19–22, 67–74), and that there are a set of alternative policies which, if adopted, would resist sprawl and reduce these harmful effects (80–91). The overall effect of these linked propositions is to persuade the reader that a choice must be made between a proven harm and a beneficial alternative. Moreover, the language used to describe sprawl throughout the passage is consistently negative, including, for example, the initial identification of sprawl as a "destructive, soulless, ugly mess" (lines 9–10). In contrast to these descriptions, communities without sprawl are described as "places that people care about" (line 35) or characterized as representing a "compact walkable environment" (70–71). Drawing a contrast between attractive and unattractive descriptions, as this passage does, is a common tactic of persuasive rhetoric.

The best answer is NOT:

B because while the author explains what sprawl is, the main purpose of the passage is not merely to explain what sprawl is, but to argue for measures that would control sprawl and "knit communities together" (line 89).

C because while the author does describe sprawl throughout the passage, these descriptions are more often colorful and emotional than they are precise and exact. For example, sprawl is initially characterized as a "destructive, soulless, ugly mess" (lines 9–10). In contrast, communities without sprawl are described as "places that people care about" (line 35) or characterized as representing a "compact walkable environment" (70–71). Drawing a contrast between attractive and unattractive descriptions, as this passage does, is a common tactic of persuasive rather than descriptive rhetoric. Therefore the principal aim of the passage is persuasive rather than descriptive.

D because the passage does not tell a story. Rather, it informs the reader of a problem and urges the reader not only to see sprawl as a problem as well, but also to take measures to solve the problem.

Question 12. The best answer is J because after describing the effect of sprawl on communities, and criticizing policies that encourage sprawl, the author proposes the adoption of policies that discourage sprawl, such as "downtown housing and mixed-use zoning" (lines 85–86) and goes on to explain that "the goal should be an integrated system of planning decisions and regulations that knit communities together instead of tearing them apart" (lines 87–90). Therefore, in the context of the sentence in which it appears and in the context of the entire passage, the establishment of "an integrated system of planning decisions and regulations" is clearly something that the author would like to see happen.

The best answer is NOT:

F because the full sentence in question reads "Too many developers follow standard formulas, and too many government entities have adopted laws and policies that constitute powerful incentives for sprawl" (lines 19–22). The author's opposition to the laws in question is signaled within the sentence by the assertion that "too many government entities" enact them. In the context of the sentence in which it appears and in the context of the author's criticism of sprawl throughout the passage, the enactment of "laws . . . that provide powerful incentives for sprawl" is not something that the author would like to see happen.

G because "the destruction of traditional downtowns" (line 34) is presented as an end result of sprawl and as something which "is corroding the very sense of community that helps bind us together as a people and as a nation" (lines 35–37). In the context of the sentence in which it appears and in the context of the author's criticism of sprawl throughout the passage, "the destruction of traditional downtowns" is not something that the author would like to see happen.

H because the author explains that "'affordable' housing on the edge of town" (line 53) is only more affordable for developers (line 55) and that the construction of this housing, which is a familiar form of sprawl (lines 48–50), requires "higher taxes for needless duplication of services and infrastructure" (lines 59–60). In the context of the sentence in which it appears and in the context of the author's criticism of sprawl throughout the passage, the construction of housing like this is not something that the author would like to see happen.

Question 13. The best answer is D because in the first paragraph the author defines sprawl as a problem, while in the last paragraph, the author offers possible solutions to this problem, including "sensible land-use planning" (line 82), "mixed-use zoning" (lines 85–86), and "an integrated system of planning decisions and regulations" (lines 87–88).

The best answer is NOT:

A because the author does not ask a question at any point in the final paragraph. Rather, the author offers solutions to the problem explained throughout the passage.

B because the author mentions no specific statistics in the final paragraph.

C because the final paragraph does not incorporate more emotional language than the first. If anything, the opposite may be true. In the first paragraph, the author uses emotionally loaded language to encourage the reader to agree that the "destructive, soulless, ugly mess called sprawl" (lines 9–10) is a serious problem. In contrast, the last paragraph, while arguing that "our communities should be shaped by choice, not by chance" (lines 80–81), uses more precise and less emotional language to describe possible solutions to the problem of sprawl, such as "an integrated system of planning decisions and regulations" (lines 87–88). This less emotional language encourages the reader to agree that these solutions may be effective.

Question 14. The best answer is F because the passage makes no mention of how long the problem of sprawl has been happening in U.S. cities.

The best answer is NOT:

G because the author answers this question in lines 17–18: "Development that destroys communities isn't progress. It's chaos."

H because the author argues that current zoning laws, which make construction of a "walkable environment" impossible, "are a major reason why 82 percent of all trips taken in the United States are taken by car (lines 69–74).

J because the author offers solutions to the problem of what to do to combat sprawl in the final paragraph in the passage.

Question 15. The best answer is B because the passage does not support the idea that the opening of a superstore leads to downtown renovations. Rather, the passage states that, after a superstore opens in a small town, "downtown becomes a ghost town" (lines 46–47).

The best answer is NOT:

A because the author states that "in many small towns, a single new superstore may have more retail space than the entire downtown business district" (lines 42–44).

C because the author states that, after a superstore opens in a small town, "downtown becomes a ghost town" (lines 46–47).

D because the author states that, when a superstore opens in a small town, "the retail center of gravity shifts away from Main Street" (lines 45–46).

Question 16. The best answer is H because the statistics in question (lines 73–76) show that a significant majority of all trips taken in the United States are taken by car, and that American families spend a significant portion of their budget on transportation expenses. The author argues that these statistics regarding automobile transportation and its costs represent the effects of land use regulations that make it impossible to construct a "compact walkable environment" (lines 69–71).

The best answer is NOT:

F because the statistics in question (lines 73–76) do not support the idea that mixed-use zoning leads to environmental destruction. Rather, they show that a significant majority of all trips taken in the United States are taken by car, and that American families spend a significant portion of their budget on transportation. According to the author, the dependence on automobile transportation is a result of current zoning laws "prohibiting mixed uses" (line 67). Because this dependence on automobile transportation is associated with sprawl, which is associated with environmental destruction throughout the passage, the statistics in question support the argument that it is the prohibition of mixed-use zoning, rather than mixed-use zoning itself, that creates environmental destruction (line 67).

G because the statistics in question (lines 73–76) show that a significant majority of all trips taken in the United States are taken by car, and that American families spend a significant portion of their budget on transportation expenses. The author argues that these statistics regarding automobile transportation and its costs represent the effects of land-use regulations that make it impossible to construct a "compact walkable environment" (lines 69–71).

J because the statistics in question do not support the idea that Americans spend too much of their budgets on food and health care. Rather, the passage states that "the average American household now allocates more than 18 percent of its budget to transportation expenses" and that this is "more than it spends for food and three times more than it spends for health care" (lines 74–79). This strongly suggests that Americans spend too much on transportation, rather than suggesting that they spend too much on food and health care.

Question 17. The best answer is C because the passage refers to "retail development that transforms roads into strip malls" (lines 38–39).

The best answer is NOT:

A because the author discusses the type of sprawl that develops far away from town centers (line 30), not adjacent to them.

B because the author argues that the development of sprawl leads to the neglect of historic buildings in towns (lines 26–27), not that sprawl leads to the utilization of these buildings.

D because the author argues that the construction of superstores is part of a process whereby "the retail center of gravity shifts away from Main Street" and "downtown becomes a ghost town" (lines 45–47). This strongly suggests that superstores are associated with the destruction, rather than the promotion, of a sense of community in the towns in which they are constructed.

Question 18. The best answer is G because the sentence describes these "detached homes" as being located in "residential subdivisions that 'leapfrog' from the urban fringe into the countryside" (lines 49–50). Because *leapfrog* means that there is open space between that urban fringe and the subdivisions in question, this suggests that *detached* in this context refers to homes located in subdivisions that are "set apart" from urban areas.

The best answer is NOT:

F because while the word *detached* can indicate an objective point of view, *detached* is used in this context to describe a house (line 51), which cannot have a point of view.

H because the sentence describes these "detached homes" as being built in "residential subdivisions that 'leapfrog' from the urban fringe into the countryside" (lines 49–50). While the term *leapfrog* does suggest that the homes and the subdivisions in which they are located are separated from urban areas, there is no suggestion that the homes are mobile in any way and therefore have not been "broken apart" from anywhere or anything.

J because the sentence describes these "detached homes" as being located in "residential subdivisions that 'leapfrog' from the urban fringe into the countryside" (lines 49–50). While the term *leapfrog* does suggest that the homes and the subdivisions in which they are located are separated from urban areas, there is no suggestion that the homes are mobile in any way and therefore have not been "taken away" from anything or anywhere.

Question 19. The best answer is **D** because the statement in question is preceded by, and is intended to counter, the claim made by some people that "sprawl is merely the natural product of marketplace forces at work" (lines 62–63). Therefore, the author is arguing that people who make this claim "fail to recognize" (line 63) that those market forces are influenced by governmental decisions. The author's rhetoric here assumes that the reader will recognize "a level playing field" as a popular term for conditions governed purely by market forces, and will understand that a playing field that isn't "level" (line 64) refers to conditions where governmental decisions *do* influence market forces.

The best answer is NOT:

A because the "needless duplication of services and infrastructure" (line 60) referred to in the passage is identified as a *result* of sprawl, while the phrase "the game isn't being played on a level field" (line 64) is used to identify the influence of governmental decisions on market forces, and not market forces alone, as a *cause* of sprawl.

B because the "higher taxes" (line 59) referred to in the passage are identified as a *result* of sprawl, while the phrase "the game isn't being played on a level field" (line 64) is used to identify the influence of governmental decisions on market forces, and not market forces alone, as a *cause* of sprawl.

C because the phrase "the game isn't being played on a level field" (line 64) is used to identify the influence of governmental decisions on market forces, and not market forces alone, as a cause of sprawl. The author's rhetoric here assumes that the reader will recognize "a level playing field" as a popular term for conditions governed purely by market forces, and will understand that a playing field that "isn't level" (line 64) refers to conditions where governmental decisions do influence market forces.

Question 20. The best answer is **J** because the passage identifies zoning laws that prohibit "mixed uses" (line 67) as a primary cause of the separation of urban commercial zones and residential subdivisions described in the three paragraphs that immediately precede the sentence in question (lines 48–66). That separation of commercial and residential land use is contrasted, in the following sentences, with "the sort of compact walkable environment that attracts us to older neighborhoods and historic communities all over the world (lines 70–72). Therefore the term *mixed uses* can be understood as referring to zoning that allows one area to contain various types of development.

The best answer is NOT:

F because the passage identifies both large parking lots (lines 3–4) and large retail stores (lines 38–42) as being characteristic of sprawl, which is encouraged by the prohibition of "mixed uses" (line 67). Furthermore, parking lots and retail stores are both understood to be commercial uses of land, and therefore the phrase *mixed uses* is unlikely to refer to them.

G because while the passage states that the prohibition of "mixed uses" (line 67) makes it "impossible—even illegal—to create the sort of compact walkable environment that attracts us to older neighborhoods and historic communities" (lines 69–72), the term *mixed uses* itself is not directly associated with historic preservation in any way. Rather, *mixed uses* refers to the designation of land use as residential, commercial, or industrial under zoning laws.

H because while "mixed uses" (line 67) are understood within the context of the passage as encouraging the creation of a "walkable environment" (line 71), there is no association between the term *mixed uses* and the prohibition of driving or parking.

Passage III

Question 21. The best answer is **A** because the passage begins by with the narrator's description of an incident in which she first became interested in identifying flowers and in the natural world (lines 1–24), and the remainder of the passage describes how this early interest developed into a larger part of her life.

The best answer is NOT:

B because while the identification of an aster is part of the incident (lines 1–24) that leads to the narrator's lifelong interest in flowers and the natural world, there is no mention in the passage of the author having a lifelong fascination for asters in particular. Rather, the incident in question leads to a lifelong fascination with identifying flowers in general.

C because while the author briefly mentions hiking with companions (lines 31–32) and identifying flowers with a friend (lines 81–82), the primary focus of the passage is on the author's individual interest in flowers and how that interest developed.

D because the author does not discuss her career in the passage.

Question 22. The best answer is **H** because the author describes the young man's answer to her question as containing "the hint of a sniff" (line 7), which indicates that she detected disdain or condescension in the tone of the young man's answer.

The best answer is NOT:

F because there is nothing in the passage to suggest that the guide treated the author with acceptance. Rather, his reaction to her question about the flower is described as containing "the hint of a sniff" (line 7), which indicates disdain or condescension, qualities that are incompatible with acceptance.

G because there is no mention in the passage of the guide being surprised by the author's question. Rather, his reaction is described as containing "the hint of a sniff" (line 7), which indicates disdain or condescension and not surprise.

J because there is no mention in the passage of the guide becoming angry with the author. Rather, his reaction to her question about the flower is described as containing "the hint of a sniff" (line 7), which indicates disdain or condescension and not anger.

Question 23. The best answer is D because while the author describes her efforts to identify a yellow flower on a particular hike (lines 30–51), she does not name the flower in question. Rather, she uses the description of this incident to explain her developing "intimacy" (line 28) with the book *A Field Guide to Wild Flowers*.

The best answer is NOT:

A, B, or C because while the author mentions St. Johnswort, loosestrife, and puccoon as "five-petaled yellow flowers" (lines 50–51) similar to the one she is trying to identify, she does not identify the flower in question as St. Johnswort (A), loosestrife (B), or puccoon (C).

Question 24. The best answer is F because the author states that though daunting at first, the book was neither too frustrating as a more basic book would have become nor too daunting as a more complex one would have been (lines 58–61).

The best answer is NOT:

G because the author indicates that the book was not easy to use in the beginning. Rather, it was difficult for her, but she "persisted in wrestling" (line 61) with the book until it became easier.

H because the author makes no mention in the passage of any other guide she used.

J because the author makes no negative statements about the illustrations in the guide.

Question 25. The best answer is C because the sentence in question reads "I had no choice, really, not if I wanted to *get in*" (lines 55–56), and the surrounding sentences indicate that the matter she had no choice in was the use of the field guide, which "led to the particulars" (line 57), or deepened her understanding, of the landscape. Therefore, in this context, to "get in" to a subject can be understood as meaning to fully understand that subject.

The best answer is NOT:

A because the sentence in question reads "I had no choice, really, not if I wanted to *get in*" (lines 55–56), and there is no indication in the surrounding lines that the matter she has no choice in is her arrival in a specific location. Rather, she wants to figuratively, and not literally, arrive at a deeper understanding of the landscape, and she has no choice but to use the field guide in order to do so (lines 55–58).

B because the sentence in question reads "I had no choice, really, not if I wanted to *get in*" (lines 55–56), and there is no indication in the surrounding lines or the passage as a whole that the matter she has no choice in has anything to do with membership in any group. Rather, she wants to figuratively, and not literally, "get in" to a deeper understanding of the landscape, and she has no choice but to use the field guide in order to do so (lines 55–58).

D because the sentence in question reads "I had no choice, really, not if I wanted to *get in*" (lines 55–56), and there is no indication in the surrounding lines or the passage as a whole that the matter she has no choice in has anything to do with being friendly with someone. Rather, she wants to figuratively, and not literally, "get in" to a deeper understanding of the landscape, and she has no choice but to use the field guide in order to do so (lines 55–58).

Question 26. The best answer is **H** because the author states that she and Julie began to see that their understanding of plant communities was valuable because it led to a greater understanding of larger issues such as "climate change and continental drift" (lines 85–86).

The best answer is NOT:

F because there is no information in the passage about Julie's level of experience in identifying plant life.

G because there is no information in the passage about Julie owning a house near a bog.

J because there is no information in the passage about whether or not Julie used the Peterson's guide.

Question 27. The best answer is **D** because the author states that "over the next several years this field guide would become my closest companion" (lines 25–26), specifying that she measures the period in question in "years."

The best answer is NOT:

A because the author states that "over the next several years this field guide would become my closest companion" (lines 25–26), specifying "years" and not days as the way in which she measures the period in question.

B because the author states that "over the next several years this field guide would become my closest companion" (lines 25–26), specifying "years" and not weeks as the way in which she measures the period in question.

C because the author states that "over the next several years this field guide would become my closest companion" (lines 25–26), specifying "years" and not months as the way in which she measures the period in question.

Question 28. The best answer is **J** because the author's statement that "a landscape may be handsome in the aggregate, but this book led to the particulars, and that's what I wanted" (lines 56–58) contrasts the surface appeal of a landscape seen at a distance with the deeper knowledge of a landscape that only comes from familiarity with the "particulars," or individual parts, and specifies that this deeper knowledge of the landscape is what she sought.

The best answer is NOT:

F because the author's statement that "a landscape may be handsome in the aggregate, but this book led to the particulars, and that's what I wanted" (lines 56–58) specifies that she was more interested in the deeper knowledge of the landscape that comes from familiarity with the "particulars," or individual parts, than she was in an understanding of a landscape that might come from looking at its overall patterns.

G because while the passage does relate the way in which the field guide helps the author break landscapes down logically into their "particulars" (line 57), or individual parts, there is no indication that this made landscapes lose their appeal. Rather, she states that this kind of understanding was "what [she] wanted" (line 58) and that the logically ordered classifications in the field guide all made "such delightful sense" (lines 79–80).

H because there is no indication in the passage that the deeper understanding of landscapes that she sought through knowledge of their "particulars" (line 57), or individual parts, was in any way related to painting portraits of those landscapes.

Question 29. The best answer is **B** because the details in question describe the ways in which the field guide "changed" (line 64) as she figuratively, and not literally, "persisted in wrestling" (line 61) with it "by slow degrees" (line 62). In this context, these details indicate that this transformation occurred due to heavy use over a long period of time.

The best answer is NOT:

A because there is no indication that the transformation of the book described by the details in question (lines 64–66) takes place because of poor craftsmanship. Rather, the details in question describe the ways in which the field guide "changed" (line 64) as she, figuratively and not literally "persisted in wrestling" (line 61) with it "by slow degrees" (line 62). In this context, these details indicate that this transformation occurred due to heavy use over a long period of time.

C because the passage implies that the "cryptic annotations" (line 66) in the guide were made by the author herself.

D because the details in question describe the ways in which the field guide "changed" (line 64) as she, figuratively and not literally "persisted in wrestling" (line 61) with it "by slow degrees" (line 62). While this indicates that the book's condition was transformed due to heavy use, there is no specific indication of carelessness and no mention anywhere in the passage of any regret the author has regarding her use of the field guide.

Question 30. The best answer is **H** because the author mentions *Solidago hispida* in order to exemplify her practice of addressing flowers that she has encountered before by their Latin name after she has learned to identify them (lines 70–72).

The best answer is NOT:

F because the passage makes no mention of any trouble the author had initially identifying *Solidago hispida*.

G because the author mentions *Solidago hispida* as an example of a flower she has addressed in the past with great enthusiasm, meaning she has already come across the flower in her nature walks.

J because there is no indication anywhere in the passage that the author feels the name *Solidago hispida* is inappropriate. Rather, the author mentions *Solidago hispida* only in order to exemplify her practice of addressing flowers by their Latin name (lines 70–72).

Passage IV

Question 31. The best answer is **D** because the passage states that information gained from the study of snow crystals "has practical applications in such diverse areas as agriculture and the production of electricity" (lines 12–14). Specific details about these practical applications are presented in the final 5 paragraphs (lines 50–91) of the passage.

The best answer is NOT:

A because while the passage does mention the fact that scientists have communicated with each other in the course of studying snow crystals (lines 50–54), that communication is secondary to the main point of the passage, which is to explain the practical applications of such a study.

B because while the passage does discuss the role of snow crystal facets in the formation of snow crystals (lines 19–23) and also discusses the winter snowpack in some Western states (lines 56–61), the passage makes no specific connection between the snow crystal facets and the snowpack and does not indicate that either one is the primary reason for presenting information about the scientific study of snow.

C because while the passage does tell the story of the first time a scanning electron microscope was used in the scientific study of snow (lines 34–49), it tells this story in the context of presenting information about the practical applications of the scientific study of snow and does not explicitly discuss the varied uses of the scanning electron microscope.

Question 32. The best answer is G because the passage states that "before employing the scanning electron microscopy results, the forecasted amounts of snowpack water were inaccurate" (lines 62–64) and that "improving the prediction [of snowpack water] by 1 percent would save $38 million" in costs (lines 71–73). Because improving a prediction can be understood as making that prediction more accurate, this establishes a connection between the use of the scanning electron microscope and saving money.

The best answer is NOT:

F because while the passage mentions future predictions in the context of less snowfall expected (lines 75–80), those future predictions are not linked to any money saved.

H because as the passage states, the two scientists (who were looking at biological problems) froze the tissue they were using in order "to avoid the laborious procedure" (lines 37–38) that the use of scanning electron microscopes usually entailed. The passage does not state that the scientists were saving money by using these microscopes when looking for these biological problems.

J because while the passage states that snowmelt accounts for 75 percent of the annual water supply of these western states (lines 56–58), the passage mentions nothing about increasing the water supply of these states as a means of saving money.

Question 33. The best answer is C because the phrase in question is immediately followed by a statement in parentheses explaining that "crystals often change once on the ground depending on the surrounding environment" (lines 48–49). Since *metamorphosed* means "changed," and *conditions* and *environment* have similar meanings, we can read the parenthetical statement as clarifying the fact that *metamorphosed conditions* refers to the state of snow crystals after they reach the ground.

The best answer is NOT:

A because the passage does not establish a direct connection between the phrase *metamorphosed conditions* (lines 47–48) and the temperature and humidity at which crystals form. Rather, the phrase in question is immediately followed by a statement in parentheses explaining that "crystals often change once on the ground depending on the surrounding environment" (lines 48–49). Read in context, the parenthetical state-

ment, which makes no mention of the temperature and humidity at which crystals form, can be understood as defining the term *metamorphosed conditions*.

B because the passage does not establish a direct connection between the phrase *metamorphosed conditions* (lines 47–48) and the process by which snow crystals develop from a speck of dust and water vapor. Rather, the phrase in question is immediately followed by a statement in parentheses explaining that "crystals often change once on the ground depending on the surrounding environment" (lines 48–49). Read in context, the parenthetical statement, which makes no mention of the formation of snow crystals, can be understood as defining the term *metamorphosed conditions*.

D because the phrase in question (lines 47–48) is immediately followed by a statement in parentheses explaining that "crystals often change once on the ground depending on the surrounding environment" (lines 48–49). This indicates that the phrase *metamorphosed conditions* refers to changes in the snowflake that occur as a result of changes in the environment, and not directly to changes in the environment.

Question 34. The best answer is **G** because the passage explains that "before employing the scanning electron microscopy results, the forecasted amounts of snowpack water were inaccurate whenever the size and shape of the snow crystals varied much from the norm" (lines 62–65). This indicates that the addition of scanning electron microscopy data allowed scientists using the model to include more detailed information about structural variations in snow crystals in their predictions, making those predictions more accurate.

The best answer is NOT:

F because the passage does not specify that the addition of scanning microscopy data allowed scientists using the Snowmelt Runoff Model to include more detailed information about microwave satellite data. Rather, the passage states that Albert Rango "now uses Wergin's electron microscopy data, along with microwave satellite data, in the Snowmelt Runoff Model to predict the amount of water available in a winter snowpack" (lines 52–56). This indicates that scanning electron microscopy data and microwave satellite data are used in conjunction with each other, not that one allows the inclusion of more detailed information about the other.

H because the passage makes no mention of electron microscopy in helping provide detailed information about locations having the highest amount of snowfall.

J because while the passage mentions that William Wergin and Eric Erbe were looking for biological problems related to agriculture (lines 34–37), there is no mention of biological problems in the discussion of the Snowmelt Runoff Model, which occupies the last 5 paragraphs of the passage (lines 50–91).

Question 35. The best answer is **D** because the passage states that, due to temperature increases, less snow will fall, thus "greatly increasing water's economic value" (lines 77–82).

The best answer is NOT:

A because while the passage mentions an increased ability to track water pollution via the use of crystal research (lines 90–91), the passage makes no mention of an increase of pollution as a cause of an increase in water's value.

B because the passage makes no mention of water conservation leading to an increase in water's value.

C because while the passage mentions the ability of scanning electron microscopes to detect sulfur and nitrogen in snow (lines 87–89), the passage makes no mention of a predicted increase in sulfur and nitrogen levels in snow.

Question 36. The best answer is G because the passage states that "as the crystals fall, they encounter different atmospheric conditions that produce flakes with unique attributes" (lines 3–5).

The best answer is NOT:

F because while the passage does state that 1 septillion snowflakes fall worldwide each year (lines 1–4) the passage does not make any connection between that enormous number and the infinite variety of snowflakes. Rather, the passage states that "as the crystals fall, they encounter different atmospheric conditions that produce flakes with unique attributes" (lines 3–5).

H because the passage makes no connection between the rate at which snowflakes fall and the infinite variety of snowflakes. Rather, the passage states that "as the crystals fall, they encounter different atmospheric conditions that produce flakes with unique attributes" (lines 3–5).

J because while the passage does state that more complex atmospheric conditions produce more elaborate and therefore more varied snow crystals (lines 5–6), the passage makes no connection between those complex atmospheric conditions and the speed at which snow crystals develop, and the passage makes no connection between the speed at which snow crystals develop and the infinite variety of snowflakes.

Question 37. The best answer is D because the passage states that "snowflakes are collections of two or more snow crystals" (lines 16–17).

The best answer is NOT:

A because the passage does not state that snowflakes grow around a nucleus of dust. Rather, the passage states that "snowflakes are collections of two or more snow crystals" (lines 16–17) and that a crystal "typically grows around a nucleus of dust" (lines 18–19).

B because the snowflakes do not combine to form snow crystals. Rather, according to the passage, the opposite is true: snow crystals combine to form snowflakes (lines 16–17).

C because while the passage states that the shape of a snow crystal "depends on how the six side facets—or faces—grow in relation to the top and bottom facets" (lines 19–20), there is no mention of any direct relation between top and bottom facets and the growth of snowflakes.

Question 38. The best answer is G because the passage specifies that the physicist Kenneth Libbrecht "creates 'designer' snowflakes in his lab" (lines 31–32).

The best answer is NOT:

F because the passage makes no connection between the term "*designer" snowflakes* (line 32) and the fact that no two snowflakes are alike. Rather, the passage specifies that the physicist Kenneth Libbrecht "creates 'designer' snowflakes in his lab" (lines 31–32).

H because the passage makes no mention of the grand design of nature. Rather, the passage specifies that the physicist Kenneth Libbrecht "creates 'designer' snowflakes in his lab" (lines 31–32).

J because while the passage does state that the physicist Kenneth Libbrecht "creates 'designer' snowflakes in his lab" (lines 31–32), the passage makes no mention of the beauty of Libbrecht's snowflakes.

Question 39. The best answer is C because the sentence in question states that "snowmelt water is critical to crop irrigation and hydroelectric power, as well as recreation and domestic water supplies, fisheries management and flood control" (lines 58–61). In context, this is understood to mean that snowmelt water is vital, or very important, to these processes and practices.

The best answer is NOT:

A because the sentence in question states that "snowmelt water is critical to crop irrigation and hydroelectric power, as well as recreation and domestic water supplies, fisheries management and flood control" (lines 58–61). In this context, *critical* cannot be read as meaning "evaluative" because snowmelt water cannot evaluate anything or anyone.

B because the sentence in question states that "snowmelt water is critical to crop irrigation and hydroelectric power, as well as recreation and domestic water supplies, fisheries management and flood control" (lines 58–61). In this context, *critical* cannot be read as meaning "faultfinding" because snowmelt water cannot find fault with anything or anyone.

D because the sentence in question states that "snowmelt water is critical to crop irrigation and hydroelectric power, as well as recreation and domestic water supplies, fisheries management and flood control" (lines 58–61). In context, the adjective *critical* is understood to mean that snowmelt water is vital, or very important, to these processes and practices. Although it is also an adjective and can sometimes be understood to mean vital or important, *acute* cannot be substituted for *critical* in this sentence because it would be neither grammatical nor logical to say "water is *acute* to crop irrigation."

Question 40. The best answer is F because while the passage does state that research about snow crystals has helped scientists to identify and possibly track the source of pollutants in snow (lines 90–91), the passage does not make any connection between research about snow crystals and the extraction of pollutants *from* snow.

The best answer is NOT:

G because one meaning of *gauge* is "to measure," and the term *snowmelt* refers to water generated by a melting snowpack; therefore, when the passage states that research about snow crystals has helped scientists to "predict the amount of water available in a winter snowpack" (lines 55–56), that statement means that research about snow crystals has helped scientists to gauge (measure) the probable amount of snowmelt. Lines 84–85 specifically state that "the crystal research help[s] gauge snowmelt."

H because the passage states that, in the process of conducting research about snow crystals, physicist Kenneth Libbrecht "creates 'designer' snowflakes in his lab" (lines 31–32).

J because the passage states that research about snow crystals "is also useful in predicting avalanches" (line 85).

Passage I

Question 1. The best answer is B. The question postulates that water is unsafe for swimming if there are over 400 *E. coli* colonies per 100 mL of water. Figure 1 shows that on Day 30 at Site 1 there were 708 *E. coli* colonies per 100 mL of water. Based on the criterion of the question, the water would have been unsafe for swimming only on Day 30 at Site 1.

The best answer is NOT:

A because Figure 1 shows that on Day 1 at Site 1 there were 101 *E. coli* colonies per 100 mL of water. The question postulates that water is unsafe for swimming if there are over 400 *E. coli* colonies per 100 mL of water. Based on this criterion, the water would have been safe for swimming on Day 1 at Site 1.

C because Figure 1 shows that on Day 1 at Site 2 there were 16 *E. coli* colonies per 100 mL of water. The question postulates that water is unsafe for swimming if there are over 400 *E. coli* colonies per 100 mL of water. Based on this criterion, the water would have been safe for swimming on Day 1 at Site 2.

D because Figure 1 shows that on Day 30 at Site 2 there were 173 *E. coli* colonies per 100 mL of water. The question postulates that water is unsafe for swimming if there are over 400 *E. coli* colonies per 100 mL of water. Based on this criterion, the water would have been safe for swimming on Day 30 at Site 2.

Question 2. The best answer is F. The average for a site is determined by summing the values for a site and then dividing by 5 (the number of collection days). Based on the data in Figure 1, the average number of *E. coli* colonies per 100 mL of water at Site 1 was (101 + 92 + 708 + 9 + 5)/5 = 183, and the average number of *E. coli* colonies per 100 mL of water at Site 2 was (16 + 4 + 173 + 10 + 5)/5 = 41.6. The average water flow at Sites 1 and 2 can be calculated in a similar fashion; however, it is easier to recognize that in Figure 2 the water flow at Site 1 was greater than the water flow at Site 2 on each of the 5 days. Thus, the sum of the values for Site 1 is greater than the sum of the values for Site 2, so the average water flow calculated for Site 1 would be greater than the average water flow calculated for Site 2. Therefore, Site 1 had the higher water flow and also the higher *E. coli* level.

The best answer is NOT:

G because based on the data in Figure 1, the average number of *E. coli* colonies per 100 mL of water at Site 2 is less than the average number of *E. coli* colonies per 100 mL of water at Site 1.

H because based on the data in Figure 2, the average water flow at Site 2 is less than the average water flow at Site 1.

J because based on the data in Figure 2, the average water flow at Site 2 is less than the average water flow at Site 1, and, according to Figure 1, the average number of *E. coli* colonies per 100 mL of water at Site 2 is less than the average number of *E. coli* colonies per 100 mL of water at Site 1.

Question 3. The best answer is **B.** Table 2 shows that the average BI at Sites 1 and 2 was 6.3 and 2.5, respectively. Table 1 shows that the water quality associated with a BI of 6.3 and a BI of 2.5 is excellent and fair, respectively. Thus, Site 1 would have more stonefly larvae than Site 2, which is consistent with the students' hypothesis.

The best answer is NOT:

A because although the data in Table 2 are consistent with the hypothesis, Site 1 had a water quality rating of excellent, not good, and Site 2 had a water quality rating of fair, not poor.

C because the data in Table 2 are consistent, rather than inconsistent, with the hypothesis. Site 1 had a water quality rating of excellent, not poor, and Site 2 had a water quality rating of fair, not good.

D because the data in Table 2 are consistent, rather than inconsistent, with the hypothesis. Site 1 had a water quality rating of excellent, not fair, and Site 2 had a water quality rating of fair, not excellent.

Question 4. The best answer is **F.** The passage states: "*E. coli* levels that are above 100 colonies formed per 100 mL of water indicate reduced water quality." Figure 1 shows that at Site 1 there were 2 days on which *E. coli* colonies per 100 mL of water were greater than 100: Day 1 and Day 30. In contrast, Figure 1 shows that at Site 2 there was only 1 day on which *E. coli* colonies per 100 mL of water were greater than 100: Day 30. Thus, Figure 1 supports the claim that Site 1 had a *lower* water quality than Site 2.

The best answer is NOT:

G because Figure 2 shows water flow data but does not provide any information about the relationship between water flow and water quality.

H because Table 1 does not provide any data about Site 1 or Site 2.

J because Table 2 shows that Site 1 has a higher average BI than does Site 2. Because Table 1 shows that water quality ratings are better when the BI is higher, Table 2 supports the conclusion that Site 1 has a *higher* water quality on average than Site 2. It does not support the conclusion that Site 1 has a *lower* water quality than Site 2.

Question 5. The best answer is **D.** The entry of large amounts of fertilizer at Site 1 will cause eutrophication (an increase in nutrients that leads to an overgrowth of algae, a decrease in dissolved oxygen, and a decrease in the number and diversity of aquatic invertebrate animals). Eutrophication decreases the water quality, which would be reflected in a decrease in the BI for Site 1, based on the information in Table 1.

The best answer is NOT:

A because eutrophication will decrease, not increase, the water quality at Site 1, resulting in a decrease, not an increase, in the BI for the site.

B because eutrophication will decrease the water quality at Site 1, resulting in a decrease, not an increase, in the BI for the site.

C because eutrophication will decrease, not increase, the water quality at Site 1, resulting in a decrease in the BI for the site.

Passage II

Question 6. The best answer is G. The data in Table 1 for the volume of H_2 produced by Days 2, 4, 6, and 8 from the AWP 2 sample are: 21 mL, 187 mL, 461 mL, and 760 mL, respectively. The graph in G has a curve including the coordinates (2,21), (4,187), (6,461), and (8,760), which correspond with the data for AWP 2 in Table 1.

The best answer is NOT:

F because the curve in this graph does not include the coordinates (4,187) and (6,461). Thus, this curve does not represent the data for AWP 2.

H or J because the curve in neither graph includes the coordinates (2,21), (4,187), (6,461), and (8,760). Thus, the curve in neither graph represents the data for AWP 2.

Question 7. The best answer is B. The data in Table 1 for the volume of H_2 produced by Days 2, 4, 6, and 8 from the AWP 1 sample are: 4 mL, 33 mL, 81 mL, and 133 mL, respectively. So, the volume of H_2 produced by AWP 1 increased over time. Between Days 2 and 4, 29 mL of H_2 was produced; between Days 4 and 6, 48 mL of H_2 was produced; and between Days 6 and 8, 52 mL of H_2 was produced. So, between Days 8 and 10, more than 52 mL of H_2 would most likely have been produced, but not as much as 328 mL of H_2. Thus, the volume of H_2 produced by Day 10 from the AWP 1 sample would most likely have been between 133 mL and 461 mL.

The best answer is NOT:

A because the volume of H_2 produced by Day 10 from the AWP 1 sample would more likely have been between 133 mL and 461 mL than it would have been less than 133 mL.

C the volume of H_2 produced by Day 10 from the AWP 1 sample would more likely have been between 133 mL and 461 mL than it would have been between 461 mL and 760 mL.

D the volume of H_2 produced by Day 10 from the AWP 1 sample would more likely have been between 133 mL and 461 mL than it would have been greater than 760 mL.

Question 8. The best answer is F. The data in Table 1 for the volume of H_2 produced by Days 6 and 8 from the AWP 1 sample are: 81 mL and 133 mL, respectively. Thus, from the time the volume was measured on Day 6 until the time the volume was measured on Day 8, the volume increased from 81 mL to 133 mL. So, the volume of H_2 produced by AWP 1 from the time the volume was measured on Day 6 until the time the volume was measured on Day 8 was equal to 133 mL minus 81 mL, or 52 mL.

The best answer is NOT:

G, H, or J because the volume of H_2 produced by AWP 1 from the time the volume was measured on Day 6 until the time the volume was measured on Day 8 was equal to 52 mL.

Question 9. The best answer is C. The chemical equation in the passage shows that Al and H_2O react to produce $Al(OH)_3$ and H_2. For every 6 molecules of H_2O consumed, 2 atoms of Al are converted to 2 units of $Al(OH)_3$ and 3 molecules of H_2 are produced. Thus, by measuring the volume of H_2 produced in the trials represented in Table 1 and Figure 1, the experimenters were able to monitor the rate at which Al is converted to $Al(OH)_3$.

The best answer is NOT:

A because Al and H_2O are reactants, so H_2O is not converted to Al.

B because Al and H_2O are reactants, so Al is not converted to H_2O.

D because Al is a reactant and $Al(OH)_3$ is a product, so Al is converted to $Al(OH)_3$. The single right arrow in the chemical equation indicates that the reaction does not occur in reverse.

Question 10. The best answer is J. Table 1 shows that the volume of H_2 produced by Day 2 from the AWP 3 sample that contained no corrosion inhibitor was 121 mL. Figure 1 shows the volume of H_2 produced by Days 1, 4, 7, and 10 from the AWP 3 sample containing EDTA. By Day 1, the volume was approximately 20 mL; by Day 4, the volume was approximately 65 mL; by Day 7, the volume was approximately 100 mL; and by Day 10, the volume was approximately 120 mL. Thus, the volume of H_2 produced by Day 2 from the AWP 3 sample that contained no corrosion inhibitor and the volume of H_2 produced by Day 10 from the AWP 3 sample containing EDTA were approximately the same.

The best answer is NOT:

F because the volume of H_2 produced by Day 1 from the AWP 3 sample containing EDTA was approximately 20 mL, which is approximately 100 mL less than 121 mL.

G because the volume of H_2 produced by Day 4 from the AWP 3 sample containing EDTA was approximately 65 mL, which is approximately 56 mL less than 121 mL.

H because the volume of H_2 produced by Day 7 from the AWP 3 sample containing EDTA was approximately 100 mL, which is approximately 20 mL less than 121 mL.

Passage III

Question 11. The best answer is B. In Trial 5, Scale A's hand pointed in the same direction as did Scale B's hand. Thus, the force of the 10.0 N weight was equally distributed between Scales A and B, and the forces on the 2 scales were equal.

The best answer is NOT:

A because in Trial 4, Scale A's hand was pointing in a different direction than was Scale B's hand. Thus, the forces on the 2 scales were not equal.

C because in Trial 6, Scale A's hand was pointing in a different direction than was Scale B's hand. Thus, the forces on the 2 scales were not equal.

D because in Trial 5, Scale A's hand was pointing in the same direction as was Scale B's hand. Thus, the forces on the 2 scales were equal. So there was, in fact, a trial in which the force of the 10.0 N weight was equally distributed.

Question 12. The best answer is G. Trials 1 and 2 allow one to make 2 observations: (1) In Trial 2, when the 5.0 N weight was placed on Scale A, Scale A's hand rotated one-fourth of the way around Scale A's dial. (2) In Trial 1, when Scale A was placed on Scale B, Scale B's hand rotated one-fourth of the way around Scale B's dial. The first observation shows that when a 5.0 N object was placed on either of the 2 identical scales, the hand of that scale rotated one-fourth of the way around the scale's dial. The second observation shows that Scale A weighed 5.0 N because when it was placed on Scale B, Scale B's hand rotated one-fourth of the way around Scale B's dial. Thus, these 2 identical scales each weigh 5.0 N.

The best answer is NOT:

F because if Scale A weighed 2.5 N, then when Scale A was placed on Scale B in Trial 1, Scale B's hand would have rotated one-eighth of the way around Scale B's dial.

H because if Scale A weighed 7.5 N, then when Scale A was placed on Scale B in Trial 1, Scale B's hand would have rotated three-eighths of the way around Scale B's dial.

J because if Scale A weighed 10.0 N, then when Scale A was placed on Scale B in Trial 1, Scale B's hand would have rotated one-half of the way around Scale B's dial.

Question 13. The best answer is C. In Trial 3, a 10.0 N weight was placed on Scale A. No weight was placed on Scale A in Trial 1. Scale A's hand rotated a greater distance in Trial 3 than in Trial 1. As rotation of the hand increased, compression of the spring increased. As compression of the spring increased, the amount of potential energy stored in the spring increased. Thus, compared to Trial 1, during Trial 3 the hand rotated more, so the spring compressed more, so more potential energy was stored in the spring.

The best answer is NOT:

A because Scale A's spring was not compressed in Trial 1, so the amount of potential energy stored in Scale A's spring did not increase. In contrast, a 10.0 N weight was placed on the platform of Scale A in Trial 3, so Scale A's spring was compressed, and the amount of potential energy stored in Scale A's spring did increase. In addition, the amount of weight on the platform of Scale A was less in Trial 1 than in Trial 3.

B because Scale A's spring was not compressed in Trial 1, so the amount of potential energy stored in Scale A's spring did not increase. In contrast, a 10.0 N weight was placed on the platform of Scale A in Trial 3, so Scale A's spring was compressed, and the amount of potential energy stored in Scale A's spring did increase.

D because the amount of weight on the platform of Scale A was *greater* in Trial 3 than in Trial 1. Thus, Scale A's spring was compressed more in Trial 3, and the potential energy stored in Scale A's spring was greater in Trial 3 than in Trial 1.

Question 14. The best answer is F. The results of Study 1 indicate that each scale weighs 5 N, and that for either scale, the pointer rotates 90° clockwise for every 5 N exerted on the scale's platform, starting from the "0" mark. When Scale A is upside down, its weight is supported by its platform; therefore Scale A's pointer will rotate 90° clockwise. When Scale A is placed atop Scale B, the weight of Scale A is also supported by Scale B; therefore Scale B's pointer will also rotate 90° clockwise. The only figure that shows each scale supporting 5 N of weight is F.

The best answer is NOT:

G because the figure indicates that Scale B is supporting 10 N of weight, not 5 N.

H because the figure indicates that Scale A is supporting 10 N of weight, not 5 N.

J because the figure indicates that each scale is supporting 10 N of weight, not 5 N.

Question 15. The best answer is C. Scale B's hand rotated a greater distance in Trial 4 than in Trial 5. Scale B's hand rotated a greater distance in Trial 5 than in Trial 6. Furthermore, the distance between the 10.0 N weight and the pencil was less in Trial 4 than in Trial 5. Likewise, the distance between the 10.0 N weight and the pencil was less in Trial 5 than in Trial 6. These observations support the following 2 conclusions: (1) When the force exerted on the surface of Scale B's platform was greatest (Trial 4), the distance between the weight and the pencil was least (0.10 m). (2) When the force exerted on the surface of Scale B's platform was least (Trial 6), the distance between the weight and the pencil was greatest (0.30 m). Thus, as the distance between the 10.0 N weight and the pencil on Scale B increased, the amount of force exerted on the surface of Scale B's platform decreased.

The best answer is NOT:

A because in Study 2, the amount of force exerted on the surface of Scale B's platform varied and this force was a function of the distance between the 10.0 N weight and the pencil on Scale B.

B because in Study 2, the force was greater when the distance was shorter. Thus, as the distance increased, the force did not increase, it decreased.

D because in Study 2, there was a general trend. The force was greater when the distance was shorter.

Question 16. The best answer is J. The students wanted to ensure that in Trials 4–6, the distance that each scale's hand rotated around the corresponding dial was a function of the force exerted by the 10.0 N weight. That is, they did not want to measure how the force exerted on the scale's platform was affected by the weight of the board or by the weight of the pencils. By setting the dial readings of both scales to zero, *after* the board and the pencils were positioned on the scales, the students ensured that the dial readings were a function of the force exerted by the 10.0 N weight. In other words, the weights of the board and pencils were subtracted from each weight measurement.

The best answer is NOT:

F or H because the weights of the scales did not affect the measured weights. Setting the dial readings of both scales to zero after Study 1 eliminated the weights of the board and pencils from the observed reading. It was not designed to eliminate the weights of the scales.

G because by setting the dial reading of both scales to zero after the board and pencils were placed on the scales, the weights of the board and pencils were *subtracted* from each weight measurement, not added.

Passage IV

Question 17. The best answer is B. According to Table 2, as engine speed increased from 1,500 rpm to 3,500 rpm, the EOR decreased from 97.4 to 90.6. An increase in engine speed was always accompanied by a decrease in the EOR. The EOR is the minimum octane number of a fuel required for an engine to operate without becoming damaged. Thus, as engine speed increases, the minimum octane number of a fuel required for an engine to operate without becoming damaged decreases only.

The best answer is NOT:

A, C, or D because according to Table 2, an increase in engine speed was always accompanied by a decrease in the EOR.

Question 18. The best answer is G. In Experiment 3, the octane number always decreased as engine speed increased for both Fuel A and Fuel B. So, the results of a trial performed at an engine speed of 2,200 rpm would most likely have been between the results of the trial performed at an engine speed of 2,000 rpm and the results of the trial performed at an engine speed of 2,500 rpm. For Fuel A, the octane numbers determined at engine speeds of 2,000 rpm and 2,500 rpm were 96.6 and 95.0, respectively. The octane number of 96.1 falls between these 2 values. For Fuel B, the octane numbers determined at engine speeds of 2,000 rpm and 2,500 rpm were 96.1 and 95.4, respectively. The octane number of 95.8 falls between these 2 values.

The best answer is NOT:

F, H, or J because at an engine speed of 2,200 rpm, the octane number determined for Fuel A would most likely have been less than 96.6 and greater than 95.0, and the octane number determined for Fuel B would most likely have been less than 96.1 and greater than 95.4.

Question 19. The best answer is C. Table 1 shows that the octane number of each fuel mixture is equal to the percent by volume of isooctane in the mixture. Thus, the octane number of each fuel mixture is equal to 100 times the volume of isooctane in the mixture divided by the sum of the volume of heptane and the volume of isooctane in the mixture.

The best answer is NOT:

A because the denominator of the fraction should be the sum of the volume of heptane and the volume of isooctane.

B because the numerator of the fraction should be the volume of isooctane and the denominator of the fraction should be the sum of the volume of heptane and the volume of isooctane.

D because the numerator of the fraction should be the volume of isooctane.

Question 20. The best answer is H. Table 1 shows that the octane number of a mixture of heptane and isooctane is equal to the percent by volume of isooctane in the mixture. A mixture of 100 mL of heptane and 900 mL of isooctane would be 10% heptane and 90% isooctane by volume. So, the octane number of this mixture would be 90. The passage states that adding TEL to a fuel changes the fuel's octane number. Experiment 2 shows that adding 3 mL of TEL to 1,000 mL of isooctane increased isooctane's octane number from 100 to 125. If 3 mL of TEL were added to a mixture of 100 mL of heptane and 900 mL of isooctane, the octane number of the resulting fuel would most likely be between 90 and 125.

The best answer is NOT:

F or G because the fuel is 10% heptane and 90% isooctane by volume and contains 3 mL of TEL. So, the octane number of the fuel would most likely exceed 90.

J because the fuel is 10% heptane and 90% isooctane by volume and contains 3 mL of TEL. So, the octane number of the fuel would most likely exceed 90, but not 125.

Question 21. The best answer is B. The octane number of a fuel should be equal to or higher than the minimum octane number of a fuel required for an engine to operate without becoming damaged, or the EOR. In Experiment 3, the slowest engine speed tested was 1,500 rpm and the fastest engine speed tested was 3,500 rpm. At all engine speeds tested in Experiment 3, the octane number of Fuel A was higher than the EOR. At an engine speed of 1,500 rpm, the octane number of Fuel B was lower than the EOR.

The best answer is NOT:

A because the octane number of Fuel A was higher than the EOR at each of the engine speeds tested.

C because the octane number of Fuel B was lower than the EOR only at an engine speed of 1,500 rpm.

D because the octane number of Fuel B was lower than the EOR at an engine speed of 1,500 rpm.

Question 22. The best answer is J. Table 1 shows that the octane number of a mixture of heptane and isooctane is equal to the percent by volume of isooctane in the mixture. A mixture of 2 mL of heptane and 8 mL of isooctane would be 20% heptane and 80% isooctane by volume. So, the octane number of this mixture would be 80.

The best answer is NOT:

F, G, or H because a mixture of heptane and isooctane that is 20% heptane and 80% isooctane by volume would have an octane number of 80.

Passage V

Question 23. The best answer is C. Scientist B states that short-period comets were once long-period comets. Thus, Scientist B believes that long-period comets can become short-period comets.

The best answer is NOT:

A because Scientist B states that short-period comets were once long-period comets. Thus, Scientist B would disagree with the generalization that long-period comets cannot become short-period comets.

B because Scientist B does not discuss whether short-period comets can become long-period comets. This generalization is neither consistent nor inconsistent with Scientist B's viewpoint.

D because the introduction states that comets orbit the Sun. Scientist B does not make any statements that contradict the notion that comets orbit the Sun.

Question 24. The best answer is H. Scientist A states that short-period comets originate within the KB, that the KB is 30 A.U. to 50 A.U. from the Sun, and that the KB has a small inclination with respect to the ecliptic plane. Telescopic evidence of the KB would support Scientist A's viewpoint. Thus, Scientist A would want to use the telescope to search the region of space that is 30 A.U. to 50 A.U. from the Sun and that has a small inclination with respect to the ecliptic plane, for example 0° to 30° with respect to the ecliptic plane.

The best answer is NOT:

F because Scientist A's viewpoint would be best supported by finding evidence of the KB. However, the KB is between 30 A.U. to 50 A.U. from the Sun. Searching regions of space that are 100,000 A.U. beyond our solar system would not help to establish the existence of the KB.

G because Scientist A's viewpoint would be best supported by finding evidence of the KB. Scientist A states that short-period comets originate within the KB. Scientist A also states that the KB has a small inclination with respect to the ecliptic plane. Thus, Scientist A would not predict that the KB would be found by searching regions of space that are at a 90° angle with respect to the ecliptic plane.

J because Scientist A's viewpoint would be best supported by finding evidence of the KB. Scientist A does not state that Jupiter is near the KB. Thus, it is unlikely that Scientist A would want to search regions near Jupiter for evidence of the KB.

Question 25. The best answer is D. The introduction states that short-period comets have orbital planes with inclinations of 30° or less. So, short-period comets should not have orbital planes with inclinations of 45° with respect to the ecliptic plane.

The best answer is NOT:

A, B, or C because the introduction states that short-period comets have orbital planes with inclinations of 30° or less; so, some short-period comets could have orbital planes with inclinations of 5° (A), 15° (B), or 30° (C) with respect to the ecliptic plane.

Question 26. The best answer is J. Scientist B says that long-period comets can become short-period comets when the long-period comets pass close enough to giant planets to be influenced by the gravitational fields of the giant planets. Of the 4 planets listed, Saturn is the only giant planet. So, of the 4 planets listed, Saturn would be the planet most likely to influence the orbit of a long-period comet.

The best answer is NOT:

F because Mercury is not a giant planet, so Mercury would be unlikely to influence the orbit of a long-period comet.

G because Earth is not a giant planet, so Earth would be unlikely to influence the orbit of a long-period comet.

H because Mars is not a giant planet, so Mars would be unlikely to influence the orbit of a long-period comet.

Question 27. The best answer is A. The introduction states that short-period comets have orbital periods of 200 yr or less and that long-period comets originate in the Oort Cloud. In addition, Scientist B states that the KB does not exist and that short-period comets were once long-period comets. Thus, because Comet Halley has an orbital period of 76 yr, it is by definition a short-period comet. Thus, Scientist B would most likely propose that it was once a long-period comet that originated in the Oort Cloud.

The best answer is NOT:

B or D because Scientist B states that the KB does not exist.

C because the Introduction states that long-period comets have orbital periods of more than 200 yr. So Comet Halley cannot be a long-period comet.

Question 28. The best answer is J. Scientist A states that the KB contains billions of comet-size icy bodies with diameters between 10 km and 30 km. Scientist A also states that there is telescopic evidence of larger icy bodies that are part of the KB. These larger icy bodies would have diameters greater than the comet-size icy bodies: that is, greater than 30 km.

The best answer is NOT:

F, G, or H because based on Scientist A's viewpoint, the larger icy bodies in the KB should have diameters that are greater than 30 km.

Question 29. The best answer is **D.** The 2 scientists do not disagree about the presence of the Oort Cloud. In addition, the finding that a nearby star lacked a spherical shell of material similar to the Oort Cloud would not affect the scientists' viewpoints.

The best answer is NOT:

A because this discovery would not affect Scientist A's viewpoint.

B because this discovery would not affect Scientist B's viewpoint.

C because this discovery would not affect Scientist A's or Scientist B's viewpoint.

Passage VI

Question 30. The best answer is **J.** Each line had a lower average fruit mass when it was grown in 120 g of NaCl/10 L of nutrient solution than when it was grown in 60 g of NaCl/10 L of nutrient solution, and Line 4 produced less fruit mass, on average, than did Line 2. Thus it is most likely that a plant that produced no fruit and had a height of only 21 cm came from Line 4 and that this plant was grown in 120 g of NaCl/10 L of nutrient solution.

The best answer is NOT:

F or G because Line 2 plants produced more fruit mass than did Line 4 plants.

H because Line 4 plants grown in 60 g of NaCl/10 L of nutrient solution produced more fruit mass than did Line 4 plants that were grown in 120 g of NaCl/10 L of nutrient solution.

Question 31. The best answer is **C.** The passage refers to osmosis occurring between the cytoplasm of the plants' cells and the environment, and the cell membrane separates the cytoplasm of the plants' cells and the environment.

The best answer is NOT:

A because the chromosomes do not separate the cytoplasm of the plants' cells and the environment.

B because the nuclear envelope does not separate the cytoplasm of the plants' cells and the environment.

D because the rough endoplasmic reticulum does not separate the cytoplasm of the plants' cells and the environment.

Question 32. The best answer is G. NaCl is a salt. In addition, for each line, average plant mass was greater in 3 g of NaCl/10 L of nutrient solution than in 60 g of NaCl/10 L of nutrient solution, and average plant mass was greater in 60 g of NaCl/10 L of nutrient solution than in 120 g of NaCl/10 L of nutrient solution. Thus, as the concentration of NaCl increased, average plant mass decreased only.

The best answer is NOT:

F, H, or J because average plant mass was greater in 3 g of NaCl/10 L of nutrient solution than in 60 g of NaCl/10 L of nutrient solution, and average plant mass was greater in 60 g of NaCl/10 L of nutrient solution than in 120 g of NaCl/10 L of nutrient solution. Thus, as the concentration of NaCl increased, average plant mass never increased.

Question 33. The best answer is A. The independent variable is the variable that is controlled by the experimenter. In the experiment, the experimenter determined whether or not each line received the *AtNHX1*.

The best answer is NOT:

B because all of the plants were tomato plants, so this factor was not varied.

C because the value of the plant mass without fruit was not directly controlled by the experimenter.

D because the value of the plant height was not directly controlled by the experimenter.

Question 34. The best answer is J. As height increased, mass increased. This results in a positive slope, because a positive change along the x-axis corresponds with a positive change along the y-axis.

The best answer is NOT:

F because the line would be vertical only if all of the points had the same x-value, but there was variability in plant height.

G because the line would have a slope of zero only if all of the points had the same y-value. However, there was variability in plant mass without fruit.

H because the line would have a negative slope only if as height increased, mass decreased. However, as height increased, mass increased.

Question 35. The best answer is D. The control line was the line that did not receive *AtNHX1*, and L4 did not receive *AtNHX1*.

The best answer is NOT:

A because the control line was the line that did not receive *AtNHX1*, and L1 received *AtNHX1*.

B because the control line was the line that did not receive *AtNHX1*, and L2 received *AtNHX1*.

C because the control line was the line that did not receive *AtNHX1*, and L3 received *AtNHX1*.

Passage VII

Question 36. The best answer is F. Figure 2 shows that as the length of the insulated copper rods increased from 2 cm to 12 cm, R continually decreased from about 175 W to about 40 W. In contrast, Figure 3 shows that as the cross-sectional area of the insulated copper rods increased from 1 cm^2 to 6 cm^2, R continually increased from about 30 W to about 145 W. Likewise, Table 1 shows that as ΔT increased from 10°C to 50°C, R continually increased from 24 W to 118 W. Since the radius of the insulated copper rods is directly proportional to the cross-sectional area of the insulated copper rods, as the radius of the insulated copper increased, R continually increased.

The best answer is NOT:

G because Figure 3 shows that as the cross-sectional area of the insulated copper rods increased from 1 cm^2 to 6 cm^2, R continually increased from about 30 W to about 145 W.

H because Table 1 shows that as ΔT increased from 10°C to 50°C, R continually increased from 24 W to 118 W.

J because the radius of the insulated copper rods is directly proportional to the cross-sectional area of the insulated copper rods, and Figure 3 shows that as the cross-sectional area of the insulated copper rods increased from 1 cm^2 to 6 cm^2, R continually increased from about 30 W to about 145 W.

Question 37. The best answer is C. Figure 2 shows that R is directly proportional to the cross-sectional area of the rods. Since the cross-sectional area of B is double the cross-sectional area of A, R for B will be twice as much as R for A. So the ratio of R for B to R for A will be 2:1.

The best answer is NOT:

A because Figure 2 shows that R is directly proportional to the cross-sectional area of the rods. Since the cross-sectional area of B is double the cross-sectional area of A, R for B will be twice as much as R for A. So the ratio of R for B to R for A will be 2:1, not 1:4.

B because Figure 2 shows that R is directly proportional to the cross-sectional area of the rods. Since the cross-sectional area of B is double the cross-sectional area of A, R for B will be twice as much as R for A. So the ratio of R for B to R for A will be 2:1, not 1:2.

D because Figure 2 shows that R is directly proportional to the cross-sectional area of the rods. Since the cross-sectional area of B is double the cross-sectional area of A, R for B will be twice as much as R for A. So the ratio of R for B to R for A will be 2:1, not 4:1.

Question 38. The best answer is H. In metal rods, heat is primarily transferred through conduction.

The best answer is NOT:

F because in metal rods, more heat is transferred through conduction than through radiation.

G because in metal rods, more heat is transferred through conduction than through convection.

J because in metal rods, more heat is transferred through conduction than through radiation and convection.

Question 39. The best answer is A. Figure 2 shows that as the length of the insulated copper rods increases, R decreases. So, the shortest rod will have the greatest R.

The best answer is NOT:

B because the insulated copper rod in A is shorter than the insulated copper rod in B.

C because the insulated copper rod in A is shorter than the insulated copper rod in C.

D because the insulated copper rod in A is shorter than the insulated copper rod in D.

Question 40. The best answer is F. Table 1 shows that as ΔT increases, R increases. In F, $\Delta T = 280°C - 250°C = 30°C$, which is greater than the ΔT in G, H, and J.

The best answer is NOT:

G because Table 1 shows that as ΔT increases, R increases. In G, $\Delta T = 280°C - 260°C = 20°C$, which is less than 30°C.

H because Table 1 shows that as ΔT increases, R increases. In H, $\Delta T = 300°C - 280°C = 20°C$, which is less than 30°C.

J because Table 1 shows that as ΔT increases, R increases. In J, $\Delta T = 310°C - 300°C = 10°C$, which is less than 30°C.