



AMERICA'S PREMIERE TESTING READINESS PROGRAM

ACT[®]
(Form Code 1460E)



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5 Ways to Increase Score Gains Using Cambridge's *Navigator Plus*

Navigator Plus is Cambridge's complete explanation guide to a previously administered test. It includes explanations for each item on the test, categorization for each item, an answer key, and more.

The following list provides suggestions for implementing the Navigator into your program to increase score gains.

- 1. Simulate test day as much as possible when proctoring tests.** Students will benefit from a testing experience that closely simulates what they will experience on test day. They will feel more confident if they know what to expect.
- 2. Follow up when you receive your data.** Use the reports you receive from Cambridge to cover the items your class struggled as a group to answer (see the Error Analysis report). Taking this step within two weeks of administering the test will ensure that your students haven't forgotten the items you cover and will be able to learn from their testing experiences.
- 3. Use the Pre-Assessment Item references in the *Victory* lesson to illustrate key points.** Your teacher's guide includes references to items on your pre-assessment that you can use as additional examples. Keep a copy of your pre-assessment test booklet handy so that you can cover these items with your students. Using pre-assessment items as additional examples helps students connect the concepts you are teaching with their test-day experiences.
- 4. Don't forget to review the wrong answers.** Many explanations in this Navigator packet include references to each wrong answer choice. Students will benefit from reviewing why each wrong answer is wrong so that they can recognize what makes the right answer correct and use the process of elimination to eliminate similar wrong answers in the future.
- 5. Pay attention to item categories.** Each item in this Navigator packet includes a category path that corresponds to the course concept outline in your *Victory* text as well as the categories listed in the Item Index of your *Victory* text. Use the Item Index to identify items students can use for further practice.

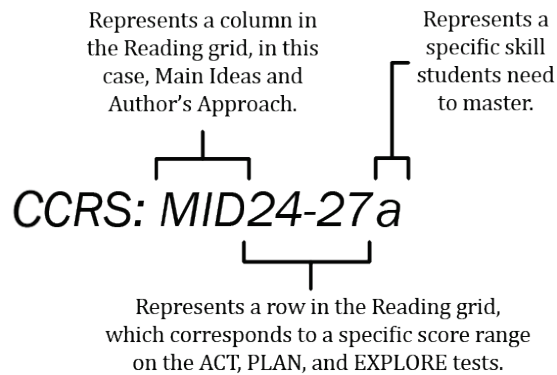
Category Paths, College and Career Readiness Standards, and Common Core State Standards

Throughout these explanations, each item is categorized in three ways.* First, each explanation includes a **Cambridge Category Path** which links the item to the Course Concept Outline in Cambridge's *Victory* series. For example:

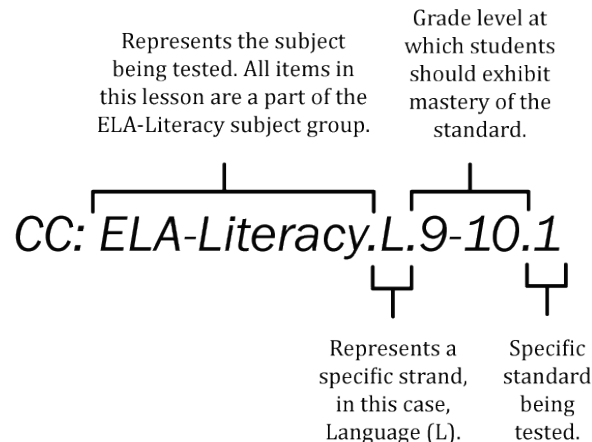
Mathematics/Geometry/Triangles/Pythagorean Theorem

An item with this particular category path is found in the Mathematics Test (based on Level 1 of the category path, mathematics) and tests students' knowledge of geometry (Level 2 of the category path), more specifically of triangles (Level 3), and even more specifically of the Pythagorean theorem (Level 4). The *Victory* Mathematics Lesson includes a section on the Pythagorean theorem, which you can find by referencing the Course Concept Outline at the beginning of the mathematics section in the *Victory* book. Additionally, you can find items testing geometry, triangles, or the Pythagorean theorem using the Item Index at the end of the *Victory* Student Text and Teacher's Guide.

Second, each explanation includes a **College and Career Readiness Standard (CCRS)** that references a specific standard in the College and Career Readiness Standards grid. College and Career Readiness Standards were developed by ACT, Inc. to indicate the skills represented within given score ranges. See the tables on the next page for an outline of the entire test sorted into the College and Career Readiness Standards. Here is an example of a College and Career Readiness Standard reference:



Third, most explanations include a **Common Core Skill (CC)** which references a specific standard in the Common Core State Standards Initiative that the item tests.* Here is an example of a Common Core skill reference:



*Not every item corresponds directly to a Common Core State Standard. In such cases, a Common Core State Standard will not be listed.



ACT ENGLISH TEST EXPLANATIONS

NOTE: Some of the items do not have an equivalent Common Core State Standard. Only the College and Career Readiness Standard will be listed for such items.

1. **(D) English/Rhetorical Skills/Style/Conciseness. CCRS: WC 16–19a. CC: ELA-Literacy.L.9–10.3.** The sentence as written contains redundant information: by definition, people who are kneeling are “on their knees.” The underlined portion of the sentence should be omitted, (D). (B) and (C) are wrong because both of these choices simply rephrase the redundancy rather than eliminating it.
2. **(H) English/Usage and Mechanics/Sentence Structure/Problems of Coordination and Subordination. CCRS: SSF 20–23a. CC: ELA-Literacy.L.9–10.3.** The original sentence is confusing. The comma and “which” seem to introduce a subordinate thought, but this thought is never completed. Rather, the information contained in the supposed subordinate clause is actually the main point of the sentence: The gigantic engines catch and roar. (H) makes this correction by removing the relative pronoun and simplifying the structure of the sentence. Both (G) and (J) use other relative pronouns and therefore fail to correct the error.

TIP Make sure the answer choice you select does not leave any unfinished thoughts. Any subordinate clause should be a part of a complete sentence.
3. **(D) English/Usage and Mechanics/Sentence Structure/Comma Splices. CCRS: COU 16–19a. CC: ELA-Literacy.L.9–10.1.** The sentence as written contains a comma splice; the first and second clauses of the sentence, both of which are independent clauses, are joined by only a comma. In addition to this error, the wording of the sentence is awkward: “you now can entertain.” What the writer intends to say is that it is too late to entertain any second thoughts. Before you can wonder whether you have made the right decision, the plane has taken off. (D) solves both problems of the original by subordinating the first clause of the sentence and providing the intended meaning: “before you can entertain any second thoughts, the plane has taken off.” (B) is incorrect because it does not solve the problem of the comma splice. (C) is incorrect because it provides an illogical meaning: it is too late for any second thoughts.
4. **(F) English/Usage and Mechanics/Grammar and Usage/Verb Tense. CCRS: COU 13–15a. CC: ELA-Literacy.L.8.1.** The sentence is correct as written. The first verb of the clause is “has taxied.” “Taken” correctly parallels this structure. (Note that “has” serves both “taxied” and “taken.”)
5. **(C) English/Usage and Mechanics/Grammar and Usage/Diction. CCRS: COU 28–32a. CC: ELA-Literacy.L.11–12.1.** This problem tests a common error. Many writers confuse “its,” which is the possessive form of “it,” with “it’s,” which is the contraction for “it is.” Here, “it” refers to the plane mentioned in the previous sentence. The contraction, not the possessive form, is needed. If we look at the answer choices, however, “it’s” is not available. Instead, choose “it is,” (C). (B) is incorrect because “its” is not a correct form in English. (D) is incorrect because there is no reason to use the past tense. The narration is taking place in the present tense.
6. **(F) English/Rhetorical Skills/Style/Conciseness. CCRS: WC 16–19a. CC: ELA-Literacy.L.9–10.3.** The sentence is correct as written. “An altitude of three thousand feet” is the most concise way to express the intended thought. (G), (H), and (J) are wrong because they all add unnecessary words. Since the word “altitude” means “height above sea level,” including “up” or “up in the air” is redundant.
7. **(B) English/Usage and Mechanics/Sentence Structure/Problems of Coordination and Subordination. CCRS: SSF 24–27a. CC: ELA-Literacy.L.11–12.6.** The original sentence is wrong because the ideas should not be joined with a semicolon. A semicolon is used to join two independent clauses. However, in this sentence, the clause following the semicolon is not independent because of the relative pronoun

“that.” Therefore, the clause as written is a dependent clause. The best way to correct this error is to remove the semicolon: “it is impossible to talk...over the engines’ roar and the noise of the wind...” This correction eliminates the dependent clause and also communicates the intended meaning of the sentence more clearly: that it is impossible to talk over both the engines’ roar and the noise of the wind. (B) is the correct answer. (C) and (D) are incorrect because both of these corrections create a sentence fragment after the period.

8. **(G) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: TOD 20–23b. CC: ELA-Literacy.L.9–10.3.** The question asks which of the choices would best convey the narrator’s growing sense of nervousness. (G) is the best choice. By revealing that the narrator might protest if given the chance, (G) strongly conveys the narrator’s nervousness. In addition, it fits in well with the preceding sentence: it is impossible to protest, although the narrator is tempted to do just that. (F) is a weak choice because it doesn’t convey nervousness, and the same idea has already been expressed in the previous sentence. (H) is also a weak choice. It states simply that the narrator doesn’t say anything, without giving us any information about his or her mental state. (J) conveys the wrong idea – it says that the narrator is having a great time, not that he or she is growing increasingly nervous.
9. **(D) English/Rhetorical Skills/Paragraph-Level Structure. CCRS: ORG 24–27b. CC: ELA-Literacy.L.11–12.3.** For this question, you need to evaluate the order of the sentences in the paragraph. This paragraph is explaining the steps leading up to the jump. As written, the paragraph doesn’t make sense. The jumper flies out the door of the plane before any of the preliminary steps are taken (reaching altitude, crawling to the doorway, seeing the instructor signal, and nodding at the instructor). Since all of these other steps logically happen before the jump, Sentence 1 needs to be placed at the end of the paragraph, after Sentence 5. (A), (B), and (C) are wrong because in all of them, the jumper jumps out of the plane before the preliminary steps are taken.
10. **(H) English/Usage and Mechanics/Punctuation/Commas. CCRS: COP 13–15a. CC: ELA-Literacy.L.8.1.** The sentence as written is incorrect because the comma is unnecessary. It disrupts the flow of the sentence without a good reason for doing so. The best correction is to remove the comma, (H). (G) and (J) are incorrect because both of them contain the unnecessary comma. In addition, (J) is awkwardly worded.
11. **(B) English/Rhetorical Skills/Strategy/Effective Transitional Sentence. CCRS: ORG 24–27a. CC: ELA-Literacy.L.11–12.3.** This item tests the transition between two ideas. The beginning of the paragraph describes the narrator’s reaction as he or she jumps out of the plane: panic, fear, even feelings of becoming ill. The next sentence explains that it is only a few seconds before the parachute opens. A transition word that expresses that contrast is needed here, and “however,” (B), is the best choice. (A) is wrong because “furthermore” is used to express the continuation of an idea, not a contrasting idea. (C) and (D) are wrong because “thus” and “consequently” indicate a cause and effect relationship between the first and the second ideas, something which is illogical here.
12. **(H) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: TOD 20–23b. CC: ELA-Literacy.L.9–10.3.** The item stem specifies that the writer wants to convey the violence of the parachute’s opening. (F) and (G) can both be rejected because they are too matter-of-fact; “becomes tight and opens” and “tightens and opens” don’t convey any particular violence. (J) is a little better because it at least adds the word “quickly” to describe the speed of the action. However, (H) is the best choice. The word “yanks” gives the reader a clear idea of the violence of the action.
13. **(A) English/Usage and Mechanics/Punctuation. CCRS: COP 28–32b. CC: ELA-Literacy.L.11–12.2.** This item tests conventions of punctuation. Both (B) and (D) insert unnecessary commas that disrupt the flow of the sentence. (C) creates a question out of a statement, and (D) also adds an unnecessary exclamation mark. The sentence is correct as written.



14. (J) *English/Rhetorical Skills/Strategy/Effective Transitional Sentence*. CCRS: ORG 24–27a. CC: ELA-Literacy.L.11–12.3. This item tests the use of transition words within a paragraph. Look at the sentence before the one in question: “you begin to drift...and...appreciate your accomplishment.” The next sentence is a continuation of this thought: “you are dangling half a mile above the earth!” (F) doesn’t make sense here because “thus” is used with cause and effect relationships, and there is no causal connection between the two sentences. (G) and (H) are wrong because not only do they use transition words that create illogical relationships between the sentences, they also both create sentence fragments. (J) is the best answer because it creates a logical connection between the two sentences.
15. (A) *English/Rhetorical Skills/Strategy/Effective Concluding Sentence*. CCRS: ORG 24–27c. CC: ELA-Literacy.L.11–12.3. The item stem asks for a closing sentence that indicates that the narrator feels relaxed. (A) is the best choice because it expresses relief and the conviction that jumping from a plane was, in fact, a good idea. (B) and (D) still contain a hint of nervousness – (B) about the landing and (D) about the idea of jumping from a plane in the future. (C) is too vague to convey any particular emotion.
16. (J) *English/Rhetorical Skills/Style/Conciseness*. CCRS: WC 16–19a. CC: ELA-Literacy.L.9–10.3. The underlined portion is incorrect because it does not add anything to the meaning of the sentence. The best thing to do is to remove it, as reflected in answer choice (J). (G) and (H) are wrong because they are simply variations on the original – extra words that don’t add any extra meaning to the sentence.
17. (C) *English/Usage and Mechanics/Punctuation/Commas*. CCRS: COP 16–19b. CC: ELA-Literacy.L.11–12.2. This item tests comma usage. The answer choices offer several similar variations, so it’s easy to get confused. First, the comma after “impatient” is not necessary. This comma disrupts the flow of the thought for no good reason and should be removed. This means that both (A) and (D) are incorrect. Using the process of elimination, we are left with (B) and (C). Both choices use a comma after “wheezing,” which correctly separates the two adjectives (“wheezing” and “tinny”) that are used to describe “notes.” The only remaining question is whether a comma is needed after “tinny,” as in (B). Again, the answer is “no.” A comma is not necessary between the final adjective in a series and the noun it describes. Thus, (B) can be eliminated. (C) correctly punctuates the sentence.
18. (J) *English/Usage and Mechanics/Sentence Structure/Problems of Coordination and Subordination*. CCRS: SSF 24–27a. CC: ELA-Literacy.L.11–12.6. As written, the sentence is a fragment. It contains a phrase (“after two weeks’ effort”) and a subordinate clause (“which...to the baseball field”) with no main clause to support them. (J) solves this problem by removing “which,” thereby turning the subordinate clause into an independent clause. (G) is wrong because “then” is redundant. The first phrase already uses the time marker “after,” so using “then” is unnecessary. (H) has the same problem as the original.
19. (C) *English/Usage and Mechanics/Grammar and Usage/Verb Tense*. CCRS: COU 13–15a. CC: ELA-Literacy.L.8.1. The original is wrong because “had went” is not a correct verb tense. The correct form of the past perfect is “had gone.” However, the past perfect is not what is needed here. The sentence is describing habitual actions in the past, using “would” and the base form of the verb. The first verb in the clause is “set,” so use a parallel verb here: “go.” (C) is correct. Both (B) and (D) use the incorrect form “would of,” which is always incorrect. The correct usage is “would have.”
20. (G) *English/Usage and Mechanics/Sentence Structure/Comma Splices*. CCRS: SSF 16–19a. CC: ELA-Literacy.L.9–10.3. The original contains a comma splice – two sentences joined together with only a comma. (G) corrects this error by dividing the two sentences with a period. This item is a little tricky because of the periods in “B.C.,” but the uppercase “t” in “This” indicates that the material starting with “This” is a new sentence. (H) is incorrect because, while it corrects the comma splice, it introduces a new error. The main verb of the original, “consisted,” has been changed to “consisting,” which turns the sentence into a fragment. (J) fails to correct the comma splice.

21. **(C) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: WC 33–36a. CC: ELA-Literacy.L.11–12.4.** The original is incorrect because the previous sentence states that the harmonica originated in China—it would be redundant. (B) and (D) are incorrect for similar reasons. Earlier in the passage, the author mentions that he has tried to learn the harmonica before, and that his father has tried to teach him to play. The best choice is the most concise, (C).
22. **(F) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: TOD 20–23b. CC: ELA-Literacy.L.9–10.3.** For this item, you need to decide which of the options best fits into the paragraph. The process of elimination works well for an item like this. (G) can be eliminated because the focus is on London, not on the harmonica. (H) is incorrect because it discusses the mechanics of playing the harmonica, not the historical context, which is what the item stem asks for. (J) is similar to (G); it is wrong because the focus of this sentence is not on the harmonica but on something else, in this case, Benjamin Franklin. (F) is the correct answer. It gives a relevant detail about the history of the harmonica.
23. **(D) English/Usage and Mechanics/Sentence Structure/Unintended Meanings. CCRS: SSF 20–23a. CC: ELA-Literacy.L.9–10.3.** This item contains a thought-reverser. You need to find the position in which “originally” is LEAST acceptable. Test the answer choices. (A), (B), and (C) are all acceptable, though (A) and (B) sound a little awkward. (D), however, changes the meaning of the sentence. This wording makes it sound as though the harmonica was explicitly marketed as having first been a child’s toy, and then as being something else.
24. **(F) English/Usage and Mechanics/Sentence Structure/Problems of Coordination and Subordination. CCRS: SSF 24–27b. CC: ELA-Literacy.L.11–12.1.** The question here is how to punctuate the division between the subordinate clause and the independent clause that make up this sentence. The original is correct because the comma appropriately separates the clauses. (G) is incorrect because a semicolon can separate two independent clauses but not a subordinate and an independent clause. (H) is incorrect because it eliminates all punctuation, and a comma is needed to separate the clauses. (J) is incorrect because the addition of “that” turns the second clause into a subordinate clause, which alters the structure of the sentence.
25. **(A) English/Rhetorical Skills/Strategy/Effective Transitional Sentence. CCRS: ORG 20–23c. CC: ELA-Literacy.L.9–10.3.** A good transition sentence serves as a bridge between previous ideas and the ones to come. (A) accomplishes this perfectly. The writer has just finished talking about the history of the harmonica and is about to talk about taking a class in harmonica playing. (A) touches on both these ideas, which makes it a good choice for a transitional sentence. (B) is a worthless sentence – it adds nothing to the passage and is too casual for written English. (C) uselessly repeats information already well-established in the passage – that the writer is interested in the harmonica. (D) is wrong because it doesn’t connect well to either of the two paragraphs.
26. **(H) English/Usage and Mechanics/Grammar and Usage/Pronoun Usage. CCRS: COU 28–32a. CC: ELA-Literacy.L.11–12.1.** This item requires that you use the appropriate pronoun in the context of the sentence. More specifically, this item demands that you have an understanding of the difference between the subject and the object in a sentence. “Who” is a subject pronoun, while “whom” is an object pronoun. As for the original, the pronoun in this context needs to function as the subject of the verb phrase “had performed.” Since “whom” is an object pronoun, the original construction is wrong.



If you are confused as to whether “who” or “whom” is the correct pronoun to use in a clause or sentence, test the material in question by replacing the given pronoun with alternative subject and object pronouns (e.g., “he/him” or “she/her”). Substituting pronouns that are easier to work with should make clear whether “who” or “whom” is appropriate. For example, substitute “he” for “who” and “him” or “whom” in the sentence. In this case, the clause “he had performed in local rock



bands” is correct, while the clause “him had performed in local rock bands” is not. So, (H) is the correct answer choice.

(G) is wrong for two reasons. First, as already discussed, “whom” is not the appropriate pronoun in this context. Second, the idea that the instructor “once” performed in local rock bands “for years” is illogical.

(J) is wrong because “did performed” is not a correct verb form. What would be needed in this case is either the simple past tense form (“performed”) or the verb “did” immediately followed by the infinitive tense (“did perform”).

27. **(B) English/Usage and Mechanics/Punctuation/Commas. CCRS: COP 28–32b. CC: ELA-Literacy.L.11–12.2.** The problem with the original is that the third comma disrupts the logical flow of the sentence. The conjunction “that” is used to introduce the noun clause “the entire class sat,” so the comma located between the two is inappropriate. (B) is the correct answer choice because it removes the unnecessary comma, while leaving the other two necessary commas in place.

(C) fails to solve the problem of the original. Additionally, (C) removes the comma between the coordinate adjectives “pure” and “sad.” Since both of these adjectives are used to modify the noun “wail” and are of equal importance, they must be separated by a comma.

(D) is wrong for two reasons. First, as with (C), this version removes the comma that is needed to separate the coordinate adjectives “pure” and “sad.” Second, (D) relocates the first underlined comma from before the conjunction “but” to after the conjunction. As it is positioned in the original, the first comma correctly separates the preceding independent clause from the remainder of the sentence. (D), however, suggests that the phrase “with such a pure sad wail” is a non-restrictive element that is not essential to the overall meaning of the sentence. Removing this phrase would result in an incomplete and confusing construction: “Then he played the same melody but that the entire class sat in stunned silence when he’d finished.”

28. **(J) English/Rhetorical Skills/Organization/Sentence-Level Structure. CCRS: ORG 24–27b. CC: ELA-Literacy.L.11–12.3.** This item asks you to put the sentences in the paragraph in the most logical order. You should pay attention to particular transitional phrases and words that help to indicate sequence. As for sentence 1, the transitional word “then” suggests that this sentence as it functions in the paragraph should be preceded by something else. Additionally, since the preceding paragraph ends with the instructor guiding his class in a performance of “Mary Had a Little Lamb,” the paragraph in question logically should begin with sentence 2 (“When we had finished, he said, “That was “Mary Had a Little Lamb.””). Now, after reading sentences 2, 3, and 4 in consecutive order, you will see that sentence 1 makes sense when placed after sentence 5, (J):

“He lifted the instrument to his lips. Then he played the same melody”

Also, when reading sentences 2, 3, and 4, notice that the instructor says that he is about to play on his harmonica a variation on “Mary Had a Little Lamb” that he calls “Mary Had the Blues.” This clue foreshadows his playing the melody “with such a pure, sad wail” (sentence 1) after he lifts the harmonica to his lips (sentence 5).

(G) is wrong because it would not make sense for the instructor to play the sad rendition of the song before picking up his harmonica.

As for (H), while the instructor picking up his harmonica and then playing the sad song appears correct at first glance, a closer examination of the sentences in the paragraph will show that he must put the instrument to his lips before playing the song.

29. **(B) English/Usage and Mechanics/Sentence Structure/Faulty Parallelism. CCRS: WC 16–19a. CC: ELA-Literacy.L.9–10.3.** The underlined portion is wrong because the phrase “if I could” disrupts the parallelism between the verbs “find” and “bend.” The author seems to be saying that he or she “worked to find the...holes and [worked to] if [he or she] could bend the right notes.” The phrase “to if” does not occur in written English; “to see if,” however, would make sense in this context (see below). (B) solves the problem of the original by simply eliminating the phrase “if I could,” thereby creating a parallel verb construction that correctly expresses the author’s intended meaning: “I worked to find the...holes and [worked to] bend the right notes.”

(C) attempts to address the issue of the original by inserting the infinitive “to see” as a parallel construction to the infinitive “to find.” This option, however, both removes the conjunction “and” and replaces the verb “could” with the phrase “were to.” These changes result in unintended causal relationships between finding the right mouth holes and bending the right notes, as well as between bending the right notes and doing something else (“if I were to bend the right notes, [then I would]...”).

As for (D), replacing the past tense verb “could” with the present tense of the verb (“can”) does nothing to solve the problem of the original.

30. **(J) English/Rhetorical Skills/Style/Conciseness. CCRS: WC 16–19a. CC: ELA-Literacy.L.9–10.3.** The problem with this sentence is that the underlined portion provides superfluous information, resulting in a long and awkward construction that consists of too many clauses. The precise day of the week that the author was attempting to play “Old Folks at Home” is not a necessary detail. So, (J) is the correct answer choice.

As for (G) and (H), they both provide alternative renderings of the original and therefore fail to eliminate the non-essential information.

31. **(B) English/Rhetorical Skills/Style/Conciseness. CCRS: WC 20–23a. CC: ELA-Literacy.L.9–10.3.** The error of the original is that “uttered out loud” is an unnecessarily wordy and redundant phrase. To utter is to express something audibly or “out loud.” This redundancy is also an indication that the material needs to be abbreviated. (B), “spoke,” is the correct answer choice because it is the most abbreviated of all the options and therefore gets right to the point.

(C) suffers from the same problem as does the original. The phrase “said verbally” is redundant.

(D) is simply awkward and non-idiomatic. “Verbalized” would be a more appropriate option.

32. **(J) English/Rhetorical Skills/Style/Conciseness. CCRS: WC 16–19a. CC: ELA-Literacy.L.9–10.3.** The problem with this item is that “originally” is redundant of “first.” To say that someone was the first to write something down is to say that he or she originally wrote it down. (J) addresses the problem by omitting the underlined portion and then ending the sentence with a period.

As for (G) and (H), “in the beginning” and “initially,” respectively, are synonymous with “originally” and therefore fail to eliminate the redundancy.

33. **(A) English/Usage and Mechanics/No Change. CCRS: COP 13–15a. CC: ELA-Literacy.L.8.1.** This item tests comma usage, as indicated by the answer choices. Notice that each of the three alternative constructions is worded in exactly the same way as is the original, the only difference being that each of them inserts an unnecessary comma that only serves to disrupt the logical flow of the sentence. So, (A) is the correct answer choice.

34. **(G) English/Rhetorical Skills/Organization/Paragraph-Level Structure. CCRS: ORG 33–36a. CC: ELA-Literacy.L.11–12.3.** This item asks whether the sentence of which the underlined portion is a part should begin a new paragraph. Starting a new paragraph here, however, would interrupt the logical flow



created by the series of questions. So, (H) and (J) can be eliminated. Additionally, this item tests whether the underlined portion uses the correct verb tense. Remember that the same verb tense should be used whenever possible within a sentence or paragraph. In the previous sentence, the author uses the present perfect tense “have” when asking a question (“Have you ever said...?”). The underlined portion, however, uses the present tense “do” (“Do you suspect...?”) and is therefore inconsistent. So, (G) is the correct answer choice.

35. **(D) English/Rhetorical Skills/Strategy/Effective Transitional Sentence. CCRS: ORG 24–27a. CC: ELA-Literacy.L.11–12.3.** At the beginning of a sentence, the adverb “nonetheless” is used to introduce an idea that is related to what is expressed in the previous sentence. In this case, however, “nonetheless” illogically suggests that the expression “piece of work” is still used today *in spite of the fact* that it has been used in the past. In fact, a transitional term is unnecessary at the beginning of this sentence and should simply be removed, (D).

(B) is wrong because the adverb “otherwise” indicates that there is a changed set of circumstances. The fact is, though, that Shakespeare used the expression “piece of work” and we still use it today.

As for (C), beginning the sentence with the conjunction “while” would be acceptable except that it is redundant of the conjunction “though” that begins the second clause in the sentence.

36. **(F) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: TOD 16–19a. CC: ELA-Literacy.L.9–10.3.** This item asks you to explain what would be the result of removing the proposed clause from the passage. The clause in question explains that the expression “piece of work” is used today “to describe someone who is hard to understand or deal with.” This clause sets up a nice contrast between the current meaning of the expression and its meaning in the time of Shakespeare, which is one that expresses regard. So, (F) is the correct answer choice.

(G) is wrong because, as already shown, the clause is relevant to the paragraph’s logic.

As for (H), the clause describing the expression “piece of work” does not serve as a transition to the next paragraph, which describes the events of Shakespeare’s *Othello*.

(J) is wrong because the clause does not contradict that we still use the expression “piece of work” but instead explains how the expression is currently used.

37. **(C) English/Usage and Mechanics/Punctuation/Commas. CCRS: COP 20–23a. CC: ELA-Literacy.L.9–10.2.** At first glance, the underlined comma seems to correctly help set off the non-restrictive element that describes the character Iago (“the villain of the tragedy”). However, at closer inspection, you will notice that removing the unessential clause as it is written results in a meaningless construction: “Iago *Othello* strives to undo....” (*Othello* is not Iago’s last name; and even if it was, why would he italicize it?!) The noun “tragedy” should modify the title of the play, so the two should not be separated by a comma. Relocating the comma so that it immediately follows “*Othello*” results in a non-restrictive element whose removal would yield a meaningful construction: “Iago strives to undo....” So, (C) is the correct answer choice.

(B) fails to solve the problem of the original, and (D) sabotages the non-restrictive element by removing the comma altogether.

38. **(J) English/Usage and Mechanics/Punctuation/Apostrophes. CCRS: COP 24–27c. CC: ELA-Literacy.L.11–12.2.** This item tests your ability to correctly use an apostrophe to show possession for a noun, in this case the proper noun “*Othello*.” Remember that singular nouns add the apostrophe and “-s,” while plural nouns ending in “-s” add only the apostrophe. Since *Othello* is an individual, the singular possessive is needed (not the plural possessive, as written) in order to indicate that the officer referenced is under his command. So, (J) is the correct answer choice.

(G) is wrong because “Othellos” is simply the plural form of the proper noun, indicating no possession whatsoever.

(H) fails to solve the problem of the original and inserts an unnecessary comma between “one” and “of” that disrupts the logical flow of the sentence.

39. (A) *English/Usage and Mechanics/No Change*. CCRS: SSF 16–19b. CC: ELA-Literacy.L.9–10.1. This original is correct because the past tense “became” is consistent with the rest of the paragraph (“The Globe audience *heard*.... In *Henry V*, Shakespeare *used*....”).

(B) and (C) are wrong because they offer incorrectly formed past perfect and present perfect verbs, respectively. The past tense verb “became” should not be used to form either of these two perfect tenses. Instead, in both cases, “became” would be replaced with “become.”

(D) is wrong, as we know, because the present progressive tense “becoming” is inconsistent with the past tense used in the paragraph. Additionally, the present progressive would require that the present participle be immediately preceded by the verb “to be” (“are becoming”).

40. (J) *English/Rhetorical Skills/Style/Conciseness*. CCRS: TOD 16–19b. CC: ELA-Literacy.L.9–10.3. The problem with the underlined sentence is simply that it introduces a tangential fact that is not relevant to what is discussed in the paragraph. While the author does refer to *Henry V* earlier in the paragraph, the focus is on how terms and expressions that were used in Shakespeare’s plays are still used today. Whether a recent film version of that play is popular is of no significance. (G) and (H) offer sentences that again refer to the recent film version of *Henry V*, so (J) is the correct answer choice.

41. (C) *English/Usage and Mechanics/Grammar and Usage/Verb Tense*. CCRS: SSF 16–19b. CC: ELA-Literacy.L.9–10.1. The original is wrong because the present progressive should be used to describe an event that is occurring at this very moment, a present continuous process. To say, however, that certain Shakespearean terms are *at this very moment in the process of* including “birthplace,” “downstairs,” etc. does not make sense. In this case, the present tense “include” should be used to introduce those terms that Shakespeare’s plays “have preserved” up until this point in time. So, (C) is the correct answer choice.

(B) is wrong because “included” inappropriately isolates the event to the past. Additionally, the colon disrupts the logical flow of the sentence, unnecessarily setting off a series of terms that are the direct objects of the verb.

As for (D), omitting the underlined portion would remove the main verb and result in an incomplete sentence.

42. (J) *English/Usage and Mechanics/Grammar and Usage/Diction*. CCRS: COU 16–19b. CC: ELA-Literacy.L.9–10.1. This item is an example of wrong word choice. The noun “illusion” refers to something that is misperceived by the senses or considered unreal. In this context, however, the author intends to use the noun “allusion,” which means “a reference to or mention of something else”: “We also find [references to] Shakespeare’s words in film.” Be careful not to confuse the prepositions that should be used with each of these two very different terms. The correct constructions are “illusions of” and “allusions to,” not “illusions to” and “allusions of.” So, (J) is the correct answer choice.

43. (B) *English/Usage and Mechanics/Grammar and Usage/Subject-Verb Agreement*. CCRS: COU 20–23b. CC: ELA-Literacy.L.9–10.1. This item tests your ability to recognize whether the subject and verb in a sentence agree in number. The original is wrong because the plural verb “are” does not agree with its subject. In this case, the phrase “one of the *Star Trek* movies” refers to a single movie, so the corresponding verb must be a singular verb. (B) is the correct answer choice.



As for (C) and (D), both of these options insert a comma, resulting in a string of dependent clauses and no main verb to complete the sentence.

44. **(H) English/Usage and Mechanics/Punctuation/Commas. CCRS: COP 28–32b. CC: ELA-Literacy.L.11–12.2.** The original is wrong because the comma interrupts the prepositional phrase “presence in.” The author intends to say that Shakespeare’s plays have a “strong presence in speech and popular culture,” but the comma separates the noun “presence” from the preposition “in.” So, (F) and (J) can be eliminated. Notice, too, that (J) inserts an additional comma immediately after the noun “speech,” incorrectly suggesting that “in speech” is a non-restrictive element. As for (G) and (H), while they both address the problem with the original, (G) disrupts the compound subject “speech and popular culture” by relocating the comma to immediately follow the noun “speech.” So, the correct answer choice is (H) because it inserts the comma immediately after the noun “culture,” creating the introductory phrase intended by the author: “Given Shakespeare’s strong presence in speech and popular culture.” Remember that a comma is needed after an introductory phrase of five or more words.
45. **(C) English/Rhetorical Skills/Strategy/Appropriate Supporting Material and Main Idea. CCRS: ORG 24–27c. CC: ELA-Literacy.L.11–12.3.** This question asks you to conclude the sentence in question and in turn the passage itself with a reference to a main theme. Since the focus of the passage is on the many words and expressions of today that were originally coined by Shakespeare, (C) is the best answer choice: “there will be no escaping his influence on the English language.” While the other answer choices are certainly conceivable (that Shakespeare will continue to be popular, discussed and debated, and borrowed from), they fail to accomplish the author’s goal.
46. **(F) English/Usage and Mechanics/No Change. CCRS: SSF 28–32a. CC: ELA-Literacy.L.11–12.2.** The original is correct because it consists of a comma setting off the introductory prepositional phrase at the beginning of the sentence. As for the remaining answer choices, they all result in comma splices (two independent clauses separated by a comma).
47. **(B) English/Usage and Mechanics/Punctuation/Commas. CCRS: COP 20–23a. CC: ELA-Literacy.L.9–10.2.** Remember that an appositive can be a noun that immediately follows another noun in order to provide further explanation. In this case, the proper noun “Maya Lin” is simply the name of the “college student,” so it should function as an appositive. Appositives, however, should be set off with commas, so the original is wrong. (B) provides the second comma necessary to set off the appositive.
- (C) contains no commas and therefore not only fails to set off the appositive but also creates an awkward construction.
- (D) contains only one of the two necessary commas and therefore disrupts the logical flow of the sentence.
48. **(J) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: ORG 33–36a. CC: ELA-Literacy.L.11–12.3.** This question asks you to determine which of the answer choices provides a phrase that characterizes the monument in general terms. Only one of the options, (J), offers terms (“simplicity” and “power”) that would be used to describe the monument itself.
- (F) and (G) characterize the *acclaim* won by the monument in terms of time (“for a while now”) and degree (“from many people”).
- As for (H), referring to Maya Lin’s talent does not characterize the monument itself but instead describes Maya Lin.
49. **(A) English/Usage and Mechanics/No Change. CCRS: SSF 16–19a. CC: ELA-Literacy.L.9–10.3.** The original is correct because the comma is used appropriately to separate the dependent clause from the

independent clause in the sentence. Remember that dependent clauses are usually introduced with subordinating conjunctions, such as “although,” “while,” and “if.”

(B) is wrong because the colon interrupts the natural flow of language. Colons are typically used to extend a thought, calling attention to elaboration or explanation.

As for (C) and (D), end-stop punctuation is used to separate two sentences, and a semicolon is used to separate two independent clauses.

50. **(G) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: TOD 28–32a. CC: ELA-Literacy.L.11–12.3.** This item asks whether the addition of certain material is appropriate at this point in the passage. The related paragraph begins by discussing how Maya Lin uses “understated methods to suggest matters of significance” and then goes on to give some examples. The additional sentence proposed by the author is informal in tone, which is not consistent with the rest of the passage; and the abstract idea of reflecting on one’s life has nothing to do with the concrete details of Maya Lin and her work. So, (G) is the correct answer choice.

(F) is wrong because the proposed sentence does not take any position on the subject of public sculpture; and neither (H) nor (J) offers a convincing argument for expressing an ordinary concept.

51. **(A) English/Usage and Mechanics/No Change. CCRS: COU 13–15a. CC: ELA-Literacy.L.8.1.** This item deals with verb tense. The original is correct because the present perfect tense “has applied” is used to describe an action that began in the past and extended to the present (“Since the unveiling of the Vietnam Veterans Memorial....”).

Do not be distracted by (C); the simple past tense would be used to describe an action that started and finished at a particular point in time in the past.

As for (B) and (D), neither the future tense nor the incorrectly constructed present progressive tense (only the gerund) is appropriate in this context.

52. **(G) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: TOD 16–19a. CC: ELA-Literacy.L.9–10.3.** This item asks you to identify what would be lost if the given phrase were deleted from the preceding sentence. The phrase in question makes the claim that Maya Lin has applied her approach to sculpture in parts of the United States besides Washington, D.C. Later in the passage, the author makes reference to some of these places: Alabama, Ohio, Pennsylvania, and New York. So, (G) is the correct answer choice.

As for (H), neither is the phrase out of place nor does the sentence focus on the Vietnam Veterans Memorial.

And (J) is wrong because the phrase is supported later in the paragraph when the author discusses the memorial located in Montgomery, Alabama.

53. **(B) English/Usage and Mechanics/Sentence Structure/Unintended Meanings. CCRS: SSF 20–23a. CC: ELA-Literacy.L.9–10.3.** The original is wrong because the author does not intend to say that Maya Lin was located in Montgomery, Alabama, but instead that a specific work of hers is located there. (B) solves the problem of the original by eliminating the reference to Maya Lin herself and adjusting the verb in accordance with the shift from the passive to the active voice.

(C) is wrong because using the gerund “consisting” results in an incomplete sentence without a main verb.



(D) is wrong because the author does not intend to say that the actual labor she performed to build the memorial is located in Montgomery, Alabama.

54. **(J) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: TOD 16–19b. CC: ELA-Literacy.L.9–10.3.** Just as with item #52, this item asks you to identify what would be lost with the deletion of certain material. The sentence in question is quite out of place because it is the only instance in which the author refers to him or herself in the passage. So, (J) is the correct answer choice. As for the remaining answer choices, they all argue that this reference to the author is appropriate, when in fact it is not.

55. **(C) English/Usage and Mechanics/Grammar and Usage/Pronoun Usage. CCRS: COU 24–27a. CC: ELA-Literacy.L.11–12.1.** The original is wrong because the possessive pronoun “their” does not have an antecedent to which it refers. Notice that the colon immediately following the singular noun “transcription” is used to set off a quote made by Dr. Martin Luther King Jr. and that that quote is the inscription on the granite wall of the monument. So, in this case, the singular pronoun “this” should be used to function as an adjective modifying the singular noun “inscription,” (C).

(B) is wrong because the pronoun “which” seems to suggest that there is more than one inscription.

And (D) is the contraction for “it is,” which is grammatically incorrect in this context. While the contraction “it’s” and the possessive pronoun “its” are commonly confused words, the latter is also inappropriate here since the situation does not call for possession.

56. **(J) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: TOD 20–23b. CC: ELA-Literacy.L.9–10.3.** Stating that each of the answer choices is true, this item then asks you to choose the option that provides the most specific information describing the famous Dr. Martin Luther King Jr. speech. So, simply examine each of the options in turn:

(F) vaguely refers to a speech and its author’s full name and title (Dr. Martin Luther King Jr.).

(G) vaguely refers to the speech (as opposed to specifically referencing “I Have a Dream”), its author’s last name and title (Dr. King), and the year that it was given (1963).

(H) refers to the speech, its author’s full name and title, and the title of the speech (“I Have a Dream”).

(J) refers to the speech, its author’s full name and title, the year it was given, and the title of the speech.

(J), then, provides the most complete information about the speech. Notice also that while (G) and (H) provide more details than does the original, they suffer from a lack of concision (“in the sixties, specifically 1963” and “Dr. Martin Luther King Jr. himself”).

57. **(B) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: TOD 16–19a. CC: ELA-Literacy.L.9–10.3.** This is yet another item that asks you to identify what would be lost with the deletion of certain material. The sentence in question describes how very different Maya Lin’s works (“understated”) are from those of other sculptors (“larger-than-life”). So, (B) is the correct answer choice. As for the remaining answer choices, the first sentence of the second paragraph does not offer a criticism, (A); Maya Lin’s motives, (C); or the author’s opinion, (D).

58. **(F) English/Rhetorical Skills/No Change. CCRS: WC 16–19a. CC: ELA-Literacy.L.9–10.3.** This item deals with conveying ideas in a clear and concise manner. The original is correct because the phrase “complexity of human experience” is much more precise and less awkward than are the other options whose references to the ideas of nature and character are unnecessarily convoluted.

59. (C) *English/Usage and Mechanics/Grammar and Usage/Sequence and Verb Tense*. CCRS: SSF 16–19b. CC: ELA-Literacy.L.9–10.1. The original is wrong because the past perfect tense “had been,” which is used to describe an action that began in the past and ended at another point in time in the past, does not accurately temporalize the present perfect description of “places that *have been* influenced by Maya Lin” up until the *present*. To capture this sequence, the present tense is required. So, (C) is the correct answer choice. As for (B) and (D), the past and past participle tenses refer to past actions and therefore fail to reflect the events described.
60. (H) *English/Rhetorical Skills/Strategy/Main Idea*. CCRS: TOD 24–27a. CC: ELA-Literacy.L.9–10.3. This item deals with identifying the main idea of the passage because it asks you to consider the author’s intended focus. As for the public reaction to the Vietnam Veterans Memorial, the author makes mention of “controversy” and “widespread acclaim” only briefly at the beginning of the passage. The essay does not focus on the public reaction to the Vietnam Veterans Memorial, so the essay would not fulfill the stated goal. You can eliminate (F) and (G) this way.



With items such as these in which two of the answer choices are in the affirmative and the other two are in the negative, the process of elimination may help to expedite the test-taking process.

As for (H) and (J), the former is the best answer choice. The passage focuses on the artist Maya Lin and offers descriptions of the Vietnam Veterans Memorial and other public structures as examples of her work. While public reaction to the Vietnam Veterans Memorial is barely mentioned (as stated in answer choice (J)), the author’s intention certainly reaches beyond providing information about that particular piece of work.

61. (C) *English/Usage and Mechanics/Sentence Structure/Comma Splices*. CCRS: SSF 24–27a. CC: ELA-Literacy.L.11–12.6. In this context, using the conjunctive adverb “however” results in a comma splice. Remember that a semicolon is used between two or more independent clauses that are connected by conjunctive adverbs. So, for the original to work, the comma immediately preceding “however” would need to be replaced with a semicolon. Since that comma is not part of the underlined portion, a coordinating conjunction must be used to join the two independent clauses. (C), therefore, is the correct answer choice.

(B) is wrong because it suffers from the same problem as does the original; the phrase “even so” is synonymous with and functions in the same way as does the adverb “however.”

As for (D), omitting the underlined portion would also result in a comma splice.

62. (F) *English/Usage and Mechanics/No Change*. CCRS: COU 16–19a. CC: ELA-Literacy.L.9–10.1. This item deals with diction, specifically with regard to preposition use. Remember that choosing the right preposition to use comes as a result of daily conversation and writing in standard written English. In this case, the correct idiomatic expression is “chronicler of ... folklore,” with the preposition “of” indicating connection or association. As for the remaining answer choices, each of them fails to function appropriately in this context.
63. (C) *English/Usage and Mechanics/Sentence Structure/Problems of Coordination and Subordination*. CCRS: SSF 24–27a. CC: ELA-Literacy.L.11–12.6. The original is wrong because the underlined portion is the beginning of a dependent clause (as indicated by the subordinating conjunction “while”) that is joined together with an independent clause by the subordinating conjunction “that.” The two clauses need only to be joined together by a comma since the dependent clause is first. However, since “that” appears later in the sentence and is not part of the underlined portion, solving the problem in this manner is not an option. Alternatively, the underlined portion needs to be changed in such a way that the first part of the sentence becomes an independent clause, resulting in two independent clauses



joined together by the subordinating conjunction “that.” (C) is the only answer choice that makes such a change. As for (B) and (D), they offer constructions that are essentially the same as the original.

64. (G) *English/Rhetorical Skills/Style/Idiomatic Expression*. CCRS: WC 20–23b. CC: ELA-Literacy.L.9–10.3. Remember that there are a few expressions heard frequently in conversation that are unacceptable in standard written English; the phrase “hook up again” is an example of such an expression. While the phrase may be used as slang to mean “reunite,” it is not appropriate in this context. The author does, however, intend to express the idea that Hurston became acquainted *again* with aspects of her childhood while she was in college. (G), “reconnect,” best expresses this idea. Not only do (H) and (J) fail to indicate this idea of *reconnection*, but the latter is simply awkward and not accurate in context. (H) would be a better option if the verb was “reunite.”

65. (A) *English/Usage and Mechanics/No Change*. CCRS: SSF 24–27a. CC: ELA-Literacy.L.11–12.6. This item deals with using the correct conjunction. The subordinating conjunction “when” joins the clauses together into a complex sentence, and it appropriately expresses the relationship of time that is reinforced by the non-restrictive element “in 1927.”

(B) is wrong because using the subordinating conjunction “that” results in a construction that does not make sense, suggesting that Hurston returned folklore to the South.

(C) is wrong because the coordinating conjunction “and” alters the relationship between gathering folklore and returning to the South, suggesting that these two events occurred at different points in time.

And (D) is wrong because omitting the conjunction results in a comma splice.

66. (H) *English/Rhetorical Skills/Style/Conciseness and Usage and Mechanics/Grammar and Usage/Pronoun Usage*. CCRS: WC 13–15b. CC: ELA-Literacy.L.8.3. This item is wrong because the object pronoun “them” doesn’t provide pronoun/antecedent agreement. It is not clear to whom the author is referring. Remember that a pronoun must have an antecedent, or referent. In the remainder of the sentence, the author refers twice to “they” (subject pronoun) and once to “their” (possessive pronoun) but not at all to the specific party in question. (H) is the only answer choice that offers a noun (“people”) in place of the pronoun in question (“When she asked...”). (G) and (J) fail to solve the problem of the original.

67. (D) *English/Rhetorical Skills/Style/Conciseness*. CCRS: WC 24–27c. CC: ELA-Literacy.L.11–12.6. Just as with item #30, the original sentence is wrong because the underlined portion provides superfluous information. In this context, it is redundant to say that Eatonville is Hurston’s hometown because that fact is already provided in the first paragraph of the passage. So, (D) is the correct answer choice. As for (B) and (C), they both provide alternative renderings of the original and therefore fail to eliminate the non-essential information.

68. (F) *English/Usage and Mechanics/No Change*. CCRS: SSF 16–19b. CC: ELA-Literacy.L.9–10.1. This item deals with verb tense. Remember that the same verb tense should be used, whenever possible, within a sentence or paragraph and that you should avoid shifts in verb tense unless there is a valid reason. Since “would” is the past tense form of the verb “will,” the underlined portion is consistent with the other verbs in the sentence (“went” and “knew”).

(G) is wrong because the present perfect tense “has been” is used to describe an action that began in the past and extended to the present.

As for (H) and (J), the future and present tenses are certainly not consistent with the events of the past that are described.

69. (A) *English/Rhetorical Skills/Strategy/Appropriate Supporting Material*. CCRS: TOD 28–32a. CC: ELA-Literacy.L.11–12.3. In the sentence that immediately precedes the point marked in the passage, the author says that Hurston “eagerly sought out the porch of the general store.” While it can be inferred that she did so to experience the oral tradition in Eatonville, there is no explanation as to why it would necessarily be found at the store. So, adding the given true statement to this sentence would help explain why Hurston chose this specific place as part of her research, as stated in answer choice (A).

Do not be distracted by (B); while this sentence does contain the only reference to the general store in the passage, it is not the general store itself but the oral tradition found outside on its porch that is important to Hurston’s work.

As for (C), while Hurston’s interest in songs and stories is mentioned in the second paragraph, it is necessary to reference her “love of talk and song” here so as to establish the connection between these aspects of the oral tradition and the porch of the general store.

(D) is wrong because Hurston’s experiences as a child are relevant to her work as an adult.

70. (J) *English/Usage and Mechanics/Grammar and Usage/Verb Tense*. CCRS: SSF 16–19b. CC: ELA-Literacy.L.9–10.1. Just as with item #68, this item deals with verb tense. For this item, however, you can use the process of elimination before proceeding to determine whether the verb in question does or does not shift in tense. Notice that only one of the answer choices is a correct verb form: “began.” As it so happens, the past tense verb “began” is consistent with “gathered” and “vied.” So, (J) is the correct answer choice.

TIP When first reading an item, be alert to any opportunity to use the process of elimination as a way to help expedite the test-taking process.

(F) is wrong because the correct verb form is “had begun,” not “begun”; “begun” cannot be used by itself as a verb.

(G) is wrong because the correct verb form is “would begin,” not “would begun.”

(H) is wrong because the correct verb form is “began,” not “had began.”

71. (D) *English/Rhetorical Skills/Style/Conciseness*. CCRS: WC 24–27a. CC: ELA-Literacy.L.11–12.6. This item deals with recognizing whether an idea is expressed as clearly and precisely as it could be. When compared with (D), none of the other answer choices satisfy this rhetorical requirement; they all offer phrases that more awkwardly convey the idea of “wealth.”

72. (H) *English/Usage and Mechanics/Grammar and Usage/Diction*. CCRS: COU 13–15a. CC: ELA-Literacy.L.8.1. Since the item asks for the alternative to the underlined portion that would NOT be acceptable, you know right away that the underlined portion and three of the four alternatives ARE acceptable.

TIP Remember to read the item stem carefully. You may find it a good idea to circle thought-reversers such as “NOT” and “EXCEPT.”

In this case, the only answer choice that does NOT work is the adverb “much” because the construction “much more stories” is non-idiomatic or not acceptable standard written English. So, (H) is the correct answer choice. The correct idiomatic expression is “many more stories,” which uses the adjectives “many” and “more” to modify the noun “stories.” The words “much” and “many” are commonly confused. “Much” is used when referring to an uncountable noun (e.g., snow), and “more” is used when referring to a countable noun (“stories”).



(F) is wrong because the adverbs “still” and “even” are synonymous, meaning “to a greater degree.”

(J) is wrong because omitting the adverb “even” results in a grammatically acceptable construction.

73. **(B) English/Rhetorical Skills/Strategy/Appropriate Supporting Material. CCRS: ORG 33–36a. CC: ELA-Literacy.L.11–12.3.** This item asks you to identify the material that most clearly and precisely previews the tales that are listed later in the sentence. The author refers to tales that describe how and why certain animals are the way they are. So, (B) is the correct answer choice. As for (C) and (D), while understanding the origins of animal characteristics does require insights into past events, such a preview would be less precise than one that makes specific reference to such characteristics.

74. **(J) English/Usage and Mechanics/Grammar and Usage/Adjectives versus Adverbs. CCRS: COU 16–19a. CC: ELA-Literacy.L.9–10.1.** The original is wrong because the adverb “exaggeratedly” cannot be used to modify the noun “accounts.” Remember that adjectives are used to modify nouns, while adverbs are used to modify verbs, adjectives, or other adverbs. In this case, the coordinating conjunction “and” would have to be used to join two adjectives that are intended to modify the noun “accounts” (“exaggerated and humorous accounts”). This, however, is not one of the options. Alternatively, since both of these descriptors are used to modify the noun “accounts” and are of equal importance, they should function as coordinate adjectives and therefore would be separated by a comma. So, (J) is the correct answer choice.

As for (G), these two adverbs can neither be used to modify each other nor the noun “accounts.” However, if the phrase consisted of an adverb modifying an adjective (“exaggeratedly humorous”), it would be a viable grammatical option.

And (H) is wrong because under no circumstances can an adjective be used to modify an adverb.

75. **(B) English/Usage and Mechanics/Punctuation/Commas. CCRS: COP 13–15a. CC: ELA-Literacy.L.8.1.** The original is wrong because the comma between the phrase “such as” and “Brer Rabbit” disrupts the logical flow of the sentence. The phrase “such as” is used to introduce an example or examples, in this case of trickster animals (“Brer Rabbit and his cousins”). Since the clause “such as Brer Rabbit and his cousins” is vital to the meaning of the sentence and therefore considered restrictive, no comma is necessary. Remember that only non-restrictive phrases or clauses are set off with commas.

TIP The “breath test” can be a helpful way of deciding where to place commas. As a general rule, commas often appear where a speaker would naturally slow down or pause to take a breath.

(B) is the correct answer choice because it eliminates the offending comma.

While (C) relocates the comma and (D) provides a second comma, neither of these options addresses the problem of the original.



English — Common Core State Standards

Standard	Description
ELA-Literacy.L.8.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
ELA-Literacy.L.8.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
ELA-Literacy.L.9-10.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
ELA-Literacy.L.9-10.2	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
ELA-Literacy.L.9-10.3	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
ELA-Literacy.L.11-12.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
ELA-Literacy.L.11-12.2	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
ELA-Literacy.L.11-12.3	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
ELA-Literacy.L.11-12.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies.
ELA-Literacy.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.



English — College Readiness Standards

Standard	Description
Topic Development in Terms of Purpose and Focus	
TOD 16-19a	Determine the basic purpose or role of a phrase or sentence.
TOD 16-19b	Delete an obviously irrelevant clause or sentence in an essay.
TOD 20-23b	Determine the relevancy of a variety of sentence-level details.
TOD 24-27a	Apply knowledge of the focus of a simple essay to add a sentence that sharpens that focus or to determine if an essay has met a specified goal.
TOD 28-32a	Determine the suitability of a phrase or sentence and its rhetorical effect by applying an awareness of the focus and purpose of a fairly involved essay.
Organization, Unity, and Coherence	
ORG 20-23c	Add a sentence to introduce a simple paragraph.
ORG 24-27a	Decide if conjunctive adverbs or phrases are needed to create subtle logical connections between sentences (e.g., <i>therefore</i> , <i>however</i> , <i>in addition</i>).
ORG 24-27b	Rearrange the sentences in a fairly uncomplicated paragraph for the sake of logic.
ORG 24-27c	In a fairly straightforward essay, add a sentence to introduce or conclude the essay or to provide a transition between paragraphs.
ORG 33-36a	Determine the need for introductory sentences or transitions, based on the logic and rhetorical effect of the paragraph and essay.
Word Choice	
WC 13-15b	Identify and revise vague nouns and pronouns that create obvious problems.
WC 16-19a	Delete material in a sentence that is synonymous and wordy.
WC 20-23a	Delete information repeated in different parts of speech (e.g., “alarmingly startled”).
WC 20-23b	Choose the word or phrase most consistent with the style and tone of a straightforward essay.
WC 24-27a	Revise a phrase that is redundant based on the meaning and logic of the entire sentence.
WC 24-27c	Determine the word or phrase that is most appropriate in terms of the content of the sentence and tone of the essay.
WC 33-36a	Delete subtly redundant material or material that is redundant in terms of the paragraph as a whole.
Sentence Structure and Formation	
SSF 16-19a	Use punctuation and conjunctions to avoid awkward-sounding sentences.
SSF 16-19b	Decide the appropriate verb tense and voice by using knowledge of the meaning of the entire sentence.
SSF 20-23a	Identify and correct disturbances of sentence flow and structure (e.g., participial phrase fragments, missing or incorrect relative pronouns, dangling or misplaced modifiers).
SSF 24-27a	Revise to avoid faulty coordination and subordination of clauses and faulty placement of phrases in sentences with structural problems.
SSF 24-27b	Maintain consistent verb tense and pronoun person based on the preceding clause or sentence.
SSF 28-32a	Use sentence-combining techniques, especially in sentences containing compound subjects or verbs, to effectively avoid comma splices, run-on sentences, and sentence fragments.
Conventions and Usage	
COU 13-15a	Solve basic grammatical problems such as how to form the past and past participle of common irregular verbs and how to form comparative and superlative adjectives.
COU 16-19a	Solve grammatical problems such as whether to use an adverb or adjective form, how to ensure straightforward subject-verb and pronoun-antecedent agreement, and determine which preposition to use in simple contexts.
COU 16-19b	Use the appropriate word in frequently confused pairs such as <i>there</i> and <i>their</i> , <i>past</i> and <i>passed</i> , and <i>led</i> and <i>lead</i> .
COU 20-23b	Ensure subject-verb agreement where there is some text between the subject and verb.



COU 24-27a	Ensure pronoun-antecedent agreement when the two occur in separate clauses or sentences.
COU 28-32a	Use reflexive pronouns, the possessive pronouns <i>its</i> and <i>your</i> , and the relative pronouns <i>who</i> and <i>whom</i> correctly.
Conventions of Punctuation	
COP 13-15a	Delete commas that create problems such as separating a verb and a direct object.
COP 16-19b	Delete commas that disturb the sentence flow such as between a modifier and the modified element.
COP 20-23a	Use commas to set off simple parenthetical phrases.
COP 24-27c	Indicate simple possessive nouns by using apostrophes.
COP 28-32b	Demonstrate the ability to deal with multiple punctuation problems.



ACT MATHEMATICS TEST EXPLANATIONS

1. (D) *Mathematics/Algebra/Manipulating Algebraic Expressions/Evaluating Expressions*. CRS: XEI 20–23a. CC: 8.EE.C.7b. This item asks you to evaluate an expression. Substitute the given values for x and y into the expression and simplify: $(x - 2y)(x + 2y) = \left(4 - 2\left(\frac{1}{2}\right)\right)\left(4 + 2\left(\frac{1}{2}\right)\right) = (4 - 1)(4 + 1) = (3)(5) = 15$.

TIP Do not use FOIL. It is easier to substitute the values in and use order of operations to solve this problem. By attempting to FOIL the original expression and then substitute, there is a greater chance for error. FOIL-ing correctly will give you $x^2 - 4y^2$. But then you are squaring a fraction. This can lead to a common mistake of dropping the exponent when you substitute values, giving you $\left(4^2 - 4\left(\frac{1}{2}\right)\right)$, which leads to the incorrect answer choice of 14 (C).

TIP When you are evaluating this expression, make sure you use the correct order of operations. An easy way to remember the order is Please Excuse My Dear Aunt Sally: Parentheses, Exponents, Multiplication and Division, Addition and Subtraction.

2. (J) *Mathematics/Arithmetic/Common Arithmetic Items/Percents*. CRS: BOA 16–19a. CC: 7.RP.A.3. This question asks you to find the least number of points Tyrone must score to earn 80% or better. Set up a proportion, cross-multiply, and solve.

$$\frac{\text{is}}{\text{of}} = \frac{\text{percent}}{100} \Rightarrow \frac{x}{40} = \frac{80}{100} \Rightarrow 100x = 3200 \Rightarrow x = 32$$

Alternatively, you can find 80% of 40. Either write 80 percent as a fraction and multiply it by 40:

$$\frac{80}{100}(40), \text{ or turn 80\% into a decimal and multiply it by 40: } (0.80)(40).$$

3. (D) *Mathematics/Algebra/Manipulating Algebraic Expressions/Basic Algebraic Manipulations*. CRS: XEI 20–23e. CC: HSA-APR.A.1. Use the FOIL method to identify equivalent expressions. F(first), O(outer), I(inner), L(last): $(2x - 3)(3x - 4) = 6x^2 - 8x - 9x + 12 = 6x^2 - 17x + 12$.

TIP If you forget how to FOIL, you can assume a value for x . Set and evaluate the given expression: $(2(2) - 3)(3(2) - 4) = (4 - 3)(6 - 4) = 2$.

Now evaluate the answers using $x = 2$ and see which yields 2:

- A. $2^2 = 4$ ✗
 B. $5(2^2) - 12(2) - 7 = -11$ ✗
 C. $5(2^2) + 12 = 32$ ✗
 D. $6(2^2) - 17(2) + 12 = 2$ ✓
 E. $6(2^2) + 12 = 36$ ✗

4. (J) **Mathematics/Statistics and Probability/Probability. CRS: PSD 16–19e. CC: 7.SP.C.5.** To find the probability that an event does NOT happen, subtract the probability of it happening from 1:

$$1 - \frac{2}{9} = \frac{9}{9} - \frac{2}{9} = \frac{7}{9}.$$

Alternatively, remember that the sum of all probabilities for an event is 1, so the sum of $\frac{2}{9}$ and the correct answer is 1:

F. $\frac{2}{9} + 0 = \frac{2}{9}$ ✗

G. $\frac{2}{9} + \frac{1}{9} = \frac{3}{9}$ ✗

H. $\frac{2}{9} + \frac{2}{9} = \frac{4}{9}$ ✗

J. $\frac{2}{9} + \frac{7}{9} = 1$ ✓

5. (B) **Mathematics/Arithmetic/Common Arithmetic Items/Proportions and Direct-Inverse Variation. CRS: BOA 20–23a. CC: 7.RP.A.3.** Set up a proportion, and cross multiply to solve for the missing quantity:

$$\frac{\text{liters of sauce}}{\text{servings}} \Rightarrow \frac{4.5}{150} = \frac{x}{80} \Rightarrow 360 = 150x \Rightarrow 2.4 = x.$$

TIP Use estimation to eliminate answers. Since the question asks you to find how much sauce is needed for 80 servings, first compare 80 to 150. The new serving amount is a little more than half of the original amount. So the new sauce amount will be a little more than 2.25 liters, which is half of 4.5. That eliminates (A), (D), and (E). Estimating could get you to the correct answer of (B).

6. (F) **Mathematics/Algebra/Expressing and Evaluating Algebraic Functions/Functions as Models. CRS: XEI 24–27b. CC: 7.EE.B.4a.** This problem asks you to take information and create an equation from it. The equation will be linear because the candle length is decreasing at a constant rate. Linear equations can be written in the form $y = mx + b$: $y = \text{length } (l)$, $m = \text{rate of decrease}$, $x = \text{time } (t)$, and $b = \text{initial length}$.

Substituting t and l for x and y respectively, the new equation is: $l = mt + b$. The starting point (b) is the initial length of the candle, which is 36 inches. The rate (m) the candle is burning is 0.48. Since the candle is getting smaller, the value is negative. Substituting these values and switching the order gives: $l = -0.48t + 36 \Rightarrow l = 36 - 0.48t$.

Alternatively, use the given information to check the possible answers. When $t = 2$, $l = 35.04$:

F. $35.04 = 36 - (0.48)(2)$ ✓

G. $35.04 \neq 36 + (0.48)(2)$ ✓

H. $35.04 \neq (0.48)(2)$ ✗

J. $35.04 \neq (35.52)(2)$ ✗

K. $35.04 \neq (75)(2)$ ✗



7. (C) **Mathematics/Geometry/Triangles/Working with Triangles.** CRS: PPF 24–27c. CC: HSG-CO.C.10. This problem asks you to find a missing angle measure in a triangle. Angles in a triangle add up to 180° , so $\angle BAC$ and $\angle BCA$ add up to 110° . Because $AB = BC$, the triangle is isosceles and the two base angles, $\angle BAC$ and $\angle BCA$, are congruent. That means that each of them is half of 110° and $\angle BAC = 55^\circ$.

8. (H) **Mathematics/Geometry/Rectangles and Squares and Arithmetic/Common Arithmetic Items/Proportions and Direct-Inverse Variation.** CRS: MEA 28–32a. CC: HSG-MG.A.3. This problem requires you to first find the total area of the four rectangles and then determine how many bags of cedar chips are required. To find the total area, multiply the length and the width for each rectangle and add the four areas together:

$$\text{Total Area} = 2(8) + 1(4) + 2(20) + 1(5) = 65 \text{ square feet}$$

Since a bag of chips covers 10 square feet, you will need 6 bags to cover 60 square feet and a half bag to cover 5 square feet. Looking at the answer choices, 6.5 bags isn't an option. Round up to the nearest whole number, 7.

9. (D) **Mathematics/Algebra/Expressing and Evaluating Algebraic Functions/Concepts of Domain and Range.** CRS: GRE 20–23a. CC: HSF-IF.A.1. This question asks you to find the domain of a set of ordered pairs. The domain of a function is the set of all possible x -values. The given points are: $\{(0, 2), (2, 2), (3, -2)\}$, so the domain is $\{0, 2, 3\}$, (D).

TIP Use the example in the problem. If you forget what domain is, look at the example in the problem.

10. (F) **Mathematics/Geometry.** CRS: PPF 33–36a. CC: HSS-CP.A.1. This question asks you to identify the converse of a statement. Take the given statement “If the lights are on, then the store is open” and determine what part represents p and what part represents q in “If p , then q ”: p = “the lights are on” and q = “the store is open.” Substitute these phrases into the converse: “if q , then p ,” so “if the store is open, then the lights are on,” (F).

Alternatively, you can use the answers and substitute p or q :

- F. If q , then p
- G. If not p , then not q
- H. If not q , then not p
- J. not p
- K. not q

Answer choice (F) matches the converse.

11. (A) **Mathematics/Coordinate Geometry/The Coordinate System and Transformations and Their Effects on Graphs of Functions.** CRS: GRE 20–23a. CC: 6.NS.C.8. To reflect a point over the y -axis, the y value stays the same and the x value becomes the opposite. Therefore, the point (a, b) becomes $(-a, b)$, (A).

12. (K) **Mathematics/Algebra/Manipulating Algebraic Expressions/Manipulating Expressions Involving Exponents.** CRS: XEI 24–27d. CC: HSA-APR.A.1. Subtract the initial expression from the final one:

$$x^2 + 5x + 1 - (4x^2 + x - 5) = x^2 + 5x + 1 - 4x^2 - x + 5 = -3x^2 + 4x + 6, \text{ (K).}$$

TIP Use the answer choices. The first term in the initial quantity, $4x^2$, must be added to $-3x^2$ in order to create x^2 , the first term in the final quantity. Therefore, eliminate (F) and (G). The second term in the initial quantity, x , must be added to $4x$ in order to create $5x$, the second term in the final quantity. Therefore, eliminate (H) and (J). The correct answer must be (K).

13. (B) **Mathematics/Arithmetic/Simple Manipulations. CRS: BOA 20–23a. CC: 7.RP.A.3.** First determine the difference in cost for the 5-pound bags of potatoes and then divide the answer by 5 to find the difference per pound: $\$2.19 - \$1.99 = \$0.20 \Rightarrow \frac{\$0.20}{5} = \$0.04$.

14. (F) **Mathematics/Algebra/Solving Algebraic Equations or Inequalities with One Variable/Simple Equations. CRS: XEI 20–23c. CC: 8.EE.C.7b.** Solve the equation for x :
 $12x = -8(10 - x) \Rightarrow 12x = -80 + 8x \Rightarrow 4x = -80 \Rightarrow x = -20$.

TIP Test the answer choices. Test the answer choices, beginning with (F). Once the correct answer is identified, stop testing choices and move on.

F. $12(-20) = -8(10 - (-20)) \Rightarrow -240 = -240 \checkmark$

15. (B) **Mathematics/Arithmetic/Common Arithmetic Items/Percents. CRS: BOA 20–23a. CC: 7.RP.A.3.** The unknown initial price of the refrigerator is increased by 15%, which is the same as multiplying it by 1.15 ($100\% + 15\% = 115\% = 1.15$). Set up an equation and solve for x , where x is the initial cost to the store:
 $1.15x = 414 \Rightarrow x = 360$.

TIP Test the answer choices. Start with answer choice (C) and then determine if the initial price is higher or lower.

C. $399(1.15) = 458.85 \times$

This value is too high, so try the next smallest one:

B. $360(1.15) = 414 \checkmark$

16. (J) **Mathematics/Geometry/Rectangles and Squares and Triangles/Working with Triangles. CRS: MEA 28–32a. CC: HSG-MG.A.3.** This question asks you to find the area of quadrilateral $EBCD$. Since $ABCD$ is a square, $\overline{EB} \parallel \overline{DC}$, making $EBCD$ a trapezoid. Begin by determining the length of \overline{EB} . Since E is the midpoint of \overline{AB} , \overline{EB} is 5 cm. Next, use the formula for the area of a trapezoid to find the shaded region

$$EBCD: A = \frac{(b_1 + b_2)h}{2} \Rightarrow A = \frac{(5 + 10)10}{2} \Rightarrow A = 75 \text{ cm}^2.$$

Alternatively, you could find the area of the square and subtract the area of triangle AED : Area $ABCD = (\text{Side})^2 = 10^2 = 100 \text{ cm}^2$ and Area $AED = \frac{1}{2}(AE)(AD) = \frac{1}{2}(5)(10) = 25 \text{ cm}^2$. Since Shaded area = Area $ABCD$ - Area AED , Shaded Area = $100 - 25 = 75$.

TIP Use estimation to eliminate answers. The area of the square is 100 cm^2 . The shaded region must be less than 100, eliminating (H) and (K). The shaded region is more than half of the square, eliminating (G) and (F).



17. (D) *Mathematics/Algebra/Solving Simultaneous Equations*. CRS: XEI 28–32f. CC: HSA-REI.C.6. To use elimination to solve for y , subtract the second equation from the first and solve for y :

$$\begin{array}{r} x + 2y = 12 \\ -(x - y = 3) \\ \hline 3y = 9 \\ y = 3 \end{array}$$

Substitute $y = 3$ into the second equation to solve for x : $x - 3 = 3 \Rightarrow x = 6$.

TIP *Plug in the answer choices to the equations.* If the answer choice does not work for the first equation, there is no need to test it on the second one:

- A. $-6 + 2(9) = 12$ and $-6 - 9 \neq 3$ ✗
- B. $2 + 2(5) = 12$ and $2 - 5 \neq 3$ ✗
- C. $3 + 2(4.5) = 12$ and $3 - 4.5 \neq 3$ ✗
- D. $6 + 2(3) = 12$ and $6 - 3 = 3$ ✓
18. (H) *Mathematics/Algebra/Expressing and Evaluating Algebraic Functions/Function Notation*. CRS: FUN 28–32a. CC: HSF-IF.A.2. Begin by substituting 3 in for x in $g(x)$: $g(3) = (3)^2 = 9$. Next, substitute 9 in for x in $f(x)$: $f(9) = 2(9) = 18$.
19. (E) *Mathematics/Arithmetic/Common Arithmetic Items/Properties of Numbers*. CRS: PSD 20–23d. CC: HSS-CP.B.9. To determine how many dinner combinations there are at Nassif's, multiply:
 $(\text{number}_{\text{appetizers}})(\text{number}_{\text{main courses}})(\text{number}_{\text{desserts}}) = (5)(4)(5) = 100$ dinner combinations, (E).
20. (H) *Mathematics/Algebra/Solving Algebraic Equations or Inequalities with One Variable/Simple Inequalities*. CRS: XEI 24–27f. CC: HSA-REI.B.3. Solve the inequality:
 $-5 + m \leq -4 + 2m \Rightarrow -5 \leq -4 + m \Rightarrow -1 \leq m$ or $m \geq -1$.
21. (B) *Mathematics/Arithmetic/Complicated Manipulations/Decimal-Fraction Equivalents*. CRS: NUM 24–27b. CC: 7.NS.A.2d. Begin by putting each term into decimal form: $\frac{1}{3} = 0.\overline{33}$, $\frac{2}{5} = 0.4$, $\frac{3}{8} = 0.375$, and
 $\frac{3}{10} = 0.3$.
- Next, put them in order from least to greatest and then substitute the original form: $0.28, 0.3, \overline{0.33}, 0.37, 0.375, 0.4 = 0.28, \frac{3}{10}, \frac{1}{3}, 0.37, \frac{3}{8}, \frac{2}{5}$, (B).
22. (F) *Mathematics/Algebra/Manipulating Algebraic Expressions/Manipulating Expressions Involving Exponents*. CRS: NUM 28–32d. CC: HSN-RN.A.2. Begin by getting rid of the negative exponent. A

negative exponent means to take the reciprocal: $(3x^3)^{-2} = \frac{1}{(3x^3)^2}$. Next, square the $(3x^3)$. Remember, both the 3 and the x^3 get squared: $\frac{1}{9x^6}$.

TIP Assume a value for x . Set $x = 2$: $(3(2)^3)^{-2} = \frac{1}{576}$. Plug $x = 2$ into the answer choices:

F. $\frac{1}{9(2)^6} = \frac{1}{576}$; $\frac{1}{576} = \frac{1}{576}$ ✓

There is no need to test the remaining choices.

23. (C) **Mathematics/Geometry/Lines and Angles**. CRS: PPF 16–19a. CC: 8.G.A.5. Begin by determining which angles must be congruent. $\angle 2$ and $\angle 4$ are congruent because they are alternate interior angles. $\angle 2$ and $\angle 1$ are congruent because they are vertical angles, along with $\angle 4$ and $\angle 5$. $\angle 1$ and $\angle 5$ are alternative exterior angles and $\angle 1$ and $\angle 4$ are corresponding angles.

$\angle 1 \cong \angle 2 \cong \angle 4 \cong \angle 5$, and the only angle not guaranteed to be congruent is $\angle 3$. The only answer choice containing $\angle 3$ is (C).

24. (G) **Mathematics/Algebra/Manipulating Algebraic Expressions/Manipulating Expressions Using Exponents**. CRS: NUM 33–36b. CC: HSF-BF.B.5. Begin by substituting 10^{B+C} for A in $\log_{10} A$: $\log_{10} 10^{B+C}$. A property of logarithms is $\log_m m^p = p$. So $\log_{10} 10^{B+C} = B + C$.

25. (B) **Mathematics/Algebra/Solving Quadratic Equations and Relations**. CRS: XEI 28–32e. CC: HSA-REI.B.4b. Solve the quadratic equation by isolating x : $4x^2 - 9 = 0 \Rightarrow 4x^2 = 9 \Rightarrow x^2 = \frac{9}{4} \Rightarrow x = \pm \frac{3}{2}$.

Alternatively, factor: $4x^2 - 9 = 0 \Rightarrow (2x + 3)(2x - 3) = 0 \Rightarrow x = -\frac{3}{2}$ or $x = \frac{3}{2}$.

TIP Plug in the answer choices. If the first number in the solution set does not work, you do not need to try the second one:

A. $4(-\sqrt{2})^2 - 9 \neq 0$ ✗

B. $4\left(-\frac{3}{2}\right)^2 - 9 = 0$ and $4\left(\frac{3}{2}\right)^2 - 9 = 0$ ✓

26. (G) **Mathematics/Geometry/Triangles/Pythagorean Theorem**. CRS: PPF 28–32b. CC: 8.G.B.7. To find the hypotenuse of the right triangle, use the Pythagorean theorem: $(\text{leg}_1)^2 + (\text{leg}_2)^2 = (\text{hypotenuse})^2 \Rightarrow 2^2 + 1^2 = (\text{hypotenuse})^2 \Rightarrow 4 + 1 = (\text{hypotenuse})^2 \Rightarrow 5 = (\text{hypotenuse})^2 \Rightarrow \sqrt{5} = \text{hypotenuse}$.



TIP *Eliminate unreasonable answers.* In a right triangle, the hypotenuse is the longest side. Therefore, it cannot have a length of $\sqrt{3}$, (F), or 2, (H). Also, in any triangle, the sum of any two sides has to be greater than the third side. This eliminates (J) and (K). The only reasonable answer is $\sqrt{5}$, (G).

27. (B) *Mathematics/Algebra/Solving Simultaneous Equations.* CRS: BOA 28–32a. CC: HSN-Q.A.1. Begin by creating an equation that represents the estimate of each heating company: C = cost, h = hours, Lehman Heating: $C = 30 + 22h$, and A-1 Heating: $C = 35 + 20h$.

To determine when the estimates are equal, set the two cost equations equal to each other and solve:

$$30 + 22h = 35 + 20h \Rightarrow 30 + 2h = 35 \Rightarrow 2h = 5 \Rightarrow h = 2\frac{1}{2}.$$

28. (H) *Mathematics/Coordinate Geometry/Slope of a Line.* CRS: GRE 24–27b. CC: 8.F.B.4. Substitute the x

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 5}{7 - (-3)} = \frac{-2}{10} =$$

and y -values of $(-3, 5)$ and $(7, 3)$ into the slope formula and reduce:

$$-\frac{1}{5}.$$

29. (C) *Mathematics/Algebra/Evaluating Sequences Involving Exponential Growth.* CRS: NUM 20–23a. CC: HSF-BF.A.2. Start by finding the ratio (or multiplier). Substitute the given values into the geometric sequence formula, $t_n = t_1(r)^{n-1}$, where t_n = the n th term, t_1 = first term, r = ratio, and n = term number:

$$256 = 4r^{4-1} \Rightarrow 64 = r^3 \Rightarrow r = 4.$$

Since $r = 4$, to find the second term you multiply the first, 4, by the ratio, 4, and get 16, (C).

TIP *Use the answer choices.* Divide the answer choice by the first term to find the ratio. Then, substitute that ratio into the sequence formula, $t_4 = 4(r)^3$ and check if the fourth term is 256:

$$\text{A. } r = \frac{8}{4} = 2 \quad t_4 = 4(2)^3 = 32$$

$$\text{B. } r = \frac{12}{4} = 3 \quad t_4 = 4(3)^3 = 108$$

$$\text{C. } r = \frac{16}{4} = 4 \quad t_4 = 4(4)^3 = 256$$

30. (H) *Mathematics/Geometry/Triangles/Working with Triangles.* CRS: PPF 28–32b. CC: HSG-SRT.B.4. Begin by doubling the legs of the right triangle to find the new leg lengths: $leg_1 = 12$ and $leg_2 = 5$. The question is asking for the LONGEST side of the new triangle, which is the hypotenuse. Use the Pythagorean theorem to find it: $(leg_1)^2 + (leg_2)^2 = (\text{hypotenuse})^2 \Rightarrow 12^2 + 5^2 = (\text{hypotenuse})^2 \Rightarrow 144 + 25 = (\text{hypotenuse})^2 \Rightarrow 169 = (\text{hypotenuse})^2 \Rightarrow 13 = \text{hypotenuse}$.

31. (D) *Mathematics/Algebra/Solving Algebraic Equations or Inequalities with One Variable.* CRS: XEI 28–32a. CC: HSA-CED.A.4. For this item, directly solve for x : $3x + a = 9 \Rightarrow 3x = 9 - a \Rightarrow x = \frac{9 - a}{3}$, (D).

TIP Alternatively, apply the Plug-and-Chug strategy. Select a value for a , then substitute it into the item stem equations and answer choices. For example, let $a = 10$. Substitute into $3x + a = 9$: $3x + 10 = 9 \Rightarrow$

$3x = -1 \Rightarrow x = -\frac{1}{3}$. Test the answer choices to find the choice that results in $-\frac{1}{3}$:

- A. $\frac{a}{6} = \frac{10}{6} = \frac{5}{3}$ ✗
- B. $3a = 3(10) = 30$ ✗
- C. $3 - a = 3 - 10 = -7$ ✗
- D. $\frac{(9-a)}{3} = \frac{9-10}{3} = -\frac{1}{3}$ ✓

32. (J) Mathematics/Arithmetic/Complicated Arithmetic Application Items. CRS: NUM 24–27b. CC: 7.NS.A.2d. For this item, recall that distance = (rate)(time), or $d = rt$. The item stem states that the each runner ran for 3 minutes distances measured in miles. Thus, $t = 3$ and the rate will be in miles per minute: $d = rt \Rightarrow d = 3r \Rightarrow r = \frac{d}{3}$. Now determine which distance given in the answer choices results in the largest rate (the fastest speed).

F. $d = \frac{3}{5} \Rightarrow r = \frac{d}{3} = \frac{\left(\frac{3}{5}\right)}{3} = \frac{3}{15} = 0.2$

G. $d = \frac{3}{8} \Rightarrow r = \frac{\left(\frac{3}{8}\right)}{3} = \frac{3}{24} = 0.125$

H. $d = \frac{5}{8} \Rightarrow r = \frac{\left(\frac{5}{8}\right)}{3} = \frac{5}{24} \approx 0.208$

J. $d = \frac{7}{9} \Rightarrow r = \frac{\left(\frac{7}{9}\right)}{3} = \frac{7}{27} \approx 0.259$

K. $d = \frac{11}{16} \Rightarrow r = \frac{\left(\frac{11}{16}\right)}{3} = \frac{11}{48} = 0.229$

The correct answer is (J).

An alternative way to conceptualize this item is to realize that since all of the runners run for the same amount of time, the runner who ran the farthest ran the fastest. Thus, compare the answer choices to find the longest distance.

First note that $\frac{3}{8} < \frac{5}{8}$: eliminate (G). Now convert the fractions to decimals then find the largest numeral:

F. $\frac{3}{5} = 0.6$

H. $\frac{5}{8} = 0.625$

J. $\frac{7}{9} \approx 0.778$



K. $\frac{11}{16} \approx 0.688$

33. (C) *Mathematics/Coordinate Geometry/Slope-Intercept Form of a Linear Equation*. CRS: GRE 24–27c. CC: 8.F.B.4. One way to approach this item is to derive an equation for the line using the information from the item stem and the slope-intercept form for the equation of a line. slope-intercept form of a linear equation is $y = mx + b$, where $m = \text{slope}$ and $b = y\text{-intercept}$.

First, since the line passes through the points $(0,0)$ and $(4,3)$, calculate the slope:

$$m = \frac{\text{change in } y}{\text{change in } x} = \frac{(3-0)}{(4-0)} = \frac{3}{4}. \text{ Next, since the line passes through the origin, the } y\text{-intercept} = 0. \text{ Thus,}$$

$$y = \frac{3}{4}x \Rightarrow 4y = 3x \Rightarrow 3x - 4y = 0, \text{ (C).}$$

Alternatively, the equation of the line could be found using point-slope form of a linear equation, $(y - y_1) = m(x - x_1)$, where m is the slope of the line and x_1 and y_1 refer to a point on the line.

$$\text{Calculate the slope: } m = \frac{\text{change in } y}{\text{change in } x} = \frac{(3-0)}{(4-0)} = \frac{3}{4}.$$

Select one of the points the line passes through and determine the equation for the line:

$$(y - 0) = \left(\frac{3}{4}\right)(x - 0) \Rightarrow y = \frac{3x}{4}.$$

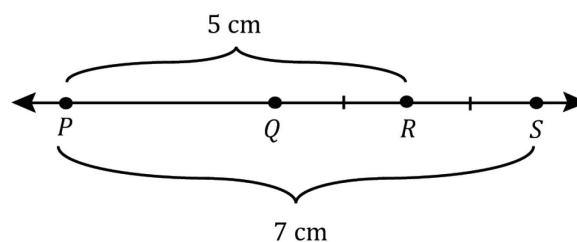
TIP Apply the Test-the-Test strategy. Substitute each point given in the item stem into the answer choices to see which one returns two true statements:

A. $x - y = 1 \Rightarrow 0 - 0 = 1 \Rightarrow 0 \neq 1$ ✗

B. $x + y = 7 \Rightarrow 0 + 0 = 7 \Rightarrow 0 \neq 7$ ✗

C. $3x - 4y = 0 \Rightarrow 3(0) - 4(0) = 0 \Rightarrow 0 = 0$ and $3x - 4y = 0 \Rightarrow 3(4) - 4(3) = 0 \Rightarrow 0 = 0$ ✓

34. (H) *Mathematics/Geometry/Lines and Angles*. CRS: GRE 24–27d. CC: HSN-CN.B.6. The most direct approach to this item is to create a diagram illustrating the information given in the item stem:



R is the midpoint of \overline{QS} , so $\overline{QR} = \overline{RS}$ and $\overline{QS} = 2\overline{RS}$. Additionally, $\overline{PS} - \overline{PR} = \overline{RS} \Rightarrow 7 - 5 = \overline{RS} \Rightarrow 2 = \overline{RS}$. Thus, $\overline{QS} = 2\overline{RS} = 2(2) = 4$, (H).

35. (E) *Mathematics/Algebra/Manipulating Expressions/Factoring Expressions*. CRS: XEI 24–27e. CC: HSA-REI.B.4b. For this item, directly factor the given expression:

$$3x^4 + 6x^2 - 45 = 3(x^4 + 2x^2 - 15) = 3(x^2 + 5)(x^2 - 3), \text{ (E).}$$

TIP Alternatively, apply the Plug-and-Chug strategy. Select a value for x other than 0, 1, or -1 since these values often do not lead to unique solutions. Then, use your selected x value to evaluate the expressions in the item stem and answer choices to find which one returns the same value as determined from the item stem. For example, let $x = 2$: $3x^4 + 6x^2 - 45 = 3(2^4) + 6(2^2) - 45 = 3(16) + 6(4) - 45 = 48 + 24 - 45 = 27$.

Now evaluate the answer choices:

- A. $(x^2 + 5)(x^2 - 3) \Rightarrow (2^2 + 5)(2^2 - 3) = (4 + 5)(4 - 3) = (9)(1) = 9$; $9 \neq 27$ ✗
- B. $(3x^2 - 15)(x^2 + 3) \Rightarrow (3(2)^2 - 15)(2^2 + 3) = (3(4) - 15)(4 + 3) = (12 - 15)(7) = (-3)(7) = -21$; $-21 \neq 27$ ✗
- C. $3(x^4 + 6x^2 - 45) \Rightarrow 3((2)^4 + 6(2)^2 - 45) = 3(16 + 6(4) - 45) = 3(16 + 24 - 45) = 3(-5) = -15$; $-15 \neq 27$ ✗
- D. $3(x^2 - 5)(x^2 + 3) \Rightarrow 3(2^2 - 5)(2^2 + 3) = 3(4 - 5)(4 + 3) = 3(-1)(7) = -21$; $-21 \neq 27$ ✗
- E. $3(x^2 + 5)(x^2 - 3) \Rightarrow 3(2^2 + 5)(2^2 - 3) = 3(4 + 5)(4 - 3) = 3(9)(1) = 27$; $27 = 27$ ✓

- 36. (G) Mathematics/Arithmetic/Complicated Arithmetic Application Items. CRS: BOA 20–23a. CC: 7.RP.A.3.** For this item, set up a direct proportion:

$$\frac{\text{Distance between Adjacent Gridlines}}{\text{Total Distance between Gridlines}} = \frac{\text{Miles Represented}}{\text{Total Miles Represented}} \Rightarrow \frac{1 \text{ cm}}{2.5 \text{ cm}} = \frac{4 \text{ mi}}{x \text{ mi}}$$

Now cross-multiply: $x = 10$, (G).

Another approach is to apply the ratio presented in the item stem: $1 \text{ cm on the map} : 4 \text{ mi} \Rightarrow 4 \text{ mi/cm}$. Thus, $2.5 \text{ cm on the map}$ represents: $(2.5 \text{ cm})(4 \text{ mi/cm}) = 10 \text{ mi}$.

- 37. (D) Mathematics/Arithmetic/Complicated Arithmetic Application Items. CRS: GRE 28–32c. CC: HSG-GPE.B.7.** For this item, first determine the associated distance between the two points on the map and their actual distance apart. Use the direct proportion:

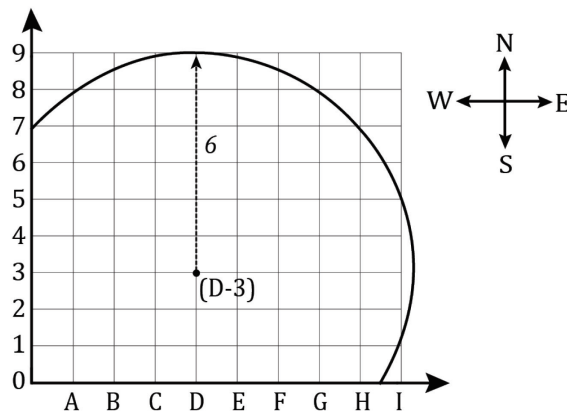
$$\frac{\text{Distance between Adjacent Gridlines}}{\text{Total Distance between Gridlines}} = \frac{\text{Miles Represented}}{\text{Total Miles Represented}} \Rightarrow \frac{1 \text{ cm}}{x \text{ cm}} = \frac{4 \text{ mi}}{24 \text{ mi}}$$

Now cross-multiply: $24 = 4x$

Divide both sides of the equation by 4: $6 = x$

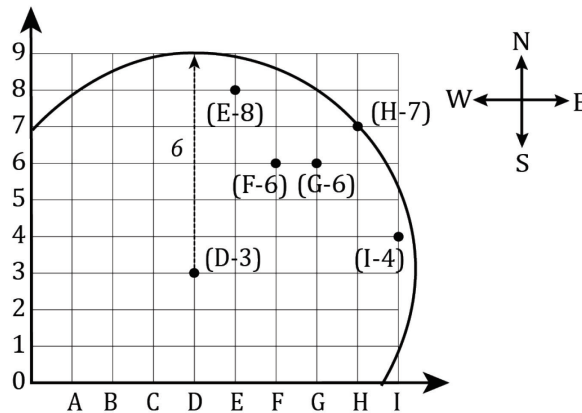
The points on the map are 6 cm apart.

One way to conceptualize the possible locations of the second point is as all of the points on a circle with radius equal to the required distance and center set as the given point.



The center of the circle is D-3 and the radius is 6 cm. The map encompasses a portion of the circle as shown.

Now determine which of the answer choices is closest to a possible location for the second landmark.



The correct answer is (D).

Alternatively, calculate the distance between the given point, D-3, and each of the answer choices to find which answer choice yields a distance closest to 6. Use the distance formula:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

- A. E-8: $d = \sqrt{(E-D)^2 + (8-3)^2} = \sqrt{(1)^2 + (5)^2} = \sqrt{26} \approx 5.09$
- B. F-6: $d = \sqrt{(F-D)^2 + (6-3)^2} = \sqrt{(2)^2 + (3)^2} = \sqrt{13} \approx 3.61$
- C. G-6: $d = \sqrt{(G-D)^2 + (6-3)^2} = \sqrt{(3)^2 + (3)^2} = \sqrt{18} \approx 4.24$
- D. H-7: $d = \sqrt{(H-D)^2 + (7-3)^2} = \sqrt{(4)^2 + (4)^2} = \sqrt{32} \approx 5.66$
- E. I-4: $d = \sqrt{(I-D)^2 + (4-3)^2} = \sqrt{(5)^2 + (1)^2} = \sqrt{26} \approx 5.09$

38. (F) *Mathematics/Arithmetic/Complicated Arithmetic Application Items.* CRS: BOA 28–32a. CC: HSN-Q.A.1. One way to approach this item is to first convert the actual length of the side of the square to the

length it would be on the map, then calculate the area. Use the direct proportion:

$$\frac{\text{Distance between Adjacent Gridlines}}{\text{Total Distance between Gridlines}} = \frac{\text{Miles Represented}}{\text{Total Miles Represented}} \Rightarrow \frac{1 \text{ cm}}{x \text{ cm}} = \frac{4 \text{ mi}}{\frac{1}{2} \text{ mi}}$$

Now cross-multiply: $\frac{1}{2} = 4x$

Divide both sides of the equation by 4: $\frac{\frac{1}{2}}{4} = \frac{4x}{4} \Rightarrow \frac{1}{8} = x$

The area of a square is the length of the side squared: $A = \left(\frac{1}{8}\right)^2 = \frac{1}{64}$ square miles, (F).

Alternatively, first calculate the area of the actual park and then convert the area to square centimeters:

$$A_{\text{square}} = s^2 \Rightarrow A_{\text{square}} = \left(\frac{1}{2} \text{ mile}\right)^2 = \frac{1}{4} \text{ square miles}$$

From the item stem we know that 1 centimeter represents 4 miles. Therefore, $(1 \text{ cm})^2 = (4 \text{ mi})^2 \Rightarrow 1 \text{ cm}^2 = 16 \text{ mi}^2$.

Use the direct proportion: $\frac{\text{Area of a Square on the Map}}{\text{Total Area of Squares on the Map}} = \frac{\text{Area Represented}}{\text{Total Area Represented}} \Rightarrow$

$$\frac{1 \text{ cm}^2}{x \text{ cm}^2} = \frac{16 \text{ mi}^2}{\frac{1}{4} \text{ mi}^2}$$

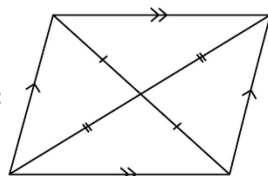
Now cross-multiply: $\frac{1}{4} = 16x$

Divide both sides of the equation by 16: $\frac{\frac{1}{4}}{16} = \frac{16x}{16} \Rightarrow \frac{1}{64} = x$

39. (E) **Mathematics/Geometry/Rectangles and Squares.** CRS: MEA 28–32a. CC: HSG-MG.A.1. For this item, recall that diagonals of a quadrilateral bisect each other only if both pairs of opposite sides are parallel to each other. Of the answer choices, only a trapezoid does not meet the requirement. Thus, the correct answer is (E).

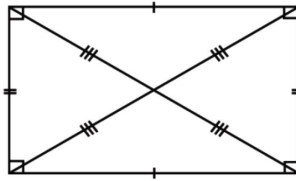
Alternatively, draw an example of each shape and its diagonals. Note whether the diagonals appear to bisect each other:

A. Parallelogram:

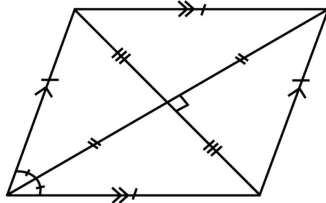




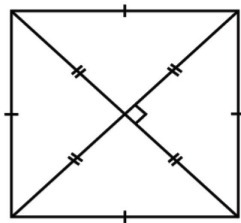
B. Rectangle:



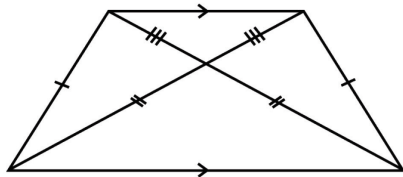
C. Rhombus:



D. Square:



E. Trapezoid:



40. (J) *Mathematics/Arithmetic/Complicated Arithmetic Application Items*. CRS: NUM 24–27a. CC: 6.NS.B.4. One way to conceptualize this item is to recognize that this is a situation where finding the common multiples of the two numbers will solve the problem.

Medication 1: every 6 hours

Medication 2: every 4 hours

The first dose of each is taken at 7:00 a.m. List the common multiples up to 24 (24 hours):

6: 6, 12, 18, 24

4: 4, 8, 12, 16, 20, 24

Twelve hours after the first dose, the two medications will again be taken at the same time, (J).

Alternatively, simulating administration of the drugs can solve this item. The first dose of each is taken at 7:00 a.m.

Medication 1: every 6 hours \Rightarrow 1:00 p.m., 7:00 p.m., 1:00 a.m., 7:00 a.m.

Medication 2: every 4 hours \Rightarrow 11:00 a.m., 3:00 p.m., 7:00 p.m., 11:00 p.m., 3:00 a.m., 7:00 a.m.

7:00 p.m. is 12 hours after the initial dose.

41. (B) *Mathematics/Statistics and Probability/Data Representation/Tables (Matrices)*. CRS: PSD 16–19d. CC: 6.SP.B.5a. For this item, apply the information in the table to find the solution. Note: Total Games Won = Games Won at Home + Games Won Away.

Team	Wins	Losses	Winning rate	Home Win-Loss Record	Away Games Won
New York	92	70	.568	49-31	$92 - 49 = 43$
Baltimore	88	74	.543	43-38	$88 - 43 = 45$
Boston	85	77	.525	47-34	$85 - 47 = 38$
Toronto	74	88	.457	35-46	$74 - 35 = 39$
Detroit	53	109	.327	27-54	$53 - 27 = 26$

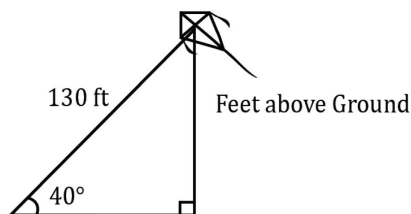
Baltimore won the most away games, 45, so the correct answer is (B).

42. (F) *Mathematics/Algebra/Solving Quadratic Equations and Relations*. CRS: XEI 24–27c. CC: HSA-REI.B.4b. One way to conceptualize this item is to apply the definition of a solution of an equation in that the solution when substituted into the equation yields a true statement: $x = 1$ is a solution to $x^2 + hx + 10 = 0$: $1^2 + h(1) + 10 = 0 \Rightarrow 1 + h + 10 = 0 \Rightarrow h = -11$, (F).

Another way to conceptualize this item is to identify the underlying factor for the given solution. Since $x = 1$ is a solution to $x^2 + hx + 10 = 0$, $(x - 1)$ is a factor of $x^2 + hx + 10 = 0$. The other factor is $(x + b)$, and $(-1)(b) = 10$. Thus, $b = -10$.

Now substitute -10 in for b and multiply the two binomials together: $(x - 1)(x + b) = (x - 1)(x - 10) = x^2 - 11x + 10$. Therefore, $h = -11$.

43. (A) *Mathematics/Trigonometry/Definitions of the Six Trigonometric Functions*. CRS: FUN 28–32b. CC: HSG-SRT.C.8. For this item, identify which of the trigonometric functions utilizes the information presented and requested in the item stem:



The length of the hypotenuse is given and the length of the side opposite the 40° angle is the requested information. Recall $\sin \theta = \frac{\text{Length of the Side Opposite } \theta}{\text{Length of the Hypotenuse}} \Rightarrow \sin 40^\circ = \frac{x}{130} \Rightarrow 0.643 = \frac{x}{130}$. Multiply each

side of the equation by 130: $0.643(130) = \frac{130x}{130} \Rightarrow 83.59 = x \Rightarrow x \approx 80$, (A).

44. (F) *Mathematics/Geometry/Circles*. CRS: MEA 28–32a. CC: 7.G.B.4. For this item find the radius of the large circle to calculate its area. Analyze the information presented in the item stem.

The 5 small circles are congruent. Therefore, they have congruent radii. The area of each of the small circles is 4π square units. $A = \pi r^2 \Rightarrow 4\pi = \pi r^2 \Rightarrow 4 = r^2 \Rightarrow 2 = r$, so each small circle has a radius of 2 and a diameter of 4.



The centers of the small circles lie on the same diameter and they are tangent to 2 other circles. There is no space between any of the circles along the diameter going through their centers. Therefore, the diameters of the small circles form the diameter of the large circle. Since the diameter of each small circle is 4, the diameter of the large circle is $5(4) = 20$ and the radius of the large circle is 10.

Calculate the area of the large circle: $A = \pi r^2 = \pi 10^2 = 100\pi$, (F).

45. (A) *Mathematics/Algebra/Manipulating Algebraic Expressions/Manipulating Expressions Involving Exponents*. CRS: NUM 28–32d. CC: HSN-RN.A.2. For this item, simplify the expression:

$$\sqrt[3]{27r^6} = (27r^6)^{\frac{1}{3}} = 27^{\frac{1}{3}}(r^6)^{\frac{1}{3}} = 3r^{\frac{6}{3}} = 3r^2, \text{ (A).}$$

- TIP** Alternatively, apply the Plug-and-Chug strategy. Select a value for r that is easy to work with, other than 0, 1, or -1 . Then evaluate the expression in the item stem for this value and then those in the answer choices. For example, let $r = 2$. Substitute into the given equation: $\sqrt[3]{27r^6} \Rightarrow \sqrt[3]{27(2)^6} = \sqrt[3]{27(64)} = \sqrt[3]{1,728} = 12$.

Now evaluate the answer choices for $x = 2$ and determine which returns 12.

A. $3r^2 \Rightarrow 3(2)^2 = 12$ ✓

It is not necessary to continue evaluating answer choices.

46. (K) *Mathematics/Algebra/Creating Algebraic Expressions*. CRS: NUM 20–23a. CC: HSF-BF.A.2. For this item, analyze the examples presented in the item stem and continue the pattern for a few more consecutive integers:

$$1^3 + 2^3 = (1+2)^2$$

$$1^3 + 2^3 + 3^3 = (1+2+3)^2$$

Continue the pattern:

$$1^3 + 2^3 + 3^3 + 4^3 = (1+2+3+4)^2$$

$$1^3 + 2^3 + 3^3 + 4^3 + 5^3 = (1+2+3+4+5)^2$$

What would be the expression for the sum of the cubes of the first 10 counting numbers?

$$1^3 + 2^3 \dots + 10^3 = (1+2\dots+10)^2$$

Now, generalize this result for the first c counting numbers:

$$1^3 + 2^3 \dots + c^3 = (1+2\dots+c)^2$$

Therefore, the correct answer is (K).

- TIP** Alternatively, apply the Plug-and-Chug strategy. Evaluate the sum of the cubes of a small number of consecutive counting numbers and then evaluate each of the answer choices to determine which yields the correct sum.

For example calculate the sum of the cubes of the first 4 counting numbers: 1, 2, 3, and 4:

$$1^3 + 2^3 + 3^3 + 4^3 = 1 + 8 + 27 + 64 = 100.$$

F. $(c+1)^3 \Rightarrow (4+1)^3 = 5^3 = 125$; $125 \neq 100$ ✗

G. $(c+1)^2 \Rightarrow (4+1)^2 = 5^2 = 25$; $25 \neq 100$ ✗

H. $(1+2+\dots+c)^c \Rightarrow (1+2+3+4)^4 = 10^4 = 10,000$; $10,000 \neq 100$ ✗

J. $(1+2+\dots+c)^3 \Rightarrow (1+2+3+4)^3 = 10^3 = 1,000$; $1,000 \neq 100$ ✗

K. $(1+2+\dots+c)^2 \Rightarrow (1+2+3+4)^2 = 10^2 = 100$; $100 = 100$ ✓

47. **(B) Mathematics/Geometry/Circles. CRS: MEA 33–36a. CC: HSG-MG.A.2.** For this item, apply the formula given in the item stem to the rest of the information presented in the item stem:

$$\text{Volume}_{\text{Sphere}} = \frac{4}{3}\pi r^3.$$

Determine an equation for the relationship of the radii of Earth and Uranus: $r_{\text{Uranus}} = 4r_{\text{Earth}}$. Now calculate the related volume for Uranus and Earth:

$$V_{\text{Uranus}} = \frac{4}{3}\pi(r_{\text{Uranus}})^3 \Rightarrow V_{\text{Uranus}} = \frac{4}{3}\pi(4r_{\text{Earth}})^3 = \frac{4}{3}\pi(4^3)(r_{\text{Earth}})^3 = \frac{4}{3}\pi(64)(r_{\text{Earth}})^3$$

$$V_{\text{Earth}} = \frac{4}{3}\pi(r_{\text{Earth}})^3$$

$$V_{\text{Uranus}} = 64\left(\frac{4}{3}\pi(r_{\text{Earth}})^3\right) \Rightarrow 64(V_{\text{Earth}})$$

Therefore, the correct answer is (B).

Alternatively, informally reason that an increase in the radius of a sphere results in a multiplicative increase in the sphere's volume, precisely a cubic increase. The radius of Uranus is 4 times that of Earth. Thus, the volume of Uranus is $4^3 = 64$ times that of Earth.

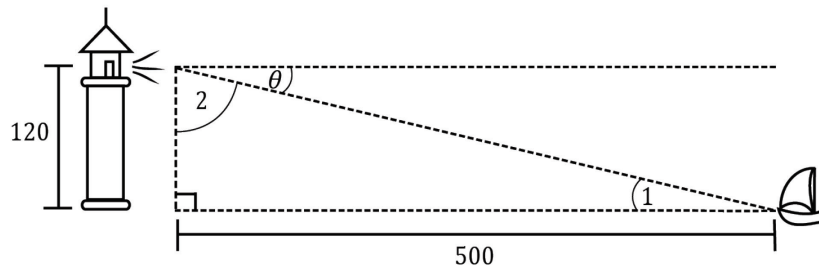
48. **(H) Mathematics/Statistics and Probability/Averages. CRS: XEI 28–32a. CC: HSA-CED.A.4.** For this item,

apply the formula for finding the average of a group of elements. $\text{Average} = \frac{\text{Sum of the Elements}}{\text{Number of Elements}} \Rightarrow$

$$a = \frac{a+a+a+b+c}{5} = \frac{3a+b+c}{5} \Rightarrow 5a = 3a+b+c \Rightarrow 2a = b+c \Rightarrow a = \frac{b+c}{2}, \text{ (H)}.$$

49. **(E) Mathematics/Trigonometry/Determining Trigonometric Values. CRS: FUN 24–27b. CC: HSG-SRT.C.8.**

For this item, determine which of the triangle's acute angles has a measure equal to θ , before determining which trigonometric functions can be used to find theta's measure:



Note: $90 + \angle 1 + \angle 2 = 180$ and $\angle 2 = 90 - \theta$. Thus, $\angle 1 = 180 - 90 - \angle 2 = 90 - \angle 2 = 90 - (90 - \theta) = \theta$.

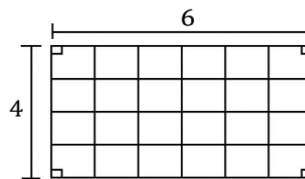
Alternatively, note that the two horizontal lines are parallel and θ and angle 1 are alternate interior angles. Thus $\angle 1 = \theta$.

Determine the trigonometric function that could be used to find θ :

$$\tan \theta = \frac{\text{Length of the Side Opposite } \theta}{\text{Length of the Side Adjacent to } \theta} = \frac{120}{500}$$

Therefore, the correct answer is (E).

50. (H) *Mathematics/Geometry/Rectangles and Squares*. CRS: MEA 28–32a. CC: HSG-MG.A.3. For this item draw a diagram suggested in the item stem:



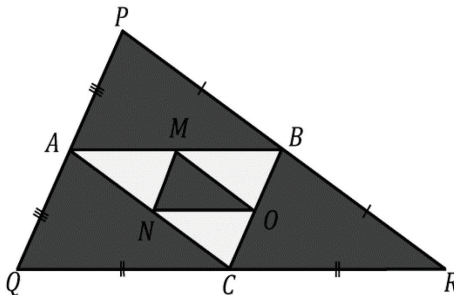
Now determine the number of sides of the small squares in the diagram. Count each side only once.

Each column consists of 4 sides of a square: $(7)(4) = 28$.

Each row consists of 6 sides of a square: $(5)(6) = 30$.

Total sides: $28 + 30 = 58$, (H).

51. (E) *Mathematics/Geometry/Triangles/Working with Triangles*. CRS: MEA 33–36b. CC: HSG-MG.A.3. One way to conceptualize this item is to find the fraction of the total area that the not shaded triangles comprise:



The item stem states that A , B , and C are midpoints of the sides of triangle PQR . The following sides are congruent: $\overline{PB} \cong \overline{BR}$, $\overline{QC} \cong \overline{CR}$, and $\overline{QA} \cong \overline{AP}$. Also, \overline{PQ} is proportionate to \overline{AQ} ($\overline{AQ} = \frac{1}{2}\overline{PQ}$), \overline{QR} is proportionate to \overline{QC} ($\overline{QC} = \frac{1}{2}\overline{QR}$), and $\angle Q$ is the corresponding inscribed angle for triangles PQR and AQC . Finally, triangle PQR is similar to triangle AQC .

Using this same reasoning, triangles PAB and BCR are both similar to triangle PQR , with the same proportional relationship: their sides are $\frac{1}{2}$ of the corresponding side of triangle PQR . The following sides are congruent: $\overline{BA} \cong \overline{QC}$, $\overline{BA} \cong \overline{CR}$, $\overline{CB} \cong \overline{PA}$, and $\overline{CB} \cong \overline{AQ}$, $\overline{CA} \cong \overline{PB}$, and $\overline{CA} \cong \overline{BR}$. Therefore triangles PAB , AQC , BCR , and CBA are congruent to each other because all corresponding sides are congruent to each other. The areas of triangles PAB , AQC , BCR , and CBA are equal, and each triangle's area is $\frac{1}{4}$ the area of triangle PQR , and $\frac{1}{4}$ the area of triangle PQR is equal to the area of triangle ABC .

The item stem also states that M , N , and O are midpoints of the sides of triangle ABC . The same reasoning for determining that the area of triangle ABC is equal to $\frac{1}{4}$ of the area of triangle PQR applies to triangle ABC and the four triangles formed by the midpoints of its sides. The areas of triangles ANM , OMN , MOB , and NCO are equal, and the areas of triangles ANM , MOB , and NCO is $\frac{1}{4}$ the area of triangle ABC .

Now determine the area of the unshaded triangles: $3\left(\frac{1}{4}\text{Area}_{\Delta ABC}\right) = \frac{3}{4}\text{Area}_{\Delta ABC} = \frac{3}{4}\left(\frac{1}{4}\text{Area}_{\Delta PQR}\right)$.

Therefore, $\text{Area}_{\text{Unshaded Triangles}} = \frac{3}{16}\text{Area}_{\Delta PQR}$ and $\text{Area}_{\text{Shaded Triangles}} = \frac{13}{16}\text{Area}_{\Delta PQR}$, (E).

Alternatively, using the same line of reasoning as above, directly find the area of the shaded portion:

Since the areas of triangles PAB , AQC , BCR , and CBA are equal, each triangle's area is $\frac{1}{4}$ the area of triangle PQR . Additionally, $\text{Area}_{\Delta PAB} + \text{Area}_{\Delta AQC} + \text{Area}_{\Delta BCR} = \frac{1}{4}\text{Area}_{\Delta PQR} + \frac{1}{4}\text{Area}_{\Delta PQR} + \frac{1}{4}\text{Area}_{\Delta PQR} = \frac{3}{4}\text{Area}_{\Delta PQR}$, and the areas of triangles ANM , OMN , MOB , and NCO are equal, each triangle's area is $\frac{1}{4}$ the area of triangle ABC . Therefore, $\text{Area}_{\Delta OMN} = \frac{1}{4}\text{Area}_{\Delta ABC} = \frac{1}{4}\left(\frac{1}{4}\text{Area}_{\Delta PQR}\right) = \frac{1}{16}\text{Area}_{\Delta PQR}$.

The total shaded area is: $\frac{3}{4}\text{Area}_{\Delta PQR} + \frac{1}{16}\text{Area}_{\Delta PQR} = \frac{12}{16}\text{Area}_{\Delta PQR} + \frac{1}{16}\text{Area}_{\Delta PQR} = \frac{13}{16}\text{Area}_{\Delta PQR}$

TIP Alternatively, use the Meastimate strategy. Assume that the diagram is drawn to scale to informally assess the answer choices.

The diagram shows that the shaded regions represent more than half of the area of triangle PQR . In fact, the three large shaded triangles appear to be three fourths of the area of triangle PQR . Since one of the



smaller triangles is shaded in, the total shaded area appears to be greater than $\frac{3}{4}$ the area of triangle PQR . Eliminate (A), (B), (C), and (D).

52. (K) **Mathematics/Coordinate Geometry/Distance Formula.** CRS: GRE 28–32c. CC: HSG-GPE.B.7. Apply the midpoint and distance formulas.

$$\text{Midpoint } (x,y) = \frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}$$

$$\text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

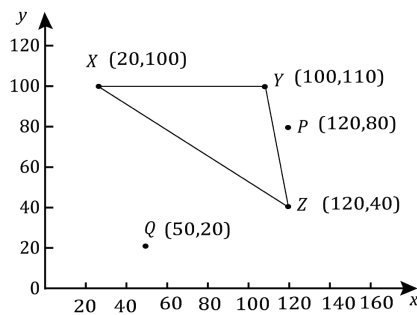
Calculate the midpoint between the two points under consideration, $X(20,100)$ and $Z(120,40)$:

$$\text{Midpoint } (x,y) = \frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2} \Rightarrow \frac{120 + 20}{2}, \frac{40 + 100}{2} \Rightarrow \frac{140}{2}, \frac{140}{2} \Rightarrow (70,70)$$

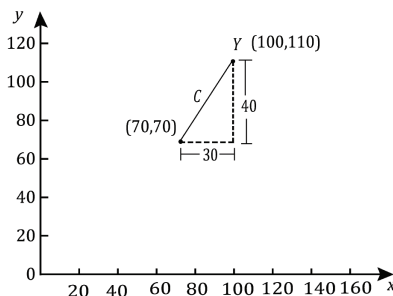
Now determine the distance between the point $(70,70)$ and $Y(100,110)$:

$$\text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \Rightarrow \sqrt{(100 - 70)^2 + (110 - 70)^2} = \sqrt{(30)^2 + (40)^2} = \sqrt{900 + 1,600} = \sqrt{2,500} = 50, \text{ (K).}$$

Another way to approach this item is to “step” it out:



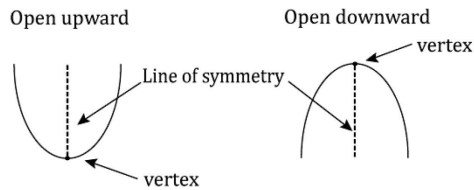
Notice that the vertical distance between X and Z is 60 units and the horizontal distance is 100. Thus the midpoint is found by traversing half of these distances: 30 and 50 units respectively. Starting at X , move down 30 units, $(100 - 30 = 70)$, then to the right 50 units, $(20 + 50 = 70)$. The midpoint is $(70,70)$.



Note the right triangle in the diagram with the line segment connecting the points $(70,70)$ and Y as the hypotenuse. Now notice that the horizontal leg of this right triangle has a length of 30 units and the vertical leg 40. Use the Pythagorean theorem to find the length of the hypotenuse, the distance between the ticket booth and point Y : $c^2 = a^2 + b^2 \Rightarrow c^2 = 30^2 + 40^2 \Rightarrow c^2 = 900 + 1,600 \Rightarrow c^2 = 2,500 \Rightarrow c = 50$.

TIP Once the two lengths of the legs of the right triangle have been ascertained, use the Meastimate strategy. The hypotenuse of a right triangle is the longest side of the triangle; (F), (G), and (H) can be eliminated. While the hypotenuse in the diagram above does not appear to be significantly longer than the longest leg, remember that the scale is in increments of 20 units. The extent to which the hypotenuse is longer appears less than it actually is. Eliminate (J).

53. (A) *Mathematics/Algebra/Solving Quadratic Equations and Relations*. CRS: GRE 33–36b. CC: HSA-SSE.B.3b. This item can be approached in a variety of ways. One approach is to recall that a parabola is the graph of a quadratic function:



The vertex of a parabola is either the maximum or minimum point of the function and is on the line of symmetry. If the coefficient of the squared term is positive, the vertex is a minimum, and if the coefficient is negative, the vertex is a maximum. Recall the formula for determining the x -coordinate of the vertex when the equation is written in standard form: $y = ax^2 + bx + c$. The x -coordinate of the vertex is $\frac{-b}{2a}$.

Note the quadratic function presented in the item stem uses the variable t instead of x and h instead of y : $h = 3t - t^2 = -t^2 + 3t$. Since $a = -1$, the parabola opens downward and the vertex is a maximum. Also, $b = 3$. Therefore, the t -coordinate of the vertex is $\frac{-b}{2a} \Rightarrow \frac{-3}{2(-1)} = \frac{3}{2}$, (A).

Alternatively, graph the function. Select values for t and calculate h . For example calculate h for $t = 0, 1, 2, 3$:

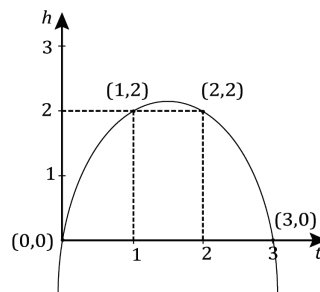
$$t = 0: h = 3(0) - 0^2 = 0$$

$$t = 1: h = 3(1) - 1^2 = 2$$

$$t = 2: h = 3(2) - 2^2 = 6 - 4 = 2$$

$$t = 3: h = 3(3) - 3^2 = 9 - 9 = 0$$

Graph these points:





The vertex of the parabola will be on the line of symmetry. From the graph, observe that this line intersect the t -axis at the midpoint between 1 and 2: $\frac{3}{2}$.

Another approach to this item is to recall that the solutions of a function when $y = 0$ are the x -intercepts of the graph of the function. Since the function given is quadratic, the graph will be a parabola and there will be 0, 1, or 2 solutions to the function when $y = 0$.

Solve the function for $h = 0$: $h = 3t - t^2 \Rightarrow 0 = 3t - t^2 = t(3 - t)$. Therefore, $t = 0$ and $t = 3$.

Since there are two solutions, the vertex will be along the line of symmetry for the parabola, the midpoint between the two solutions: $t = \frac{3-0}{2} = \frac{3}{2}$

TIP Alternatively, apply the Test-the-Test strategy. Evaluate t for each of the answer choices to find which yields the largest value for h :

A. $t = \frac{3}{2}$: $h = 3\left(\frac{3}{2}\right) - \left(\frac{3}{2}\right)^2 = \frac{9}{2} - \frac{9}{4} = 4.5 - 2.25 = 2.25$

B. $t = 2$: $h = 3(2) - (2)^2 = 6 - 4 = 2$

C. $t = \frac{9}{4}$: $h = 3\left(\frac{9}{4}\right) - \left(\frac{9}{4}\right)^2 = \frac{27}{4} - \frac{81}{16} = 6.75 - 5.0625 = 1.6875$

D. $t = 3$: $h = 3(3) - (3)^2 = 9 - 9 = 0$

E. $t = \frac{9}{2}$: $h = 3\left(\frac{9}{2}\right) - \left(\frac{9}{2}\right)^2 = \frac{27}{2} - \frac{81}{4} = 13.5 - 20.25 = -6.75$

Note that since the answer choices are in ascending order, it is unnecessary to test the answer choices after (B) IF there is an understanding about the shape of the graph of a quadratic function that has a maximum.

54. **(K) Mathematics/Algebra/Manipulating Algebraic Expressions/Basic Algebraic Manipulations. CRS: XEI 20–23b. CC: HSA-APR.A.1.** For this item, solve directly by finding a common denominator and simplify the resulting expression.

Given the expression $\frac{1}{x+1} + \frac{1}{x}$, a common denominator is $x(x+1)$:

$$\left(\frac{x}{x}\right)\left(\frac{1}{x+1}\right) + \left(\frac{x+1}{x+1}\right)\left(\frac{1}{x}\right) = \frac{x}{x(x+1)} + \frac{x+1}{x(x+1)} = \frac{x+x+1}{x(x+1)} = \frac{2x+1}{x(x+1)}, \text{ (K).}$$

TIP Alternatively, apply the Plug-and-Chug strategy. Select a value for x greater than 0 that is easy to use. (Note it is advisable to use a value other than 1 since using 1 does not always lead to unique solutions.) Use this value to evaluate the expression in the item stem and those in the answer choices. For example, let $x = 2$:

Evaluate the given expression for $x = 2$: $\frac{1}{x+1} + \frac{1}{x} = \frac{1}{2+1} + \frac{1}{2} = \frac{1}{3} + \frac{1}{2} = \frac{2}{6} + \frac{3}{6} = \frac{5}{6}$

Compare this resultant to those from evaluating the answer choices for $x = 2$:

F. $\frac{1}{x(x+1)} : \frac{1}{2(2+1)} = \frac{1}{2(3)} = \frac{1}{6}; \frac{1}{6} \neq \frac{5}{6}$ ✗

G. $\frac{1}{2x+1} : \frac{1}{2(2)+1} = \frac{1}{5}; \frac{1}{5} \neq \frac{5}{6}$ ✗

H. $\frac{2}{x(x+1)} : \frac{2}{2(2+1)} = \frac{2}{2(3)} = \frac{2}{6} = \frac{1}{3}; \frac{1}{3} \neq \frac{5}{6}$ ✗

J. $\frac{2}{x} + 1 : \frac{2}{2} + 1 = 1 + 1 = 2; 2 \neq \frac{5}{6}$ ✗

K. $\frac{2x+1}{x(x+1)} : \frac{2(2)+1}{2(2+1)} = \frac{4+1}{2(3)} = \frac{5}{6}; \frac{5}{6} = \frac{5}{6}$ ✓

55. (D) **Mathematics/Geometry/Rectangles and Squares. CRS: PPF 20–23b. CC: 8.G.A.5.** For this item recall that quadrilaterals have four sides ($n = 4$) and that the sum of the measures of the interior angles of a quadrilateral is 360 degrees ($360 = (n - 2)180$). Apply this information to the information presented in the item stem.

The measure of the angles of a quadrilateral are in the ratio of 1:2:3:4. There is a common factor, x , for the measure of each angle such that when it is divided out what remains is 1, 2, 3, and 4. The measure of the angles of the quadrilateral are $1x$, $2x$, $3x$, and $4x$. Therefore,

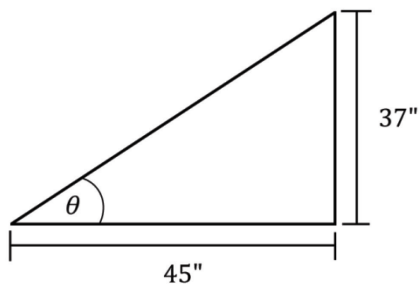
$$1x + 2x + 3x + 4x = 360 \Rightarrow 10x = 360 \Rightarrow x = 36.$$

Now calculate the measure of the largest angle. The measure of the largest angle is represented by $4x$, so $4x = 4(36) \Rightarrow 4x = 144$, (D).

56. (K) **Mathematics/Trigonometry/Determining Trigonometric Values. CRS: FUN 28–32b. CC: HSG-SRT.C.8.**

Recall that the cosine of a right triangle is defined as $\cos \theta = \frac{\text{The Length of the Leg Adjacent to } \theta}{\text{The Length of the Hypotenuse}}$. Note

that the smallest angle of a triangle is the angle opposite the shortest leg. Thus, for this particular right triangle, the angle opposite the leg of length 37 inches is the smallest angle.



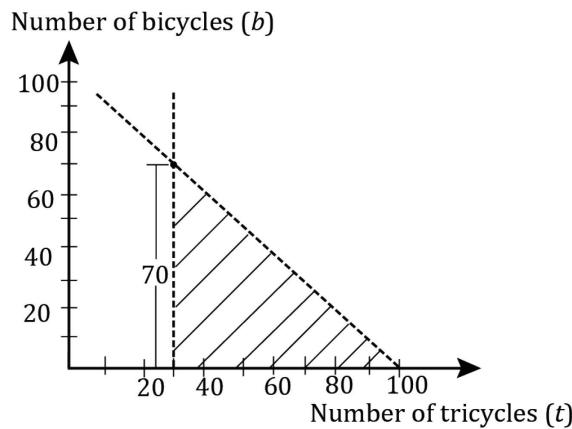


$$\cos \theta = \frac{45}{\text{The Length of the Hypotenuse}}$$

Find the length of the hypotenuse using the Pythagorean theorem: $c^2 = a^2 + b^2 \Rightarrow$

$$c^2 = 37^2 + 45^2 \Rightarrow c = \sqrt{37^2 + 45^2}. \text{ Therefore, } \cos \theta = \frac{45}{\sqrt{37^2 + 45^2}}, \text{ (K).}$$

57. (E) *Mathematics/Algebra/Solving Simultaneous Equations. CRS: GRE 28–32a. CC: HSF-IF.B.4.* For this item, the system of inequalities has been solved graphically as shown by the shaded region:



To describe the solution set, analyze the shaded region. Assign variables to the axes. Let t represent the number of tricycles and b represent the number of bicycles. Find equations for boundaries of the shaded region:

The horizontal axis is a boundary: $b = 0$. Since this line is solid and the region above it is shaded, $b \geq 0$.

Note that the vertical line intersects the horizontal axis at 30, so $t = 30$. Since this line is dashed and the region to the right of it is shaded, $t > 30$. therefore, the number of tricycles is greater than 30.

Next analyze the diagonal line. $(0,100)$ and $(100,0)$ are points on the line. The slope of the line is

$$m = \frac{\text{rise}}{\text{run}} = \frac{0 - 100}{100 - 0} = \frac{-100}{100} = -1 \text{ and this line intersects the vertical axis at } 100: b = -t + 100. \text{ Since the}$$

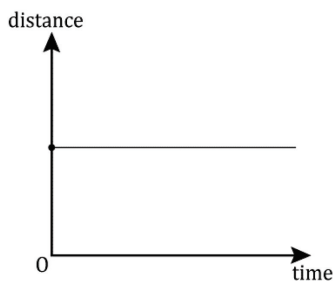
line is dashed and the region below the line is shaded, $b < -t + 100$. Add t to both sides:

$$b + t < -t + 100 + t \Rightarrow b + t < 100. \text{ The sum of the bicycles and tricycles is less than } 100, \text{ (E).}$$

Alternatively, analyze each answer choice:

- A. $t > 30$ and $b > 30$: This is incorrect because a portion of the shaded region has $b < 30$.
- B. $t > 30$ and $b < t$: This is incorrect because there are points within the shaded region where the number of bicycles is greater than the number of tricycles: for example the point $(31, 69)$.
- C. $t < 100$ and $b < 100$: This is incorrect because there are points outside of the shaded region that fit this description: for example the point $(20, 80)$.
- D. $b + t > 100$ and $b < 100$: This is incorrect because none of the points that fit this description are in the shaded region: for example the point $(80, 60)$.
- E. $b + t < 100$ and $t > 30$: All points that fit this description are in the shaded region.

58. (K) *Mathematics/Coordinate Geometry/Qualitative Behavior of Graphs of Functions*. CRS: GRE 28–32a. CC: HSF-IF.B.4. For this item, interpret the meaning of the graph of the function as suggested in the item stem:



Distance is defined to be *the distance between a fixed point and an object* as measured over a period of time. Since the resulting graph of this distance is a horizontal line, this suggests the equation for this function is $d = a$ constant value. That is, for the period of time under consideration, the distance between the fixed point and the object did not change.

What are the possible scenarios that could result in this?

Instead of trying to imagine possible scenarios of what the object could be doing, analyze the possibilities presented in the item stem:

(The object is) Moving in a circle around the fixed point.

(The object is) Moving in a straight line away from the fixed point.

(The object is) Standing still.

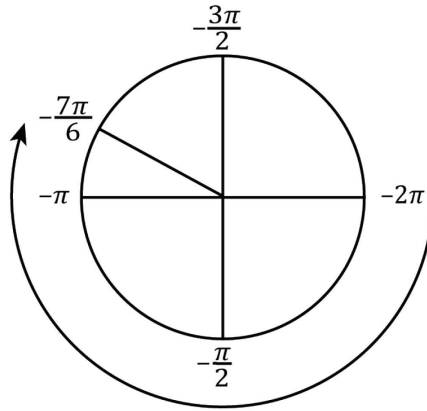
I: The graph is a straight line, not a circle. Realize though that the graph is showing the distance the object is **from a fixed point**. Recall the definition of a circle: a round plane figure whose boundary consists of points equidistant from a fixed point. Imagine walking on a line denoting a circle: your distance from the center of that circle will always be the same. Thus a graph of the distance between you and the center of the circle would be a horizontal line: the distance did not change over the period of time you walked on the line denoting the circle. Statement I is true.

II. For this scenario, imagine walking away from a fixed point, say the library. How does the distance between you and the library change as you continue walking? It increases the longer you walk. The graph for this item, though, indicates that the distance between the object and a fixed point does not change. Statement II is false.

III. Consider an object standing still for a period of time. How does the distance between this object and a fixed point change over this period of time? It doesn't. Statement III is true. The correct answer choice is (K).



59. (D) *Mathematics/Trigonometry/Trigonometric Relationships*. CRS: FUN 33–36c. CC: HSF-TF.A.2. Recall that in the radian system of angular measurement, the measure of one revolution is 2π : 2π radians = 360° . Also recall that movement along the unit circle begins at the x -axis and proceeds counterclockwise: a negative angle would proceed clockwise. Thus, an angle of $\frac{-7\pi}{6}$ can be drawn as:



Now convert $\frac{-7\pi}{6}$ radians to degrees using a direct proportion:

$$\frac{\text{Radians of the Desired Angle}}{\pi \text{ radians}} = \frac{\text{Degrees of the Desired Angle}}{180^\circ} \Rightarrow \frac{\frac{-7\pi}{6} \text{ radians}}{\pi \text{ radians}} = \frac{x^\circ}{180^\circ}$$

Cross-multiply: $-\frac{7\pi}{6}(180) = \pi x \Rightarrow -210\pi = \pi x \Rightarrow -210 = x$. Now find the reference angle: $360^\circ - 210^\circ = 150^\circ$, (D).

Alternatively, use a calculator to calculate the sine and cosine for the angle in the item stem and each answer choice. First either find the degree measure of $\frac{-7\pi}{6}$ radians or put your calculator in radian mode.

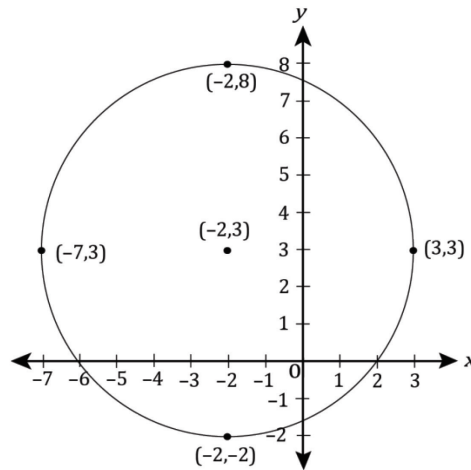
$$\sin\left(\frac{-7\pi}{6}\right) = 0.5; \cos\left(\frac{-7\pi}{6}\right) \approx -0.866$$

Now find the sine and cosine for the answer choices (remember to put the calculator in degree mode).

- A. 30° : $\sin(30) = 0.5$; $\cos(30) \approx 0.866$ ✗
 B. 60° : $\sin(60) \approx 0.866$; $\cos(60) = 0.5$ ✗
 C. 120° : $\sin(120) \approx 0.866$; $\cos(120) = -0.5$ ✗
 D. 150° : $\sin(150) = 0.5$; $\cos(150) \approx -0.866$ ✓
 E. 210° : $\sin(210) = -0.5$; $\cos(210) \approx -0.866$ ✗
60. (G) *Mathematics/Geometry/Circles*. CRS: GRE 28–32e. CC: HSG-GPE.A.1. Recall the standard form of the equation of a circle: $(x-h)^2 + (y-k)^2 = r^2$, where (h,k) are the coordinates of the center of the circle and r is the radius.

Determine the equation of the circle suggested in the item stem. The center is $(-2,3)$, so $h = -2$ and $k = 3$. The radius is 5, so $r = 5$. Therefore, $(x - (-2))^2 + (y - 3)^2 = 5^2 \Rightarrow (x + 2)^2 + (y - 3)^2 = 25$. Multiply out the squared binomials: $(x + 2)^2 + (y - 3)^2 = 25 \Rightarrow x^2 + 4x + 4 + y^2 - 6y + 9 = 25 \Rightarrow x^2 + 4x + y^2 - 6y + 13 = 25 \Rightarrow x^2 + y^2 + 4x - 6y = 12$, (G).

Alternatively, draw a diagram of the circle suggested in the item stem on coordinate axes:



From the item stem, the center is $(-2,3)$ and the radius is 5. Thus the four points $(3,3)$, $(-2,-2)$, $(-7,3)$, and $(-2,8)$ must be on the circle: they are each 5 units away from the center point. Select one of these points to test the answer choices. For example, test the answer choices using $(3,3)$:

F. $x^2 + y^2 + 4x - 6y = 5 \Rightarrow 3^2 + 3^2 + (4)(3) - (6)(3) = 5 \Rightarrow 9 + 9 + 12 - 18 = 5 \Rightarrow 12 \neq 5$ ✗

G. $x^2 + y^2 + 4x - 6y = 12 \Rightarrow 3^2 + 3^2 + (4)(3) - (6)(3) = 12 \Rightarrow 9 + 9 + 12 - 18 = 12 \Rightarrow 12 = 12$ ✓

Continue checking to verify that there is only one answer choice that yields a true statement.

H. $x^2 + y^2 + 4x - 6y = 25 \Rightarrow 3^2 + 3^2 + (4)(3) - (6)(3) = 25 \Rightarrow 9 + 9 + 12 - 18 = 25 \Rightarrow 12 \neq 25$ ✗

J. $x^2 + y^2 - 4x + 6y = 12 \Rightarrow 3^2 + 3^2 - (4)(3) + (6)(3) = 12 \Rightarrow 9 + 9 - 12 + 18 = 12 \Rightarrow 24 \neq 12$ ✗

K. $x^2 + y^2 - 4x + 6y = 25 \Rightarrow 3^2 + 3^2 - (4)(3) + (6)(3) = 25 \Rightarrow 9 + 9 - 12 + 18 = 25 \Rightarrow 24 \neq 25$ ✗

Only (G) yields a true statement, so (G) is correct.

Mathematics — Common Core State Standards

Standard	Description
6.NS.B.4	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.
6.NS.C.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
6.SP.B.5a	Reporting the number of observations.
7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
7.G.B.4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
7.NS.A.2d	Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.
7.RP.A.3	Solve real-world and mathematical problems involving the four operations with rational numbers.
7.SP.C.5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around $1/2$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
8.EE.C.7b	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
8.F.B.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
8.G.A.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.
8.G.B.7	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
HSA-APR.A.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
HSA-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
HSA-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
HSA-REI.B.4b	Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .
HSA-REI.C.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
HSA-SSE.B.3b	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
HSF-BF.A.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to

	model situations, and translate between the two forms.
HSF-BF.B.5	Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
HSF-IF.A.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.
HSF-IF.A.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
HSF-IF.B.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i>
HSF-TF.A.2	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
HSG-CO.C.10	Prove theorems about triangles. <i>Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.</i>
HSG-GPE.A.1	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
HSG-GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.*
HSG-MG.A.1	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
HSG-MG.A.2	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
HSG-MG.A.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
HSG-SRT.B.4	Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
HSG-SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
HSN-CN.B.6	Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.
HSN-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
HSN-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
HSS-CP.A.1	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
HSS-CP.B.9	Use permutations and combinations to compute probabilities of compound events and solve problems.



Mathematics — College Readiness Standards

Standard	Description
Basic Operations and Applications	
BOA 16–19a	Solve one-step arithmetic problems.
BOA 20–23a	Solve two- or three-step arithmetic problems involving rate and proportion, tax added, percentage off, computing with a given average, etc.
BOA 28–32a	Solve word problems that contain multiple rates, proportions, or percentages.
Probability, Statistics, and Data Analysis	
PSD 16–19d	Perform calculations on data from tables and graphs.
PSD 16–19e	Understand and use the relationship between the probability of an event and the probability of its complement.
PSD 20–23d	Understand simple counting techniques.
Number Concepts	
NUM 20–23a	Show familiarity with basic features of the number system.
NUM 24–27a	Identify and use the least common multiple.
NUM 24–27b	Put fractions in order.
NUM 28–32d	Apply the rules of exponents.
NUM 33–36b	Demonstrate knowledge of logarithms and geometric sequences.
Expressions, Equations, and Inequalities	
XEI 20–23a	Evaluate algebraic expressions using integers.
XEI 20–23b	Add and subtract simple algebraic expressions.
XEI 20–23c	Solve routine first-degree equations.
XEI 20–23e	Multiply two binomials.
XEI 24–27b	Write expressions, equations, or inequalities with a single variable for common pre-algebra situations.
XEI 24–27c	Identify solutions to basic quadratic equations.
XEI 24–27d	Demonstrate ability to add, subtract, and multiply polynomials.
XEI 24–27e	Factor simple quadratics such as the difference of squares and perfect square trinomials.
XEI 24–27f	Solve first-degree inequalities that don't require reversing the inequality sign.
XEI 28–32a	Manipulate equations and expressions.
XEI 28–32e	Solve quadratic equations.
XEI 28–32f	Find solutions to systems of linear equations.
Graphical Representations	
GRE 20–23a	Locate points in the coordinate plane.
GRE 24–27b	Find the slope of a line from points or equations.
GRE 24–27c	Match linear graphs to their equations.
GRE 24–27d	Find the midpoint of a line segment.
GRE 28–32a	Analyze and apply information from graphs in the coordinate plane.
GRE 28–32c	Use the distance formula.
GRE 28–32e	Demonstrate the knowledge of special characteristics of parabolas and circles.
GRE 33–36b	Identify characteristics of graphs based on a general equation or a set of conditions.
Properties of Plane Figures	
PPF 16–19a	Demonstrate some knowledge of the angles associated with parallel lines.
PPF 20–23b	Show familiarity with the basic properties of angles.
PPF 24–27c	Use properties of isosceles triangles.
PPF 28–32b	Use the Pythagorean theorem.

PPF 33-36a	Know how to draw conclusions based on a set of conditions.
Measurement	
MEA 28-32a	Compute another measure using relationships involving area, perimeter, and volume of geometric figures.
MEA 33-36a	Use scale factors to determine the degree of a size change.
MEA 33-36b	Compute the area of composite geometric figures that requires planning or visualization.
Functions	
FUN 24-27b	Express the sine, cosine, and tangent of a right triangle angle as a ratio of given side lengths.
FUN 28-32a	Evaluate composite functions at integer values.
FUN 28-32b	Solve right-triangle problems by applying basic trigonometric ratios.
FUN 33-36c	Exhibit a basic knowledge of the complex numbers.



ACT READING TEST EXPLANATIONS

Passage I—Prose Fiction

1. **(C) Reading/Prose Fiction/Main Idea. CCRS: MID 24–27c. CC: ELA-Literacy.CCRA.R.2.** This question asks for the answer choice that best provides the correct summary of the excerpt. (C) is the correct answer because it adequately addresses all aspects of the main idea of this passage, which is that two sisters who have not seen each other in many years are preparing to be reunited and are reflecting on their troubled relationship.

(A) is incorrect because it doesn't address the complexities of the relationship between Sunday and Delta, nor does it take Delta's perspective into account. While the facts are true—Sunday is returning because Nana died—it doesn't discuss the tension between the sisters.

(B) is incorrect because the passage does not discuss any attempts at reconciliation between the sisters. The passage uses flashbacks to address past arguments between the sisters, and then leaves the reader at the point when the sisters are about to meet again after five years of separation.

(D) is incorrect because neither sister contemplates moving back to Wake County. Sunday had moved away from Wake County to Chicago years before, but no mention is made of her desire to return to her hometown.

2. **(H) Reading/Prose Fiction/Implied Idea. CCRS: MID 24–27b. CC: ELA-Literacy.CCRA.R.2.** This question asks what the primary conflict is between the two sisters in the passage. (H) is correct because it adequately addresses the scope of the conflict between Delta and Sunday, which is that they have fundamentally different views of the world.

(F) is incorrect because the passage clearly states that Sunday is the sister who paints, not Delta, so Delta would not feel an "inability to express herself adequately in her paintings," as stated in the answer choice.

(G) is incorrect because Sunday does not have much of an inner conflict about whether or not she should stay in her hometown. She very clearly dislikes her hometown, as stated in line 63: "This place pulls you down and holds you..."

(J) is incorrect because while there is some hostility between the two sisters, the origin of their conflict has more to do with their differing views of the world, as stated in answer choice (H), versus a desire to control one another.

3. **(A) Reading/Prose Fiction/Development. CCRS: MID 24–27d. CC: ELA-Literacy.CCRA.R.8.** This question asks the reader to determine how Sunday's feelings about Wake County are conveyed in the passage. (A) is correct because the reader learns about Sunday's inner thoughts and feelings through her sister Delta's recollections. There is no information coming directly from Sunday or from present day dialogue between the sisters.

(B) is incorrect because while the passage is written from a third person perspective, Delta is the protagonist and we get most of the information from her point of view. Sunday's thoughts are relayed through Delta.

(C) is incorrect because Delta doesn't speak directly to Sunday in the passage.

(D) is incorrect because while Sunday's artwork is described in the passage, the reader learns the most about Sunday's inner thoughts through her sister's recollections.

4. **(G) Reading/Prose Fiction/Voice. CCRS: MID 24–27d. CC: ELA-Literacy.CCRA.R.8.** This question asks the reader to determine the point in the passage where the narration shifts. (G) is correct as the narration shifts from Sunday's to Delta's point of view at line 30.

(F) is incorrect. Line 21 is still from Sunday's point of view. The "she" in line 22 is Sunday, not Delta.

(H) is incorrect. Line 55 is too far into the passage and misses several paragraphs told from Delta's perspective.

(J) is incorrect. Line 66 is too far into the passage and misses even more narration from Delta's point of view.

5. **(C) Reading/Prose Fiction/Explicit Detail. CCRS: REL 24–27c. CC: ELA-Literacy.CCRA.R.3.** This question asks the reader to identify specific information about how Delta defines herself in relation to her sister. The question describes Sunday as "a painter and someone who has broken free of childhood constraints." The correct answer is (C) because lines 59–62 show that Delta feels she doesn't understand her sister because they are so different from each other. Lines 61–62 state: "Sunday was the one she (Delta) was different from."

(A) is incorrect because there is no mention of Delta being a "homemaker, caregiver, and skilled writer."

(B) is incorrect because it is not Delta who feels different from the other residents of Wake County, it is Sunday who feels different.

(D) is incorrect because Delta's primary motivation in the passage is to repair and understand her relationship with her sister, not to become more worldly.

6. **(F) Reading/Prose Fiction/Explicit Detail. CCRS: SUP 24–27a. CC: ELA-Literacy.CCRA.R.2.** This question asks readers to determine what details are NOT included in the first paragraph of the passage. It requires students to identify which details from the answer choices ARE included and use P.O.E. (process of elimination) to determine the correct answer. The correct answer, (F), is the only detail not included in the first paragraph.

(G) is incorrect. The answer choice states, "what name had been printed on Sunday's birth certificate" as a detail that isn't included, but in lines 2–3 it says, "She was Girl Owens on the stamped paper that certified her birth."

(H) is incorrect. The answer choice states "what the name Sunday represents to Sunday herself," as a detail not included in the paragraph, but lines 5–6 say, "She had chosen 'Sunday,' the time of voices, lifted in praise."

(J) is incorrect. The answer choice states "at which point 'Sister' acquired the name Sunday" as a detail not included in the paragraph but lines 4–5 say, "When asked to decide, at six, what she would be called..."



The process of elimination (POE) is a powerful test-taking strategy and a useful way to reduce the time it takes to answer an item, as outlined in this explanation to #6.

7. **(D) Reading/Prose Fiction/Vocabulary. CCRS: MOW 24–27b. CC: ELA-Literacy.CCRA.R.4.** This question asks students to identify the intended meaning of the words *native* and *exile* as used in line 26 based on the context of the passage. (D) is correct because Sunday's childhood in Wake County is a context in



which she is considered to be a “native” of the area and her adult life in Chicago is a context in which she is an “exile” from her home.

(A) is incorrect because the line is about how she views her hometown as someone who has moved away. There is no mention of her sister Delta in this phrase.

(B) is incorrect because the words *native* and *exile* as used in line 26 have no correlation to Sunday’s love for or conflict with her sister.

(C) is incorrect because *native* and *exile* as used in line 26 do not refer to Sunday’s life as a young child before she was given her name. They refer to her journey as an adult back to her childhood home. Lines 24–25 state: “She was going back to piece together their family story of departure and return.”

8. (G) **Reading/Prose Fiction/Explicit Detail. CCRS: GEN 24–27b. CC: ELA-Literacy.CCRA.R.1.** This question asks the reader to find evidence that illustrates how Delta interpreted the paintings and block prints she received as gifts from her sister. (G) is the correct answer because it states, “She thought they were Sunday’s way of showing that she cared about her sister,” and in lines 47–48 Delta says, “she knew their appearance said something about the habit of love.”

(F) is incorrect because there is no mention in the passage about Delta’s perception that Sunday lacked skill as a painter.

(H) is incorrect because there is no evidence to suggest that Sunday’s artwork represented her belief that her sister would never leave Wake County.

(J) is incorrect because there is no evidence that Delta believed that Sunday’s artwork showed that she was a misfit.

9. (B) **Reading/Prose Fiction/Explicit Detail. CCRS: SUP 24–27a. CC: ELA-Literacy.CCRA.R.2.** This question asks the reader to specifically identify what Delta accused Sunday of doing in the passage. Answer choice (B) states that Delta accused Sunday of thinking she was better than everyone else in Wake County. This is the correct answer because in lines 77–79, the passage states: “She (Delta) had answered by calling her (Sunday) a misfit who had thought she was better than the folks she left behind.” This specific detail directly answers the question of what Delta had accused Sunday of.

(A) is incorrect because there is no evidence in the passage to suggest that Sunday did not support Delta’s artistic endeavors.

(C) is incorrect because there is no evidence to support the idea that Delta accused Sunday of disgracing the family when she moved away.

(D) is incorrect because there is no evidence to suggest that Delta believed that Sunday’s paintings had no significance in the real world.

10. (F) **Reading/Prose Fiction/Vocabulary. CCRS: MOW 24–27b. CC: ELA-Literacy.CCRA.R.4.** This question asks readers to figure out the intended meaning of the word *smallness* used in line 84 based on the context of the paragraph. The paragraph is about an argument between Delta and Sunday in which Delta is angry at her sister and realizes she is being petty and spiteful. Answer choice (F) is the correct answer because in the context of the paragraph, *smallness* most closely means *pettiness*.

(G) is incorrect because during the argument Delta is comparing herself to her sister, accusing her sister of acting superior to the people living in Wake County, which makes Delta realize that she is allowing her anger towards her sister to make her behave in a small and petty manner, not a willful manner as the answer choice suggests.

(H) is incorrect because in the context of the paragraph *smallness* is not meant to be taken literally. Therefore, *diminutive size* is not the correct answer.

(J) is incorrect because while there is mention of Sunday's artistic talent elsewhere in the passage, there is no mention of it in the context of this paragraph. *Smallness* does not mean *lack of artistic talent* as answer choice (J) suggests.

Passage II—Social Science

11. (B) *Reading/Social Science/Main Idea. CCRS: MID 28–32a. CC: ELA-Literacy.CCRA.R.2.* This question asks students to determine which answer choice best delineates the republican political theory as defined in the passage. Answer choice (B) states that the republican political theory is that citizens need to participate in politics to truly understand and appreciate their freedom. This is the correct answer choice because in paragraph five, republican political theory is defined by the imperative that citizens participate in their government for the common good, and that this participation leads to a deeper appreciation of the liberties afforded by democracy.

Answer choice (A) states that citizens should be able to choose their own values and respect others' right to do the same. This answer choice is incorrect because it doesn't take into account the part of the republican political theory that addresses citizens' need to participate in government for the collective good, which does not mean letting individuals determine their own values but requires a participatory system.

(C) is incorrect because the answer choice states that citizens should be neutral about their values so as not to offend others, but the passage explicitly states in line 5 that government should not "legislate morality," but provide citizens with a framework to construct their own values and beliefs.

(D) is incorrect because it contradicts the republican political theory. The answer choice states that choosing one's own values is inconsistent with liberal freedom, but the republican political theory states that choosing one's own values is part of liberty.

12. (G) *Reading/Social Science/Explicit Detail. CCRS: SUP 28–32a. CC: ELA-Literacy.CCRA.R.2.* This question asks students to identify information about what qualities citizens must possess. The correct answer will be information that is NOT included in a passage so students must use process of elimination. The correct answer choice, (G), states that citizens do NOT need to possess a "neutral framework of rights." A neutral framework implies a lack of involvement on the part of citizens which is in opposition to what it takes to "deliberate for the common good." In line 62 it states that citizens "cannot be neutral toward the values and ends its citizens espouse."

(F) is incorrect because it states in lines 56–57 that deliberating about the common good "requires a knowledge of public affairs."

(H) is incorrect because in lines 57–58 it states that deliberating about the common good requires "a sense of belonging, a concern for the whole..."

(J) is incorrect because in lines 58–59 it states that citizens need to possess a "moral bond with the community whose fate is at stake."



The "EXCEPT" is a thought-reverser, and a thought-reverser turns the ordinary question inside-out. The correct answer is the one that is NOT mentioned in the passage. The three that are mentioned are wrong answers. You should always circle thought-reversers in your test booklet so that you don't overlook them.



13. (B) *Reading/Social Science/Main Idea*. CCRS: MID 24–27b. CC: ELA-Literacy.CCRA.R.2. This question asks for the main idea of the second paragraph with regards to differences and similarities between conservatives and liberals. (B) is the correct answer because it states that liberals and conservatives find “government neutrality appealing for different reasons,” and the paragraph outlines school prayer and abortion as instances in which liberals invoke neutrality, and environmental protection and distributive justice, for example, as instances in which conservatives appeal to neutrality.
- (A) is incorrect because liberals and conservatives do not have the same value system as the answer choice suggests. In fact, the paragraph outlines ways in which their value systems are very different.
- (C) is incorrect because the answer choice states that conservatives are more interested in the nation’s economy than are liberals, but the economy is not mentioned in the passage at all.
- (D) is incorrect because neither liberals nor conservatives are exclusively responsible for the idea that the US government should be neutral, as the answer choice suggests.
14. (J) *Reading/Social Science/Main Idea*. CCRS: MID 24–27b. CC: ELA-Literacy.CCRA.R.2. This question asks the reader to identify the main idea of the fifth paragraph which discusses the idea that citizens should participate in self-government. (J) is the correct answer because the answer choice states that “citizens demonstrate a concern for the common good,” which is stated in lines 51–53.
- (F) is incorrect because the paragraph does not state that *both* liberal and republican theories each demand that citizens take part in politics, only that republican theory demands self-rule from its citizens.
- (G) is incorrect because the statement “liberal and republican theories each have their good points and bad points” is too general and vague to be a good main idea for this paragraph.
- (H) is incorrect because the statement “republican politicians tend to be more virtuous and compassionate than liberal politicians” is an assumption that is not supported by evidence from the paragraph.
15. (A) *Reading/Social Science/Vocabulary*. CCRS: MOW 24–27b. CC: ELA-Literacy.CCRA.R.4. This question asks the reader to identify the intended meaning of the phrase *formative politics* as used in line 65. (A) is correct because the answer choice “promotes important civic virtues” is consistent with the phrase “a politics that cultivates in citizens the qualities of character that self-government requires,” as stated in lines 65–66.
- (B) is incorrect because the answer choice states that *formative politics* is “consistent with liberal freedom” but in line 64 it states, “freedom, *unlike* the liberal conception, requires a formative politics...”
- (C) is incorrect because there is no mention in the paragraph of *formative politics* being part of a “procedural republic.”
- (D) is incorrect because *formative politics* is NOT distinct from self-rule as the answer choice suggests. In lines 65–66 it states that formative politics is a “politics that cultivates in citizens the qualities of character that self-government requires.”
16. (H) *Reading/Social Science/Development*. CCRS: MID 24–27b. CC: ELA-Literacy.CCRA.R.2. This question asks the reader to assess the relevance of the last paragraph by asking the reader what information would be lost if the paragraph were deleted. This requires that the reader understand the main idea of the paragraph. The correct answer, (H), encompasses the main idea of the paragraph, which is that the

central weakness of the current philosophy is that it “cannot secure the liberty it promises,” as stated in lines 77–78.

(F) is incorrect because it does not encompass the scope of what would be lost if the paragraph were to be deleted. Liberal and procedural republics are not directly compared in the paragraph as stated in the answer choice.

(G) is incorrect because the answer choice is too general and vague. Also, the paragraph does not address what the author sees as “the centerpiece of republican political theory,” as the answer choice suggests.

(J) is incorrect because the paragraph deals with the weaknesses of the public philosophy, as stated in the correct answer choice (H), not the difference between liberal and republican theories as answer choice (J) suggests.

17. (A) **Reading/Social Science/Vocabulary. CCRS: MOW 24–27b. CC: ELA-Literacy.CCRA.R.4.** This question asks students to identify the intended meaning of the phrase *political experience* as used in lines 68–69. This requires students to understand the context in which the phrase is used. (A) is the correct answer because *political experience* most closely means “country’s history,” which adequately addresses the far-reaching scope of our collective political experience.

(B) is incorrect because “voting patterns” is too specific to adequately describe the phrase *political experience*, nor is voting mentioned at all in the paragraph.

(C) is incorrect because “presidential campaigns” does not correlate to *political experience*, nor are presidential campaigns mentioned in the paragraph.

(D) is incorrect because “elective office” does not correlate to *political experience*, nor is elective office mentioned in the paragraph.

18. (F) **Reading/Social Science/Main Idea. CCRS: MID 24–27b. CC: ELA-Literacy.CCRA.R.2.** This question asks students to identify the main idea in lines 10–15. (F) is the correct answer because lines 10–15 states that although neutrality “derives from the liberal tradition of political thought, its province is not limited to...liberals.” This statement is paraphrased in answer choice (F), which states that the right to choose one’s own values is “shared by people with different politics.”

(G) is incorrect because the statement “liberals and conservatives can be found across the political spectrum” is vague and redundant. Liberals and conservatives are political types that are found at different ends of the political spectrum.

(H) is incorrect because it does not state in lines 10–15 that the “aspiration to neutrality is guaranteed by the American constitution,” as stated in the answer choice.

(J) is incorrect because the statement “the liberal tradition in American politics is somewhat limited in its theoretical background” is not supported by lines 10–15.

19. (D) **Reading/Social Science/Implied Idea. CCRS: GEN 24–27b. CC: ELA-Literacy.CCRA.R.1.** This question asks students which of the answer choices fits the definition of a “procedural republic.” This requires students to make an inference about what is stated in the paragraph regarding a procedural republic. (D) is the correct answer because in lines 72–73, the passage states, “...a procedural republic, concerned less with cultivating virtue than with enabling persons to choose their own values.” This supports the answer choice which states that a procedural republic is a republic with a “neutral framework of rights.”



(A) is not the correct answer because there is no evidence in the paragraph to support the statement that a procedural republic has anything to do with political procedures, as stated in the answer choice. In this context, the word “procedure” should not be taken literally.

(B) is incorrect because the answer choice states that a procedural republic is a republic that has “developed a formative politics,” but in lines 70–71 the paragraph states that the “formative aspect of our politics has *given way* to a procedural republic,” which is slightly different.

(C) is incorrect because there is no mention of “rules and regulations” in the paragraph, as stated in the answer choice.

20. (G) *Reading/Social Science/Explicit Detail*. CCRS: REL 24–27e. CC: ELA-Literacy.CCRA.R.3. This question is about the author’s claim that the “liberal vision of freedom cannot provide liberty.” Students must apply their understanding of the author’s claim to determine the correct answer. (G) is correct because in lines 78–79 it states that the liberal vision does not “inspire the sense of community and civic engagement that liberty requires.” This is consistent with the answer choice which states that the liberal vision does not teach “citizens to care about community.”

(F) is incorrect because while it is true that the liberal vision offers unlimited possibilities and choices, the author is not claiming that this is why the liberal vision of freedom cannot provide liberty.

(H) is incorrect because lines 3–5 describe why the government should not legislate morality, and that the government should allow moral freedom. This contradicts the answer choice which states that moral neutrality is anti-government.

(J) is incorrect because the liberal vision does NOT depend on legislating morality as stated in the answer choice. Throughout the passage it is stated that the government should not legislate morality but should provide a “neutral framework of rights within which people can choose their own values and ends” (lines 8–9).

Passage III—Humanities

21. (B) *Reading/Humanities/Main Idea*. CCRS: GEN 20–23a. CC: ELA-Literacy.CCRA.R.1. This question focuses on finding the overall meaning of the passage as a whole. The correct answer, (B), is the best choice because it fully encompasses the main idea of the passage. The narrator is reflecting on his childhood and on his relationship with his grandfather, while gaining a deeper appreciation for all that he has taught him.

(A) is incorrect because the passage does not allude to any difficulty or tension between the narrator and his grandfather, as the answer choice suggests.

(C) is incorrect because in the last paragraph the narrator references the garden as being a place he can always return to, and the answer choice states that the garden no longer exists, which is incorrect.

(D) is incorrect because the tone of the passage is pleasantly nostalgic. The narrator describes positive memories of his grandfather. The answer choice states that the narrator has unpleasant emotions associated with his grandfather, which is not supported by the passage.

22. (J) *Reading/Humanities/Voice*. CCRS: MID 20–23b. CC: ELA-Literacy.CCRA.R.8. This question asks students to identify at which point in the passage the tone or narration shifts most dramatically. The correct answer is (J) because in line 74, the narrator shifts from recalling memories from his childhood to speaking as an adult thirty years later. This shift in time is dramatic and reflects the change in the narrator’s perspective.

(F) is incorrect because in line 16 the narration is still in the past, with the narrator being referred to as “Jess’s Shadow” because he followed his grandfather so closely. The narrator is still reflecting on his childhood.

(G) is incorrect because there is not a dramatic shift in time or voice in line 21. The narrator is still describing a past event with the line “I remember the day—I could not have been more than two and a half years old.”

(H) is incorrect because, although line 57 does jump ahead one year by stating, “Another spring day, perhaps a year later,” it is not a *dramatic* shift in narration the way that line 74 is. The question asks the reader to identify a dramatic shift in perspective, not a subtle one.

23. (D) *Reading/Humanities/Implied Idea*. CCRS: MID 16–19a. CC: ELA-Literacy.CCRA.R.1. This question asks students to determine which answer choice does NOT apply to the nickname “Jess’s Shadow” given to the narrator in the passage. The correct answer is (D). The answer choice states that the narrator earned the nickname Jess’s Shadow because he needed his grandfather to protect him from other people, but there is no evidence in the passage to suggest that the narrator was in any way threatened by other people and in need of his grandfather’s protection.

(A) is incorrect. The nickname Jess’s Shadow was given to the narrator as a young boy because he did have a close emotional bond with his grandfather. The reader can infer from the passage, based on the positive associations that the boy had with his grandfather, that they had a close emotional bond.

(B) is incorrect because in line 14 the passage states, “that grandson of yours stays so close to you he don’t leave enough room for your shadow.” The narrator does maintain close proximity to his grandfather which earns him the nickname Jess’s Shadow.

(C) is incorrect because in line 9 the passage states that the narrator “wore the same kind of overalls” as his grandfather, implying that the narrator wanted to be like his grandfather by imitating his clothing and mannerisms.

24. (H) *Reading/Humanities/Voice*. CCRS: GEN 20–23a. CC: ELA-Literacy.CCRA.R.1. This question asks readers to characterize the tone of the fifth and sixth paragraphs, which describe the narrator’s experience of planting corn with his grandfather. Students have to determine how the narrator feels about planting corn based on the language used in the paragraphs. (H) is the correct answer because the narrator demonstrates “interest in every detail of the process in an effort to do the best job possible.” This is supported by lines 31–32 which state, “I’d watched really carefully so I knew what to do.”

(F) is incorrect because there is no evidence to suggest that the narrator demonstrates a “reluctant willingness” to plant corn. To the contrary, he is very interested in doing a good job planting corn with his grandfather.

(G) is incorrect because the fifth and sixth paragraphs do not suggest that the narrator is “careless in his work.” In fact, the narrator states in lines 32–33 that he handled the corn kernels so well that his grandfather thought “that I [the narrator] was already better at it than he was.”

(J) is incorrect because there is no evidence to suggest that the narrator’s interest in planting corn fades as the work becomes more difficult. In fact, the narrator demonstrates interest in the work and cares very much about doing a good job.

25. (A) *Reading/Humanities/Main Idea*. CCRS: SUP 16–19b. CC: ELA-Literacy.CCRA.R.2. This question asks students to determine which detail best captures the scene described in the tenth through fourteenth paragraphs. The scene is about the narrator and his grandfather looking at an ancient artifact in the garden. The correct answer is (A) because when the grandfather shows the narrator an Indian axhead,



he is sharing with him a symbol of their common heritage, as the answer choice suggests. The Indian axhead serves as an important link between the present and the past. In lines 76–79 the narrator states that when he holds the axhead in his hands many years later, his “mind is filled with images of tall corn swaying in the wind, of women dancing as they held the season’s harvest in their hands.”

(B) is incorrect because the bird mentioned in the answer choice, an oriole, is only mentioned in passing in the scene. The Indian axhead is a much more significant symbol.

(C) is incorrect because the small hoe mentioned in the answer choice is also not a very significant symbol in the excerpt. The axhead has a cultural and historical significance, which the small hoe does not. Therefore (A) is a better choice than (C).

(D) is incorrect because the grandfather is not the one reflecting on the past, as the answer choice suggests. The narrator is the one who holds the Indian axhead years later and appreciates its cultural significance, as is described in lines 74–91.

26. (G) *Reading/Humanities/Development*. CCRS: MID 20–23b. CC: ELA-Literacy.CCRA.R.8. The question asks about the effect of the imagery used in lines 4–8. (G) is the correct answer because the image of the narrator walking through the garden as a small boy with his grandfather who seemed “taller than the biggest trees” conveys a sense of being protected or watched-over by the grandfather, as described in answer choice (G).

(F) is incorrect because the image of the grandfather being taller than the trees and the boy walking closely behind him does not convey a sense of being controlled, but rather being protected. In line 8 it states that the grandfather “wouldn’t let me fall,” implying that he was there to protect his grandson. There is no evidence to suggest that the narrator felt controlled by his grandfather.

(H) is incorrect because there is no evidence in lines 4–8 that the boy is puzzled by his grandfather’s height.

(J) is incorrect because the size of the garden is not mentioned in lines 4–8 at all.

27. (A) *Reading/Humanities/Voice*. CCRS: MID 20–23b. CC: ELA-Literacy.CCRA.R.8. This question requires that students understand the intended tone in dialogue spoken by one of the characters in the passage. Lawrence Older’s comment in lines 13–15 is meant to convey amusement, as stated in correct answer choice (A). This is supported by line 13, which states that Lawrence made the comment with “a twinkle in his eye,” which is an idiom meant to express lightheartedness.

(B) is incorrect because the comment is not meant to express concern, as the answer choice suggests. When someone says something with “a twinkle in his eye,” it does not mean that the speaker is concerned.

(C) is incorrect for the same reason as (B)—the phrase “twinkle in his eye” does not express dismay.

(D) is also incorrect for this reason. Elation implies boundless happiness. While Lawrence is happy when he makes the comment about the narrator following so closely behind his grandfather as he walked, he is not elated. More accurately, he is amused, as stated in correct answer choice (A).

28. (J) *Reading/Humanities/Explicit Detail*. CCRS: REL 20–23c. CC: ELA-Literacy.CCRA.R.3. This question asks why the narrator reacts with confusion when he is called Jess’s Shadow. The only name his grandfather has called him is Sonny. The correct answer, (J), is supported by lines 17–18 which state, “My name was Sonny. I knew that for sure. That was the name my grandparents called me by.”

(F) is incorrect because there is no mention in the passage about what name the narrator was given by his parents, only that his grandparents called him Sonny.

(G) is incorrect because the narrator is not uncertain about what his name is—he knows that his name is Sonny and wonders why people are calling him Jess’s Shadow.

(H) is incorrect because when Lawrence Older calls the narrator Jess’s Shadow, the narrator is not confused about whether or not the nickname is meant for him. He is only confused about why he is being called Jess’s Shadow.

29. (C) *Reading/Humanities/Vocabulary*. CCRS: GEN 20–23a. CC: ELA-Literacy.CCRA.R.1. This question asks about the intended meaning and origin of the phrase “fitting the ground to plant.” The correct answer is (C) because the phrase was used by people in his grandfather’s family. This is supported in lines 53–55: “That is what Grampa called it. This is what Jack called it. This is what their father, Lewis Bowman, had called it.”

(A) is incorrect because there is no mention in the passage of people in the community using the phrase “fitting the ground to plant,” only members of the grandfather’s family.

(B) is incorrect because the narrator does not use the phrase “fitting the ground to plant” as this answer choice suggests.

(D) is incorrect because the narrator first hears the phrase as a young boy. He hears it again as an adult when the phrase is used by Grampa’s younger brother Jack, as stated in lines 51–52.

30. (J) *Reading/Humanities/Development*. CCRS: MID 20–23b. CC: ELA-Literacy.CCRA.R.8. This question requires the reader to assess the relevance of the fourteenth paragraph and what it adds to the passage as a whole. The correct answer is (J). This paragraph is included to convey the reverence with which the grandfather handles the Indian axhead, which is described in lines 70–71: “He did it with the same care that my grandmother used when she was gathering eggs in the henhouse...”

(F) is incorrect because the grandmother is not relevant as a character and is only mentioned in this paragraph. The way in which she carefully handled the eggs is the only relevant information given about her and is used to show how carefully the grandfather handled the axhead.

(G) is incorrect because gathering eggs is not a detail that is used to show the reader what kind of work the grandparents did, it is used as a point of comparison between the careful way in which the grandfather handled the axhead and the way that the grandmother handled eggs.

(H) is incorrect because the narrator and the grandfather do not exchange gifts in this passage. The axhead is the only item of significance that the grandfather gives to his grandson.

Passage IV—Natural Science

31. (B) *Reading/Natural Science/Main Idea*. CCRS: MID 24–27c. CC: ELA-Literacy.CCRA.R.2. This question asks readers to identify the main idea of the passage as a whole. The correct answer is (B) because the passage mainly focuses on the development of bird eggs, and only references comparisons to reptile eggs when it is relevant. The other answer choices focus more on comparisons between bird eggs and reptile eggs, but this comparison is used sparingly throughout the passage and the primary focus is on the different features of bird eggs.

(A) is incorrect because while the passage does focus on certain aspects of reptile eggs, it does not provide a “point-by-point” comparison as the answer choice suggests.



(C) is incorrect because the passage asserts that bird eggs are similar to reptile eggs in many ways, not different from them as answer choice (C) suggests. In fact, the topic sentence of the first paragraph states, "Birds are 'glorified reptiles' and some biologists believe that they are indeed no more than reptiles with feathers."

(D) is incorrect because lines 4–7 state that "the main interest in birds' eggs from an evolutionary point of view is the adaptation of the eggs of different species to particular lifestyles." This suggests that eggs from many different species are able to successfully adapt to their environment, which is contrary to what answer choice (D) states.

32. (J) *Reading/Natural Science/Explicit Detail*. CCRS: GEN 24–27b. CC: ELA-Literacy.CCRA.R.1. This question asks students to identify which aspect of the eggshell of a domestic hen is NOT supported by the passage. The correct answer is (J) because lines 36–37 state that, "The amount of calcium needed for each egg is about 2 grams." Answer choice (J) states that each egg contains 15 grams of calcium, which is NOT supported by the passage.

(F) is incorrect because lines 59–60 state, "The shell of a hen's egg is peppered with 10,000 tiny pores, just visible to the naked eye." This is consistent with what is stated in the answer choice so (F) is incorrect.

(G) is incorrect because line 33 states that each shell takes 15 to 16 hours to form, which is what is stated in answer choice (G)

(H) is incorrect because in line 34 it states that eggs consist of "crystals of calcite, a form of calcium," which is stated in answer choice (H).

33. (C) *Reading/Natural Science/Development*. CCRS: MID 24–27b. CC: ELA-Literacy.CCRA.R.2. This question requires that students understand the purpose of the last paragraph of the passage. (C) is the correct answer choice because the paragraph focuses on the shape of the eggs of different bird species such as owls, swallows, and waders. This is stated in answer choice (C).

(A) is incorrect because the paragraph focuses on egg shape, it does not summarize the main points about eggs as is suggested by the answer choice.

(B) is incorrect because the comparison between reptile and bird eggs is introduced in the first paragraph, not the last paragraph as answer choice (B) suggests.

(D) is incorrect because there is no discussion of what puzzles biologists about the design and function of eggs, as stated in answer choice (D).

34. (J) *Reading/Natural Science/Explicit Detail*. CCRS: REL 24–27e. CC: ELA-Literacy.CCRA.R.3. This question requires that the student determine what, if any, explanation is given for why a parent bird turns the eggs in the nest. Students must use process of elimination to figure out the correct answer to this question. The correct answer is (J); there is no explanation given for why parent birds turn eggs in the nest. Students can only figure out the correct answer once all other answer choices have been explored.

(F) is incorrect because there is no evidence to suggest that the parent bird turns the nest to maximize oxygen exposure. The student must skim or reread the entire passage in order to determine that answer choice (F) is not found in the passage.

(G) is incorrect because there is no evidence to suggest that the parent bird turns the egg to equalize exposure to body heat. When the student skims the passage he or she will not find this information.

(H) is incorrect because there is no mention of a parent bird turning the egg to help the egg develop properly. Skimming the passage will allow the student to determine that this information is not found in the passage.

35. (A) **Reading/Natural Science/Explicit Detail. CCRS: REL 28–32b. CC: ELA-Literacy.CCRA.R.3.** This question asks about the order of elements contained in a bird's egg, starting from the inside out. Students must correctly identify the sequence in which items in a bird's egg are listed. The correct answer is (A). In the second paragraph, the elements of a bird egg are listed, starting with the yolk and ending with the shell, as is stated in answer choice (A).

(B) is incorrect because the inner shell and parchment membranes are not listed in the second paragraph. The egg cell is mentioned, but it is part of the yolk, not a separate element of a bird egg.

(C) is incorrect because parchment membrane, cell membrane, inner shell and outer shell are not listed in the second paragraph, nor are the elements in the correct order.

(D) is incorrect because parchment membrane is not an element of a bird egg.

36. (H) **Reading/Natural Science/Vocabulary. CCRS: MOW 24–27b. CC: ELA-Literacy.CCRA.R.4.** This question asks the reader to correctly identify the intended meaning of the word *plumping* as used in line 20. As explained in correct answer choice (H), *plumping* is the process during which water and salt expand the albumen in a developing egg.

(F) is incorrect because the answer choice states that plumping is the process wherein the "female increases her nutrient intake in preparation for egg-laying," but plumping actually takes place during the process of egg development, as explained in correct answer choice (H).

(G) is incorrect because the two "parchment-like membranes" already exist and are not in the process of forming as is stated in the answer choice.

(J) is incorrect because plumping occurs during the process of egg development, not after the egg is laid as stated in answer choice (J).

37. (B) **Reading/Natural Science/Explicit Detail. CCRS: REL 28–32b. CC: ELA-Literacy.CCRA.R.3.** This question asks which answer choice best describes the form and function of the chalazae as described in the passage. (B) is correct because in lines 27–29 it states that the chalazae are twisted chords that act "as bearings to allow the yolk and embryo to rotate freely when the egg is turned."

(A) is incorrect because the answer choice states that chalazae is a hammock which develops inside the shells of bird and reptiles, but lines 30–31 state that chalazae are "unnecessary in reptile eggs because they are never turned."

(C) is incorrect because there is no mention of the chalazae acting as a vessel to allow the exchange of nutrients and waste between yolk and embryo.

(D) is incorrect because the answer choice mentions reptile eggs, but similar to answer choice (A), in line 30 it states that chalazae are not necessary in reptile eggs.

38. (H) **Reading/Natural Science/Explicit Detail. CCRS: REL 24–27e. CC: ELA-Literacy.CCRA.R.3.** This question asks about the purpose of protein fibers in the eggshells of birds. The correct answer, (H), states that the protein fibers strengthen the shell and adhere it to the underlying membrane. This is supported by lines 34–36 which state that protein fibers attach the shell to the underlying membrane.



(F) is incorrect because protein fibers do NOT deliver crystals of calcite to the bones of the developing embryos, as stated in the answer choice. Crystals of calcite are part of the shell, as stated in lines 33–34.

(G) is incorrect because there is no mention in the passage of protein fibers being used to "facilitate the movement of life-sustaining gases to the embryo."

(J) is incorrect because protein fibers are not used to suspend the yolk in a hammock-like feature. The chalazae provide that function, as stated in lines 27–29.

39. **(D) Reading/Natural Science/Explicit Detail. CCRS: SUP 24–27a. CC: ELA-Literacy.CCRA.R.2.** This question is about the medullary bone and its significance in bird development. The correct answer, (D), describes the function of the medullary bone correctly as a supplemental bone that forms inside a hen's bones prior to egg laying. This process is described in the passage in lines 42–46.

(A) is incorrect because the medullary bone does not form the legs of a bird as the answer choice suggests, it serves as a source of calcium formed within existing bones.

(B) is incorrect because Arctic birds are only mentioned briefly in the passage in line 55, and not in relation to medullary bones. If a student skims the passage for the word "Arctic," they can eliminate this answer choice as incorrect.

(C) discusses the medullary bone as serving a function for bird and reptile embryos, but reptiles are not mentioned in the paragraph describing the medullary bone. Therefore, answer choice (C) is incorrect.

40. **(G) Reading/Natural Science/Explicit Detail. CCRS: MOW 24–27b. CC: ELA-Literacy.CCRA.R.4.** This question asks the reader to determine what advantage, if any, is offered by the shape of the eggs of waders. This requires that students understand the function of egg shape and figure out if any advantage is gained from their shape. The correct answer, (G), is found in the last paragraph where egg shape is discussed. Lines 84–86 describe the advantage of the "spinning top" shape of waders' eggs.

(F) is incorrect because egg-eating predators are not mentioned in the last paragraph in the context of the discussion of egg shape.

(H) is incorrect because there is no mention of wing development in the last paragraph.

(J) is incorrect. Lines 84–86 clearly state the advantage of the spinning top shape of waders' eggs.



Reading — Common Core State Standards

Standard	Description
ELA-Literacy.CCRA.R.1	Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
ELA-Literacy.CCRA.R.2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
ELA-Literacy.R.3	Analyze how and why individuals, events, or ideas develop and interact over the course of a text.
ELA-Literacy.R.4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
ELA-Literacy.R.8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.



Reading — College Readiness Standards

Standard	Description
Main Idea and Authors Approach	
MID 16-19a	Recognize a clear main idea or purpose of straightforward paragraphs in uncomplicated literary narratives.
MID 20-23b	Understand the author or narrator’s approach (e.g., point of view, kinds of evidence used) in uncomplicated passages.
MID 24-27b	Infer the main idea or purpose of paragraphs in more complex passages.
MID 24-27c	Summarize key events and ideas in more complex passages.
MID 24-27d	Understand the author or narrator’s overall approach in more challenging passages.
MID 28-32a	Infer the main idea or purpose of more complex passages and paragraphs.
Supporting Details	
SUP 16-19b	Recognize the clear function of a section of an uncomplicated passage.
SUP 24-27a	Locate important details in more complex passages.
SUP 28-32a	Locate and interpret subtle details in more complex passages.
Sequential, Comparative, and Cause–Effect Relationships	
REL 20-23c	Identify clear cause-effect relationships in uncomplicated passages.
REL 24-27c	Determine clear relationships between characters, ideas, and so on in more complicated literary narratives.
REL 24-27e	Identify clear cause-effect relationships in more complex passages.
REL 28-32b	Understand the dynamics between people, ideas, etc. in more complex passages.
Meaning of Words	
MOW 24-27b	Determine, using context, the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more complex passages.
Generalizations and Conclusions	
GEN 20-23a	Make generalizations and conclusions about people, ideas, etc. in uncomplicated passages.
GEN 24-27b	Make generalizations and conclusions about people, ideas, and so on in more challenging passages.

ACT SCIENCE TEST EXPLANATIONS

Passage I

1. **(B) Science/Conflicting Viewpoints/Comprehension. CCRS: EM 20–23a.** Scientist 2 discusses mathematical calculations in the final paragraph of the passage. These calculations suggest that one side of *Dimetrodon's* sail would absorb (take in) heat by facing the sun but that the side turned away from the sun may have lost just as much heat. Therefore, (B) is correct. Neither scientist suggests that exposure to direct sunshine would cause rapid overheating and death (A), or a change to the *length* of the sail spines (C), so these answer choices are incorrect. Scientist 1 suggests that a *Dimetrodon* may have been able to prevent overheating from direct sunshine by controlling blood flow in its sail (Scientist 1, paragraph 2). The question asks specifically about Scientist 2's mathematical model, so although the information described in answer choice (D) can be found in the passage, (D) is not the correct answer to the question asked here.
2. **(H) Science/Conflicting Viewpoints/Application. CCRS: EM 20–23a.** Scientist 1's argument is that warm air next to a *Dimetrodon's* thin sail would warm the blood in the sail, and the warmer blood would then circulate through the body to warm the animal. If wind cooler than the *Dimetrodon's* body temperature blew by, heat would radiate from the blood in the sail to the nearby cool air. As heat would be removed from the sail—(H) and (J)—the blood in the sail would therefore be cooler. That cooler blood would circulate through the animal and lower its temperature (J).
3. **(C) Science/Conflicting Viewpoints/Comprehension. CCRS: ID 16–19c.** Scientist 2 suggests in paragraph 1 that a *Dimetrodon* would be able to change the “appearance of the skin on the sail” by controlling how much blood flows through the sail, (C). Neither scientist suggests that a *Dimetrodon* could change the size (A) or location (D) of its sail. Answer choice (B) is Scientist 1's theory to explain why *Dimetrodons* would regulate blood to their sails.



Conflicting viewpoints passages like this one will include questions that ask what one scientist said. One of the wrong answer choices will answer the question according to the *other* scientist. Expect to see this wrong answer choice, and be careful to avoid it.

4. **(F) Science/Conflicting Viewpoints/Application. CCRS: EM 24–27d.** For both scientists to agree with a statement, you need to find support for that statement in both viewpoints. Scientist 1 compares elephants flapping their ears to a *Dimetrodon* cooling or warming itself using its sail. Scientist 2 compares “modern lizards” to *Dimetrodon*; the word “similarly” is the comparison word. Therefore, (F) is correct and (G) is wrong. Neither scientist discusses *Dimetrodon's* modern descendants, so we cannot know their opinions about whether these descendants exist, (H). Likewise, neither scientist discusses modern animals that look just like a *Dimetrodon*, (J).
5. **(A) Science/Conflicting Viewpoints/Comprehension. CCRS: EM 20–23a.** The question asks about Scientist 1's argument, so be sure to look at the right part of the passage. Scientist 1's second sentence says that *Dimetrodon* needed to warm up so it could be active enough to hunt. The paragraph goes on to say that the *Dimetrodon* could warm up quickly because it had a sail. The mathematical model Scientist 1 used suggests that a reptile without a sail would take longer to warm up enough to hunt, (A). Scientist 1 did not discuss how easy it would be for other animals to see *Dimetrodon*, (C), or how the sail affected other animals' ability to hunt *Dimetrodon*, (D).
6. **(H) Science/Conflicting Viewpoints/Analysis. CCRS: EM 24–27d.** Neither Scientist says that *Dimetrodons* could move or regrow their sails, so eliminate (F) and (G). They both believe that *Dimetrodons* could regulate (control) how the blood flowed through their sails (passage paragraphs 3 and 5). Therefore, (H)



is correct. Answer choice (J) is tempting because both Scientists discuss whether and how sails could regulate body temperature. They disagree on this point, though, so (J) is wrong.

7. **(B) Science/Conflicting Viewpoints/Analysis. CCRS: ID 20–23c.** This question asks how *Dimetrodon* would position itself, according to Scientist 1, to minimize heating itself. If turning the broad side (length) of the sail toward the sun would maximize heating, then turning the thin side (width) of the sail toward the sun would minimize heating (B).

TIP It is important to read the question as it is written rather than trying to predict what the question is asking.

Passage II

8. **(G) Science/Research Summary/Comprehension. CCRS: ID 16–19d.** The results of Experiment 1 are listed in Table 1. As the temperature of the water bath increased, the reaction time decreased, (G).
9. **(D) Science/Research Summary/Application. CCRS: ID 28–32c.** In Experiment 2, reaction time went down as the temperature increased. If the reaction time were even shorter than the values listed in Table 2, the temperature most likely would be even higher than the highest temperature in Table 2, (D).
10. **(F) Science/Research Summary/Analysis. CCRS: SI 20–23d.** Experiment 2 added a catalyst (MnSO_4) to the reaction that Experiment 1 tested, and the catalyst sped up the reaction for each of the four temperatures tested, so (F) is the correct answer. The concentrations of KMnO_4 and $\text{H}_2\text{C}_2\text{O}_4$ were the same in both experiments (1st sentence in Experiment 2), so (G) and (J) are incorrect. Four temperatures were tested in Experiment 2, so (H) is also wrong.
11. **(B) Science/Research Summary/Comprehension. CCRS: SI 20–23a.** Experiments 1 and 2 vary the temperature of the reaction (C). Experiment 2 investigates the effects of a catalyst (A). Experiment 3 changed the concentration of one of the reactants (D). Each experiment used the solvents KMnO_4 and $\text{H}_2\text{C}_2\text{O}_4$, so the reaction solvents were unchanged; (B) is the correct answer.

TIP The word “solvent” is not used in this passage, but you don’t need to understand what it means to answer this question. Rule out the wrong answer choices that you can, and then look for key words from the remaining choices in the passage. The word “reactant” in choice (D) doesn’t appear in the passage, either. The other key word in that answer choice, “concentration”, is used in the introductory paragraph and Experiment 3. Table 3 shows that different concentrations of $\text{H}_2\text{C}_2\text{O}_4$ were tested in trials 9–11. Therefore, (D) can be ruled out, and (B) must be correct.

12. **(H) Science/Research Summary/Application. CCRS: ID 24–27c.** In Experiment 1, both $\text{H}_2\text{C}_2\text{O}_4$ and KMnO_4 were brought to the same temperature and then allowed to react with each other. The question asks how much time the reaction would take if they started at different temperatures. Start with what you know before you move on to the hypothetical part of the question. When $\text{H}_2\text{C}_2\text{O}_4$ and KMnO_4 were both heated to 45°C , the reaction took 48 seconds. At 35°C , the reaction took 105 seconds. If $\text{H}_2\text{C}_2\text{O}_4$ were 45°C and KMnO_4 were 40°C (warmer than 35°C but cooler than 45°C), the reaction time would be expected to be greater than 48 seconds but less than 105 seconds, (H).
13. **(D) Science/Research Summary/Application. CCRS: ID 28–32c.** Adding H_2O (water) to $\text{H}_2\text{C}_2\text{O}_4$ dilutes it (makes it less concentrated). Experiment 3 demonstrates that a smaller concentration of $\text{H}_2\text{C}_2\text{O}_4$ leads to longer reaction time. The question stem describes a concentration of $\text{H}_2\text{C}_2\text{O}_4$ that is less than the concentration used in Trial 9, 0.125M. Therefore, the reaction time would be greater than the reaction time in Trial 9, 837 seconds. The correct answer is (D).

Passage III

14. **(J) Science/Data Representation/Analysis. CCRS: ID 20–23b.** The question stem states that for ova, large volume = large amounts of nutrients. Based on this generalization, the largest ova (among the answer choices, a hen ova) has the most nutrients. Therefore, (J) is correct.

TIP Note that this question does not ask for the largest ova in Table 2 (ostrich); it asks for the largest ova among the answer choices (hen). Don't get confused by questions that seem to be missing the most correct answer.

15. **(A) Science/Data Representation/Application. CCRS: ID 28–32c.** This question asks you to extrapolate data based on a trend you can identify from a data table. In Table 1, as edge length increases, S/V decreases. The longest edge length would have the smallest S/V , then, and the shortest length would have the largest S/V . The shortest edge length to choose from is 20 mm, (A), so that cube-shaped cell would have the greatest S/V . Even if you do not fully understand the topic of the passage, you have practiced finding trends in tables. That skill enables you to correctly answer this question.
16. **(J) Science/Data Representation/Analysis. CCRS: ID 24–27e.** S/V is defined in the introduction as the ratio of a cell's surface area (S) to its volume (V). Table 1 lists the units for surface area (mm^2), volume (mm^3), and S/V (mm^{-1}). The mm^2 in the units cancel out to leave an extra (mm) in the denominator. Since units are listed in the numerator, the units are (mm) to the -1 power:

$$\frac{\text{Surface Area (mm}^2\text{)}}{\text{Volume (mm}^3\text{)}} = \frac{S \text{ (mm}^2\text{)}}{V \text{ (mm}^3\text{)}} = \frac{S}{V} \text{ mm}^{-1}$$

Even if you do not know why the units to S/V are (mm^{-1}), you can rule out (F), (G), and (H) because they all include the wrong units for volume. (J) is the only answer that has the correct units for surface area and volume.

17. **(B) Science/Data Representation/Analysis. CCRS: ID 24–27c.** Find Figure 1 and see that the dark bars represent information about spheres. Spheres with a diameter of 6 mm are not included in the data set. The data follow a trend, though, so the S/V can extrapolated (estimated based on a trend). As a sphere's diameter increases, its S/V decreases. Since 6 mm falls between 4 mm and 8 mm, its S/V will fall between the S/V values for those points. The only answer choice between those bar heights is (B).

TIP Note that you can find the correct answer to this question without understanding what the passage is about. If you know how to find trends in tables and graphs you can correctly answer this question, and others like it, without spending time studying the passage. If you are having trouble understanding a passage, begin by looking for questions you know how to answer using what you already know.

18. **(H) Science/Data Representation/Analysis. CCRS: ID 24–27c.** In Table 1, as the edge length of a cube increases, its S/V decreases. Specifically, as the edge length doubles, the S/V is halved. Said another way, if the edge length is halved, the S/V is doubled. This question asks about an edge length half of the smallest edge length listed in the table, 1 mm. Therefore, the S/V needs to be double the S/V for that edge length: 12 mm^{-1} , (H).

Passage IV

19. **(D) Science/Data Representation/Analysis. CCRS: ID 28–32c.** Figure 1 shows the boiling points of varying mixtures of $\text{C}_2\text{H}_6\text{O}_2$. When the mixture was 0% $\text{C}_2\text{H}_6\text{O}_2$ (all water), the boiling point was 100°C . When the mixture was 100% $\text{C}_2\text{H}_6\text{O}_2$ (no water), the boiling point was nearly 200°C . As the mixture



contained more and more $C_2H_6O_2$, the boiling point rose exponentially. In other words, higher concentrations of $C_2H_6O_2$ had a greater effect on boiling point. Connect the dots to see the exponential curve. When $x = 80\% C_2H_6O_2$, $y =$ greater than $115^\circ C$, (D).

20. (J) **Science/Data Representation/Application. CCRS: ID 24–27c.** The question asks for the percent by mass of $C_2H_6O_2$. Conveniently, the mass of $C_2H_6O_2$ + the mass of $H_2O = 100$ g for each trial in Experiment 3. Therefore, the mass of $C_2H_6O_2$ (g) = percent of $C_2H_6O_2$ by mass.

If the air temperature were $-31^\circ C$ or above, the freezing point of the antifreeze would need to be below that. Two freezing points listed in Table 1 are less than $-31^\circ C$: $-36.1^\circ C$ and $-51.2^\circ C$. A question can only have one correct answer choice, though. In fact, only 50% (the same as 50 g $C_2H_6O_2$), (J), is an option.

21. (D) **Science/Data Representation/Analysis. CCRS: ID 16–19c.** This question asks how concentration of $C_2H_6O_2$ corresponds to mass. According to the equation in the passage, if volume stays the same (as it does in the scenario in this question), then mass and density are directly proportional. In other words, a solution with a higher mass (when the volume is constant) has a higher density. The last sentence of the Experiment 1 text states that the density of the solutions is higher at higher concentrations of $C_2H_6O_2$. To summarize: biggest mass means biggest density means biggest concentration of $C_2H_6O_2$, answer choice (D).
22. (G) **Science/Data Representation/Analysis. CCRS: SI 24–27d.** This question asks a simpler question than it first appears to: The student put a solution in a cold bath and it didn't freeze. Why not? The temperature of the cold bath wasn't low enough to freeze the solution. The temperature of the cold bath needs to be below the solution's freezing point to freeze the solution, (G).
23. (A) **Science/Data Representation/Application. CCRS: EM 20–23a.** This question asks about Experiment 2, so expect the answer will have to do with boiling point. The question is about *hot* weather—temperatures that are well above the freezing point temperatures of antifreeze, water, or a combination thereof. That leaves options (A) and (B). Figure 1 plots the boiling point of pure water (0% $C_2H_6O_2$) at $100^\circ C$. When water and antifreeze are mixed together, the boiling point is higher than $100^\circ C$. Therefore, the answer is (A).
24. (G) **Science/Data Representation/Application. CCRS: EM 20–23a.** Experiment 2 demonstrates that when water is mixed with something, its boiling point increases. Lake water (F), salt water (H), and even tap water (J) contain particles (such as salt, minerals, and bacteria), so these answer choices are all wrong. Distilled water, (G), has had most of its particles removed, and it is the closest choice to pure water. Therefore, it would have the lowest boiling point.

Passage V

25. (B) **Science/Research Summary/Analysis. CCRS: SI 20–23b.** Experiment 1 tests how the length of a copper wire affects heat conduction. Experiment 2 tests how the thickness of a copper wire affects heat conduction. The only way to know if the type of wire will affect heat conduction is to keep everything else constant and repeat the experiment with different types of wire, (B). If the type of wire and size of wire both vary in an experiment, (A), you can't know which variable is responsible for the observed results.
26. (H) **Science/Research Summary/Comprehension. CCRS: ID 24–27a.** The passage defines thermal equilibrium as two things that are the same temperature. The only times that Block A and Block B were the same temperature is for a 10 cm, 1.4 mm wire after 2 minutes and after 3 minutes: answer choice (H).
27. (C) **Science/Research Summary/Analysis. CCRS: ID 20–23c.** The question asks what happens to the temperature of Block A as the length of the wire increases. In Table 1, as the length increases, the

temperature of Block A increases. This is true after 1 minute, 2 minutes, or 3 minutes. The same is true in Table 2. Answer choice (C) is the only one to graph this relationship. Eventually, if the wire is long enough, less heat will be carried away from Block A. That is why, for longer wire lengths, the increase in temperature begins to plateau.

28. **(F) Science/Research Summary/Application. CCRS: SI 24–27c.** Thermal conductivity means the ability to conduct (transfer) heat. The question stem says that brass doesn't transfer heat as effectively as copper does. Compared to the copper wire used in Experiments 1 and 2, a brass wire would transfer heat slower from Block A to Block B. Put another way, Block A would lose heat more slowly, (F). (J) is wrong because the slower heat transfer means that Block B would gain heat slower. (G) and (H) are wrong because the question states that a brass wire transfers heat slower than a copper wire does; the rate of heat transfer is not the same.

TIP If you have trouble determining what this question is asking, try rewording and summarizing it so that it makes sense.

29. **(A) Science/Research Summary/Analysis. CCRS: EM 20–23a.** In this experiment, a hot block, Block A, was connected to a cold block, Block B, by a wire that allows heat to move from one block to the other until the system is in equilibrium. If heat did not stay in Block A and it did not move to Block B, it had to go somewhere else. The passage says that the surface wouldn't conduct heat well, so heat wouldn't move out of the block-wire-block set-up into the surface it was sitting on. Heat either stayed in the wire or warmed the surrounding air.

(B) and (C) are both wrong because they describe the heat transfer going in the wrong direction. Block A is hotter than the wire, and the wire is hotter than Block B. Block B is colder than the surrounding air, so heat from the air would warm Block B, lessening the inequality. Therefore, (D) is also wrong. Block A, though, is warmer than the surrounding air, so it lost heat to the air as well as to the wire; (A) is the correct answer.

30. **(G) Science/Research Summary/Analysis. CCRS: ID 24–27a.** The question asks which scenario would lead to Blocks A and B having the temperatures 64°C and 23°C, respectively, if the experiment had continued another minute. Heat would continue to transfer from Block A to Block B until the blocks were the same temperature. Let's try out the answer choices one at a time.

After 3 minutes, the use of a 10 cm, 1 mm wire (Table 1) leads to a Block A temperature of 54°C and a Block B temperature of 31°C. If another minute passed, more heat would transfer from Block A to Block B. Block A wouldn't *heat up* to 64°C, so (F) is wrong. At 3 minutes, the use of a 20 cm, 1 mm wire leads to block temperatures of 72°C for Block A and 19°C for Block B. After another minute, the temperature of block A would drop (possibly to 64°C) and the temperature of Block B would rise (possibly to 23°C). Therefore, (G) is correct. If you want to check that (H) and (J) are also wrong, look in Table 2 (1.4 mm wire) to see Block A's temperature at 3 minutes. For both a 10 cm wire (H) and a 20 cm wire (J), Block A would need to warm up to get to 64°C. (H) and (J) are both wrong, then.

Passage VI

31. **(C) Science/Data Representation/Comprehension. CCRS: EM 20–23a.** The introductory paragraph explains that clouds form when the air temperature cools enough to equal the dew point temperature. When the air temperature is higher than the dew point, there are no clouds. The pilot in this question is flying at 1,200 m altitude, but that information is not actually related to any of the Figures; it is a distraction. No clouds are at that altitude because the air temperature is greater than the dew point temperature, (C).

TIP Don't overthink it! Some questions include extra information that will only distract you, not help



you. Pay attention to what you need, and only what you need, to answer the question.

32. **(H) Science/Data Representation/Analysis. CCRS: SI 16–19a.** Measuring how long it takes light to travel from ground level up to the bottom of the clouds and back down can be used to measure the distance between the bottom of the clouds and the ground. The speed of light is constant and known, and speed \times time = distance. Therefore (H) is correct.

But let's say you didn't know that. Wrong answers are wrong for a reason, so let's see how the other answer choices can be ruled out. (F) and (G) are wrong because bouncing light off the bottom of clouds will not give any information about the average air temperature or average dew point at the top of the cloud layer. For that matter, light that bounces off the bottom of a cloud layer doesn't even enter the clouds, so (J) is also wrong.

33. **(B) Science/Data Representation/Analysis. CCRS: EM 24–27a.** Air temperature and dew point temperature both drop as the altitude increases. 3,600 m is a higher altitude than the graph shows, so both temperatures will be less than 43°C. (C) and (D) are therefore wrong. At no time during the experiment was the dew point greater than the air temperature, although they are often equal to each other. Therefore, (A) is wrong and (B) is correct.
34. **(J) Science/Data Representation/Application. CCRS: EM 24–27a.** Which conditions lead to a low cloud base? Figures 1–4 indicate that the base of clouds is found at the altitude where the air temperature has cooled enough to equal the dew point temperature. Both temperatures fall as the altitude increases. The city that has a smaller difference between those temperatures on the ground would have a lower cloud base. It would take less altitude for those temperatures to equal each other up in the sky. Therefore, (J) is correct.

Another way to approach the question is to look for comparable cities in this passage. City B has a ground air temperature and dew point similar to that of Phoenix. City D is more comparable to Miami, and it has the lower average cloud-base altitude.

35. **(A) Science/Data Representation/Application. CCRS: EM 20–23a.** Regardless of altitude, clouds are present when the air temperature equals the dew point temperature. This question states that those temperatures both occurred at 0 m altitude, so (A) is correct.

Passage VII

36. **(G) Science/Data Representation/Comprehension. CCRS: ID 20–23b.** This question is a good example of how you don't have to even understand what the passage is about to answer some questions correctly. Rewording the question: In Figure 1, the greatest change in y happens over which range of x ? Let's see the approximate change in y for each answer choice: (F) $10 - 0 = 10$; (G) $55 - 30 = 25$; (H) $80 - 70 = 10$; (J) $90 - 85 = 5$. Therefore, (G) is correct. Another approach is to draw a line straight up to the data curve for the ranges offered in the answer choices and see which one has the steepest line.
37. **(A) Science/Data Representation/Analysis. CCRS: ID 33–36a.** Three questions are actually asked here: 1) How does the amount of oxygen bound to Hb relate to these figures; 2) Which blood pH correlates to more oxygen bound to Hb; and 3) Which blood temperature correlates to more oxygen bound to Hb?

The introduction defines *percent saturation of Hb* as the percent of hemoglobin in the blood that is bound to oxygen. That means that the higher the y value is, the more oxygen is bound to hemoglobin—the situation that the question asks us to maximize. In Figure 2, at 40 mm Hg, $y = 80$ when pH = 7.6, and $y = 50$ when pH = 7.2. In Figure 3, at 40 mm Hg, $y = 98$ when temperature = 10°C, and $y = 50$ when temperature = 43°C. In other words, a pH of 7.6 and a temperature of 10°C is the situation that leads to the greatest amount of oxygen bound to hemoglobin, (A).

38. **(J) Science/Data Representation/Analysis. CCRS: EM 20–23a.** As we saw in question 37, at 40 mm Hg (for example), $y = 98$ when temperature = 10°C , and $y = 50$ when temperature = 43°C . As the temperature increased, y (the percent saturation of Hb) decreased. Therefore, (J) is correct.
39. **(D) Science/Data Representation/Analysis. CCRS: EM 20–23b.** Figure 3 shows the percent saturation of Hb at various blood temperatures for a given PO_2 ; blood pH is unvaried. That's enough to show that (D) is correct. In case you had a question about the other figures, let's discuss them here. Figure 2 shows the percent saturation of Hb at various blood pHs for a given PO_2 ; blood temperature is unvaried. Figure 1 is data taken "at normal body conditions", that is at the same (constant) blood temperature and blood pH.
40. **(F) Science/Data Representation/Analysis. CCRS: EM 20–23a.** The amount of CO_2 present in blood is represented as PCO_2 (sentence before Figure 2). Additional CO_2 in the blood leads to a lower (more acidic) blood pH (caption for the lowest line in Figure 2). That means that as CO_2 dissolves in blood, it forms an acid and lowers the blood's pH, (F). (G) is wrong because more CO_2 means more acidic blood, not less acidic blood. (H) is wrong because the passage does not discuss CO_2 becoming O_2 . Actually, changing CO_2 into O_2 is something that plants do, not us; we need to exhale to get rid of CO_2 from our bodies. (J) is wrong because the formation of Hb is not discussed in this passage. The passage talks about oxygen *binding to* Hb, not mixing with CO_2 .



Science – College Readiness Standards

Interpretation of Data	
ID 16–19c	Locate basic information in a short body of text.
ID 16–19d	In a data presentation, determine how the value of one variable changes as the value of another variable changes.
ID 20–23b	Combine or compare data from a data presentation.
ID 20–23c	Translate information into a diagram, table, or graph.
ID 24–27a	Combine or compare the data from two or more basic data presentations.
ID 24–27c	Use data points in a table or graph to interpolate.
ID 24–27e	Identify and use a simple mathematical relationship between data.
ID 28–32c	Use data points in a table or graph to extrapolate.
ID 33–36a	Combine and compare data from two or more complex data presentations.
Scientific Investigation	
SI 16–19a	Demonstrate knowledge of the methods and tools used in a simple experiment.
SI 20–23a	Demonstrate knowledge of the methods and tools used in a more complex experiment.
SI 20–23b	Demonstrate knowledge of a simple experimental design.
SI 20–23d	Identify the similarities and differences between experiments.
SI 24–27c	In an experiment, predict what the results will be for an additional trial or measurement.
SI 24–27d	Identify the experimental conditions that would produce a specified result.
Evaluation of Models, Inferences, and Experimental Results	
EM 20–23a	Choose a simple hypothesis, prediction, or conclusion that is supported by two or more models or data presentations.
EM 20–23b	Identify assumptions or key issues in a model.
EM 24–27a	Choose a simple hypothesis, prediction, or conclusion that is supported by two or more models or data presentations.
EM 24–27d	Determine the similarities and differences between models.