



AMERICA'S PREMIERE TESTING READINESS PROGRAM

# TSI

## (Form Code 18A)



***Cambridge Navigator Plus:***  
*The Complete Explanation Guide*  
*to the Pre-Assessment*

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## Reading Test

1. **(A) Reading/Main Idea and Details/Main Idea.** The passage is about images of former presidents on coins, and more specifically about the significance of Franklin Delano Roosevelt’s image being featured on the dime, as (A) states. (B) and (D) are wrong because they are too specific. While the passage mentions efforts to cure polio and Roosevelt’s efforts to overcome paralysis, these are not the focus of the passage. (C) is wrong because it is too broad. The passage is about Roosevelt specifically, not all the presidents.
  
2. **(A) Reading/Inferences/Implied Idea.** There are several clues in the passage to let you know what the author’s judgment is: “overloaded,” “overburdened,” “dire,” and “desperate.” Those words all suggest crisis, (A). (B) is incorrect because the most serious manifestations of the problem will come in the future. (C) is incorrect because while the problems are long-term, they are much worse than just a “challenge.” And (D) is incorrect because the author does not regard the developments as “insoluble.”
  
3. **(A) Reading/Inferences/Implied Idea.** In the second sentence, the author lists “religious organizations, educational institutions, and even businesses” as groups that recruit highly qualified people. The next sentence lists three outstanding examples: the Jesuits, Oxford, and Hudson Bay Company. The parallel structure indicates that the Hudson Bay Company is one such outstanding business. The author goes on to explain the reason for the success of these groups: good management practices. (B) is incorrect because the company is an example of a business that developed a successful management atmosphere. Similarly, (C) is incorrect because the business is a success rather than short-lived. As for (D), while a successful business implies a profitable one, nothing in the passage suggests that the Hudson Bay Company was founded upon religious principles.
  
4. **(C) Reading/Use of Language/Vocabulary.** The only clue to the meaning of the word is Lincoln’s remark that the elder Douglas must have been a good cooper because he made a good whiskey cask. Since that is the only clue, there cannot be much doubt about the meaning of the word: a cooper makes casks or barrels.
  
5. **(C) Reading/Use of Language/Vocabulary.** The passage mentions a couple of details of the sedentary life: grooming and staying in burrows. The passage also mentions that the new life of the penguins involves a lot of swimming. Thus, “sedentary” must mean “inactive,” (C). (A) and (B) pick themes from the passage (zoo and swimming), but they do not address the issue of what it means to be sedentary. Finally, as for (D), grooming and staying in burrows does not sound all that spontaneous.
  
6. **(D) Reading/Inferences/Implied Idea.** The author spends most of the passage explaining how cylinder locks work. Both the first and last sentences set up the implied conclusion: the ordinary cylinder lock is probably not going to deter a thief.
  
7. **(B) Reading/Use of Language/Development.** This item asks about the structure or development of the passage. In the first two sentences, the author draws an analogy, comparing the complex communications of a large city to the “wiring” of the brain.
  
8. **(A) Reading/Inferences/Implied Idea.** The author states that neurons that die because of disease or injury are not usually replaced. Thus, serious injury to the brain is likely to be permanent.



9. **(A) Reading/Main Idea and Details/Main Idea.** The focus of the passage is on the US Marshals who protected James Meredith, (A). (B) and (C) are wrong because they are too specific. Both points are mentioned in the passage, but they are not the focus of the passage. (D) is wrong because it is too broad. The passage is about one person the US Marshals protected, not multiple people.
10. **(D) Reading/Inferences/Implied Idea.** There is a logical trick at work: if Hurston lied about so many things, how do we know which details we can trust? (D) follows this line of reasoning. (A) is incorrect because the author relies upon independent verification (her age on official documents is incorrect, her place of birth is incorrect, other details are incorrect) in order to determine that details in her writings are not accurate. (B) is incorrect because the author does not imply anything about writers other than Hurston, and regarding Hurston, the author implies that details are available—though the details may be unreliable. As for (C), the author does not imply such a broad conclusion. The author implies only that Hurston’s autobiographical details are questionable.
11. **(B) Reading/Inferences/Implied Idea.** The author divides the Park Service’s actions into short-term and long-term strategies. In the long term, the Park Service plans to modify behavior by offering rewards for new technology. That’s the strategy discussed in the second half of the passage. (A), (C), and (D) all refer to direct regulation of behavior rather than using incentives to reward change.
12. **(C) Reading/Main Idea and Details/Main Idea.** The author mentions three writing resources: dictionaries, an academy of scholars, and examples. The author then argues that the best alternative would be examples of good writing for others to follow, (C). (A) misstates the author’s point: There are three resources, and a good example is the most useful. (B) is not the central theme of the passage. (D) overstates the case: the author prefers the idea of good examples, but the passage does not say that this tool should be the only one available to writers.
13. **(B) Reading/Use of Language/Vocabulary.** What does the author mean by “excessive nutrients”? Obviously, that phrase must refer to nutrients, and so (D) is incorrect. Then, “excessive” must refer to something above what is required. (A) suggests this idea, but (A) does not accurately describe how the author uses the phrase. Rather, (B) is correct: the “excess” is extra nutrients that find their way into surface water and “fatten up” the algae, which in turn suck up all the oxygen. Finally, (C) is incorrect because the excessive nutrients are absorbed by the algae.
14. **(C) Reading/Use of Language/Development.** The author uses the weather as a symbol: the good weather with the sun shining represents good fortune in general (and the French are ecstatic and the English wary) while the cloud suggests the possibility of rain and unhappy times. As for (A), while weather is a natural phenomenon, that is not the importance of weather in this passage. (B) is close because it mentions the kind of contrast that the author is developing, but the contrast is between optimists and pessimists, not pleasant and unpleasant people. As for (D), there is no mention of measuring anything.
15. **(D) Reading/Use of Language/Development.** Why does the author bother to mention those other problems? In order to emphasize the significance of the problem that is posed by tobacco. (A) directly contrasts with the author’s reason for including the examples. (B) is incorrect because, while this statement may be true, it does not explain why the author mentions these problems in a passage on smoking. (C) is incorrect because not only does the list include problems that are not diseases (homicide and crashes, for example), but the purpose of the list is to illustrate the number of people affected, not the variety of causes of death.

16. **(C) Reading/Inferences/Implied Idea.** The author starts by referring to the theory that high energy particles are charged by the initial explosion of a supernova. But, the author argues, as the cloud expanded, the particles would cool—so we would not find high energy particles in the supernova remnant.
17. **(A) Reading/Use of Language/Vocabulary.** The “critical mass” mentioned by the author means a sufficient number to ensure that the language can be learned, preserved, and transmitted. The other choices are wrong because “critical mass” is not a fixed number but any minimum number that will accomplish the desired result.
18. **(A) Reading/Use of Language/Development.** The passage says that there are two established theories: the arboreal model and the cursorial model. The newly discovered evidence supports a third explanation. As for (B), though the author does provide evidence, it is not adduced as a counterexample to a claim. As for (C), there is a new theory, but the author does not suggest that the existing theories are self-contradictory. (D) is the weakest response because there is nothing in the paragraph to support such a conclusion.
19. **(D) Reading/Main Idea and Details/Main Idea.** The author begins by noting that Chaplin created a “universal symbol of laughter.” He or she talks about the early work at Keystone and then describes the typical Chaplin movie character. The passage ends with a sort of tribute to Chaplin. (D) best describes that development, although the description is not a perfect one. (A) is incorrect because, though we do learn something from the passage about how an audience might perceive Chaplin’s films, that is not the main focus of the passage. (B) is incorrect because the author does not provide details of Chaplin’s personal life. And (C) is incorrect because no other comic actors are discussed.
20. **(A) Reading/Main Idea and Details/Explicit Detail.** The author tells you why studies use the ratio proxy: it is impossible to know how much of a particular isotope was in the environment at the time. Therefore, (A) is the correct answer. (B) is incorrect because, while it could be true, it is not the reason given by the author. (C) is incorrect because this idea is inconsistent with the passage. Finally, (D) is incorrect because, while it seems to be a true statement, it does not respond to the question that is being asked.
21. **(B) Reading/Main Idea and Details/Main Idea.** The author starts by saying that invasive plants can overgrow an ecosystem, but these plants can also significantly alter the ecosystem without directly displacing the native species, (B). (A) is not the main idea of the passage; in fact, the author specifically says that this is not the only way a non-native species can inflict heavy damage. As for (C), while the author implies that some native plants cannot compete effectively in the changed conditions, this is not the main point of the passage. (D) is also not the main focus of the passage.
22. **(B) Reading/Inferences/Application.** The word “likely” in the item stem signals that this is an Application item. The author states that words function to contribute to the growth of knowledge and art functions to improve human feelings. Words and art operate in different ways, but they share two characteristics: both are cumulative, in that they preserve and transmit the learning of previous generations to the next, and both are progressive, in that they correct “mistakes.” (A) is incorrect because art functions not to depict the world but to improve human feelings. (C) is incorrect because the first sentence of the passage states that both art and words are forms of communication. Finally, (D) is incorrect because the author neither states nor implies that art depends upon words. Indeed, the passage suggests that art, because it deals with feelings rather than facts, is supreme in its own sphere.



23. **(D) Reading/Use of Language/Voice.** Looking at the first word of each answer choice, eliminate (B) and (C). The tone of the passage is scholarly or analytical, not passionate or angry. The first words of both (A) and (D) seem appropriate. The final choice depends, therefore, on the difference between “optimistic” and “concerned.” The latter better describes the passage. The author is discussing a problem and concludes with the sobering thought that the process may already have gone too far. That is concern, not optimism.
24. **(B) Reading/Inferences/Comparisons.** The main idea of Passage 1 is that Shakespeare did not write the works normally attributed to him. The main idea of Passage 2 is that Bacon was the author of the works normally attributed to Shakespeare. The two do not share the opinion (so far as we learn from the passages) that Bacon wrote the works, but they do agree on the much more limited point that it was not Shakespeare.
25. **(C) Reading/Inferences/Comparisons.** This item asks you to identify details that are common to both passages. Both authors mention elements in the works that Shakespeare himself could probably not have written about effectively. Passage 1 mentions the ways of court, and Passage 2 mentions the references to the law.
26. **(A) Reading/Literary Analysis/Implied Idea.** The setting makes it clear that Joe and Lily are not aware that their conversation is overheard. Joe explains that the attraction he and Lily feel cannot go anywhere because he intends to honor his promise to marry another woman. We get the first strong hint that the “woman” is Louisa, and this suggestion is confirmed the next evening when it is Joe who calls on Louisa, and Louisa breaks off the engagement.
27. **(B) Reading/Literary Analysis/Implied Idea.** The final paragraph describes Louisa’s feelings about the broken engagement. That evening she is a bit sad, though she was not certain why. The next morning, her ambivalence had been resolved and she felt relieved.
28. **(D) Reading/Literary Analysis/Implied Idea.** The conversation between Joe and Lily makes it clear that something had happened the day before that was significant. Joe reveals it was that they “let on how [they] felt about each other.” And the time frame is further clarified by his statement that that “it’s just as well we knew.” Joe and Lily did not know until the day before that they had strong feelings for one another.
29. **(B) Reading/Literary Analysis/Implied Idea.** A key element of the setting is that Louisa at first thinks she might slip away “unobserved,” but she stays in her place without revealing her presence. Then, the content of the conversation between Joe and Lily and the reference to the “woman” in the third person help to make it clear that Joe and Lily are not aware that there is a third person in the vicinity.
30. **(C) Reading/Literary Analysis/Implied Idea.** Lily specifically says she would not marry Joe in the event that he broke off the engagement with Louisa. Joe adds, “I don’t believe you would.”

## Writing Test

1. **(C) Writing/Essay Revision/Strategy/Appropriate Supporting Material.** The two sentences as originally written do not contain any logical explanation as to their connection. It seems, however, that the second is intended to explain how the mistake mentioned in the first came to be made. So a good way of combining the two sentences is to use a word to show that connection: *because*. Choice (B) fails to provide a logical connection. So too does choice (A), which makes the additional error called the “comma splice” or “fused sentence” (two sentences jammed together with a comma but no conjunction). And (D) reverses the direction of the logical connection intended by the author.
2. **(B) Writing/Essay Revision/Organization/Sentence-Level Structure.** The sentence to be added introduces a series of three elements, and the most likely candidate is the three versions of the medal developed in paragraph 2.
3. **(D) Writing/Essay Revision/Style/Conciseness.** The problem with the original is that “who was a woman” is needlessly repetitive of “female.” (D) is more concise. The wrong choices, in various ways, preserve the unnecessary wordiness.
4. **(C) Writing/Essay Revision/Strategy/Appropriate Supporting Material.** This item asks for the best word or phrase to connect the last sentence of the paragraph to what has come before. In sentence 10 the author stresses that the medal is awarded for extreme bravery, which presumably often includes the risk of serious injury and even death. Then the author notes that the majority of the awards have been made posthumously, indicating that the recipient was killed performing the act of bravery. “In fact” is a phrase that provides emphasis to this point.
5. **(D) Writing/Essay Revision/Strategy/Appropriate Supporting Material.** The paragraph cited provides a quick look at the “numbers” for the Medal of Honor, so the best choice here is a sentence that makes a statement about that topic. The total number of medals awarded would be an interesting addition to the paragraph.
6. **(B) Writing/Essay Revision/Style/Conciseness.** The problem with the original is that the phrase “all of whom can start the process” is unnecessary. The edit provided by (B) makes the sentence more concise. You’ll notice also that each of the wrong choices actually adds unnecessary verbiage, making the sentence more verbose.
7. **(D) Writing/Essay Revision/Style/Clarity of Meaning.** The problem with the original is that “they” is a pronoun with no clear antecedent (or referent). Does it refer to “members of the uniformed services” or to “the recipients”? Although reading the next sentence makes it clear that the author is referring to “recipients,” the initial ambiguity may leave the reader wondering. Eliminate the ambiguity by using a noun.
8. **(C) Writing/Essay Revision/Strategy/Appropriate Supporting Material.** What is the connection between the two ideas expressed by sentences 4 and 5 of the first paragraph? First, the author states that the ATF trains state agencies and shares with them; second, the author states that the ATF is itself a federal agency. Those two ideas are not unrelated, as the original might suggest. Instead, the author means to say that even though ATF is a federal agency, it offers assistance to state agencies. And (C) best captures that connection.



9. (B) *Writing/Essay Revision/Organization/Sentence-Level Structure*. The best place for this sentence is immediately after the first sentence, in which the author notes the change in the name. The new sentence explains why the change was made.
10. (D) *Writing/Essay Revision/Style/Clarity of Meaning*. The problem with the original is the lack of a clear antecedent or referent for the pronoun “it.” “It” seems to refer to the last noun in the preceding sentence, “food and praise,” but this is a compound noun that would need a plural pronoun (“them”). To be even more precise, the “it” wants to refer to “food and praise” as one noun, which would be a reward. An easy way to solve the problem is just to use the noun “reward,” as (D) suggests.
11. (A) *Writing/Essay Revision/Style/Tone*. The problem with the original is a fairly simple one: “crush” is an informal word inconsistent with the more formal tone of the rest of the passage. Better would be something like “successfully complete,” “get a satisfactory score,” or (as (A) suggests) “pass.”
12. (A) *Writing/Essay Revision/Strategy/Appropriate Supporting Material*. This item asks for a word or phrase that signals the appropriate connection between the first and second sentences of the last paragraph. The first lists the “explosives” and related substances that a graduate can detect. The second lists places where “firearms and ammunition” might be found. So the second sentence gives extra details that could be signaled by “further,” “furthermore,” “additionally,” “plus” or some similar word, including “moreover.”
13. (B) *Writing/Sentence Structure/Comma Splices*. The problem with the original is that it contains a comma splice (two clauses jammed together and separated only by a comma). You can correct the problem in several ways:
- ... Rockefeller Center. Rockefeller objected . . . (Use a period to make two sentences.)  
... Rockefeller Center; Rockefeller objected . . . (Use the “stronger” semicolon.)  
... Rockefeller Center, but Rockefeller objected . . . (Insert an appropriate conjunction.)
- The only answer choice that offers one of these solutions is (B), which introduces an appropriate conjunction.
14. (C) *Writing/Agreement/Verb Tense*. This item tests logical use of verb tenses. The phrase “two weeks after” puts the surrender of the city before the release of the film, and the verb tense needs to reflect the sequence of events. “Had surrendered” is the past perfect tense, which is used to show that an action in the past was completed before another action that also took place in the past.
15. (C) *Writing/Agreement/Subject-Verb Agreement*. The sentence contains a failure of agreement between subject and verb. The subject of the sentence is “allegation” and the main verb is “pose.” But “allegation” is singular and needs the singular verb “poses.” The intervening phrase “of campaign finance irregularities” can be misleading. “Irregularities,” despite its proximity to the verb, is not the subject of the sentence.
16. (C) *Writing/Agreement/Pronoun Usage*. The problem with the original is a failure of agreement between the pronoun “you” and its referent “one.” “You” is a second person pronoun while “one” is a third person pronoun. The problem can be corrected by changing “one” to “you,” making both pronouns the same.



17. (D) **Writing/Sentence Structure/Fragments.** The original word grouping is not a sentence at all because the grouping lacks a main verb. “Marked by” seems to be a main verb, but “marked” is actually the past participle (*mark, marked, marked*) functioning as an adjective. (D) solves the problem by turning *marked* into a main verb.
18. (A) **Writing/Sentence Structure/Faulty Parallelism.** The original is correct. Notice that the structure of the original is careful to preserve parallelism with the positioning and form of the names of the two papers. The wrong choices destroy the parallelism.
19. (B) **Writing/Sentence Structure/Diction.** The problem with the original is that it uses “raise,” a word that is often confused with “rise.”

raise: to lift or move something to a higher position or level; to increase the amount or strength of something

rise: to get up, to get out of bed, to stand

An easy way to remember the difference is that *raise* must come before an object (*raise the roof*) but *rise* does not (*All rise; Court is in session.*)

20. (B) **Writing/Sentence Structure/Fragments.** The original is a fragment because there is no main verb. The main verb seems to be “created,” but the resulting structure is “myth . . . created.” To complete the sentence, the passive voice is needed: “myth . . . was created.”
21. (A) **Writing/Sentence Structure/Fragments.** The original is correct as written. The problem with both (C) and (D) is that they eliminate the main verb “is” and turn the word grouping into a fragment. (B) is wrong because it changes the intended meaning of the of the original.
22. (B) **Writing/Sentence Structure/Comma Splices.** The sentence contains a structural defect: a comma splice. The error can be corrected by a change in punctuation or by the insertion of a conjunction. “But” is the appropriate conjunction to create the contrast needed between the first and second clause.
23. (B) **Writing/Agreement/Subject-Verb Agreement.** This sentence presents a problem of subject-verb agreement. The sentence has an inverted structure: the verb “was” comes before the subject “parents, brother, and friend.” Since the subject is actually her parents, brother, and friend, the subject is plural. Therefore, the verb must also be plural.
24. (A) **Writing/Agreement/Sequence and Verb Tense.** The original correctly describes the sequence of events in the popping process. The water is heated, expands, and explodes the kernel. The wrong choices, in various ways, distort the sequence of events.
25. (C) **Writing/Sentence Logic/Problems of Coordination and Subordination.** The next word is a transition word. The original sentence explains a causal relationship, so “because” makes the most sense. The complete revised sentence is:

It is likely that any remaining water will be found in the icy soil because the atmosphere on Mars is too thin for liquid water to exist on the surface for long.



26. (B) **Writing/Sentence Logic/Misplaced Modifiers.** The next word must be something that was published in 1845 in order for the sentence to make sense. Only (B), the holiday story, works. The complete revised sentence is:

Published in 1845, the holiday story *The Cricket on the Hearth* by Charles Dickens quickly became a sensation among Victorian readers.

27. (D) **Writing/Sentence Logic/Misplaced Modifiers.** The next word must be the person who intended to strengthen the government's financial position. The original sentence explains that this is Hamilton, (D). The complete revised sentence is:

Intending to strengthen the financial position of the new government, Treasury Secretary Alexander Hamilton proposed to incorporate a Bank of the United States modeled on the Bank of England.

28. (B) **Writing/Sentence Logic/Misplaced Modifiers.** Any of the answer choices might work, but only (B) offers a concise revision to the sentence:

World War I offered the Anti-Saloon League the ultimate opportunity to promote its message by calling for the nation to further the war effort by conserving grain used to make whiskey for food.

29. (C) **Writing/Sentence Logic/Misplaced Modifiers.** The next word must be the noun being described as "three buildings, a memorial, a museum, and a transportation hub": the new World Trade Center. The complete revised sentence is:

Consisting of three buildings, a memorial, a museum, and a transportation hub, the new world Trade Center was difficult to build, is hard to describe, and will always be a sight to behold.

30. (D) **Writing/Sentence Logic/Misplaced Modifiers.** The clearest continuation of this revision would be to mention the museum visitor by name. In this case, that is the implied "you." The complete revised sentence is:

When visiting a museum, remember to bring along a sweater or light jacket since many museums have state-of-the-art climate control in order to better preserve their collections.

## Math Test—No Calculator

1. (A) *Math/Elementary Algebra/Solving Algebraic Equations or Inequalities with One Variable/Equations*

*Involving Rational Expressions.* Solve for  $x$ :  $\frac{1}{x} + \frac{1}{x} = 8 \Rightarrow \frac{2}{x} = 8 \Rightarrow x = \frac{1}{4}$ .

Alternatively, you can reason that  $\frac{1}{x}$  and  $\frac{1}{x}$  are equal, and since their sum is 8,  $\frac{1}{x}$  equals 4. Thus,  $x = \frac{1}{4}$ .

2. (C) *Math/Elementary Algebra/Creating, Expressing, and Evaluating Algebraic Equations and Functions/Creating Algebraic Equations.* Since  $x$  is the cost from New York to San Antonio and  $y$  the cost from San Antonio to Los Angeles,  $x - y$  is the difference.

3. (A) *Math/Intermediate Algebra/Manipulating Algebraic Expressions/Factoring Expressions.* The easiest approach is to multiply the binomials given in the answer choices to find the one that is equivalent to the given expression:

A.  $(x - 2)(x + 6) = x^2 + 4x - 12$  ✓

B.  $(x - 4)(x + 3) = x^2 - x - 12$  ✗

C.  $(x - 6)(x + 2) = x^2 - 4x - 12$  ✗

D.  $(x + 2)(x + 6) = x^2 + 8x + 12$  ✗

4. (A) *Math/Intermediate Algebra/Solving Algebraic Equations or Inequalities with One Variable/Equations*

*Involving Radical Expressions.* Solve the given equation for  $x$ :  $\sqrt{x^2 + 9} = 5 \Rightarrow \left(\sqrt{x^2 + 9}\right)^2 = 5^2 \Rightarrow$

$x^2 + 9 = 25 \Rightarrow x^2 = 16 \Rightarrow x = \pm 4$ . Check both solutions:  $\sqrt{4^2 + 9} = 5 \Rightarrow \sqrt{16 + 9} = \sqrt{25} = 5$ , and

$\sqrt{(-4)^2 + 9} = 5 \Rightarrow \sqrt{16 + 9} = \sqrt{25} = 5$ . Therefore, the complete solution set is  $\{-4, 4\}$ .

5. (B) *Math/Intermediate Algebra/Manipulating Algebraic Expressions/Factoring Expressions.* Simply factor the expression as the difference of two squares:  $x^2 - y^2 = (x + y)(x - y) = 3$ . Since  $x - y = 3$ , then  $(x + y)(3) = 3 \Rightarrow x + y = 1$ .

6. (D) *Math/Elementary Algebra/Manipulating Algebra Expressions/Basic Algebraic Manipulations.* Isolate  $C$ . Begin by eliminating the denominator of the fraction on the right side of the equation:

$$A = \frac{190M + 160W + 70C}{8}$$

$$8A = 190M + 160W + 70C$$

Then subtract to isolate  $70C$ :

$$8A - 190M - 160W = 70C$$

And divide to obtain  $C$ :

$$C = \frac{8A - 190M - 160W}{70}$$



7. (C) *Math/Intermediate Algebra/Manipulating Algebraic Expressions/Manipulating Expressions Involving Exponents.* Apply the rules for working with exponents to simplify the given fraction:  $\frac{x^m}{x^n} = x^{m-n}$ ,

$$x^m(x^n) = x^{m+n}, \text{ and } (x^m)^n = x^{m \cdot n}. \text{ Therefore, } \frac{(x^2y^5)^2x^3}{x^2y^6} = \frac{x^{2(2)}y^{5(2)}x^{3-2}}{y^6} = \frac{x^4y^{10}x}{y^6} = x^{4+1}y^{10-6} = x^5y^4.$$

8. (D) *Math/Intermediate Algebra/Solving Algebraic Equations or Inequalities with One Variable/Inequalities Involving Rational Expressions.* First, solve for  $x$  without transposing multiplicative factors involving  $x$ :  $\frac{3}{x-2} > \frac{1}{6} \Rightarrow \frac{6(3)}{6(x-2)} > \frac{1(x-2)}{6(x-2)} \Rightarrow 18 > x-2 \Rightarrow x < 20$ . The denominator of the rational expression is zero if  $x = 2$ , and the rational expression becomes negative if  $x < 2$ . Therefore,  $x \leq 2$  must be excluded from the range of possible  $x$  values:  $2 < x < 20$ .

9. (C) *Math/Elementary Algebra/Creating, Evaluating, and Interpreting Algebraic Equations and Functions/Functions as Models.* Clarify the meaning of the terms in the given equation by rewriting it with the given and implied units:  $h(\text{inches}) = 24 \left( \frac{\text{inches}}{\text{year}} \right) y(\text{years}) + 96(\text{inches})$ . Translate the equation: a red oak that is over 5 years old is initially 96 inches tall and grows 24 inches each year thereafter.

10. (B) *Math/Elementary Algebra/Manipulating Algebraic Expressions/Basic Algebraic Manipulations.* If originally there were  $n$  students, the cost per student,  $c$ , was  $\frac{\$120}{n}$ . After the addition of one student, the new cost per student,  $c'$ , was  $\frac{\$120}{n+1}$ , which was \$4 less than the original cost,  $c$ , or  $\frac{\$120}{n} - 4$ . Set the two equal and solve for  $n$ :  $\frac{120}{n+1} = \frac{120}{n} - 4 \Rightarrow \frac{30}{n+1} = \frac{30}{n} - 1 \Rightarrow 30n = 30(n+1) - n(n+1) \Rightarrow 30n = 30n + 30 - n^2 - n \Rightarrow n^2 + n - 30 = 0$ . Now, factor to find the possible values for  $n$ :  $n^2 + n - 30 = 0 \Rightarrow (n+6)(n-5) = 0$ , so  $n = -6$  or  $n = 5$ . Since  $n$  refers to the original number of students, it can't be negative, so  $n = 5$ . Therefore, the original price per student was  $\frac{\$120}{5} = \$24$ .

Alternatively, test-the-test, starting with (C). If the original cost per student was \$30, then the number of students is  $\frac{\$120}{\$30} = 4$ . When another student joins the party, the new cost per student is  $\frac{\$120}{5} = \$24$ . This is a \$6 difference, so (C) is wrong.

Try (B) next. If the original cost per student was \$24, then the number of students is  $\frac{\$120}{\$24} = 5$ . When another student joins the party, the new cost per student is  $\frac{\$120}{6} = \$20$ . This is a \$4 difference, so (B) is correct.

11. (B) *Math/Geometry/Coordinate Geometry/Slope-Intercept Form of a Linear Equation.* First, find the slope of the line:  $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 3}{3 - 2} = \frac{3}{1} = 3$ . Thus, the slope-intercept form of the linear equation is  $y = 3x + b$ . To find  $b$ , substitute one of the given ordered pairs, (2,3):  $y = 3x + b \Rightarrow 3 = 3(2) + b \Rightarrow b = 3 - 6 = -3$ . Therefore, the equation of the line is  $y = 3x - 3$ .

12. (D) *Math/Elementary Algebra/Evaluating Sequences Involving Exponential Growth.* The total rise in the depth of the stream was  $14 - 2 = 12$  inches over a three-hour period ( $5 - 2 = 3$ ). So the increase was  $\frac{12 \text{ inches}}{3 \text{ hours}} = \frac{4 \text{ inches}}{\text{hour}}$ .

13. (D) *Math/Intermediate Algebra/Solving Quadratic Equations and Relations/Roots of Quadratic Equations.* This item tests conceptual understanding of the connections between the factors of a polynomial and its graph. If  $x - 3$  is a factor of  $p(x)$ , then  $p(x) = 0$  when  $x - 3 = 0$ , so  $x = 3$ . The value of the polynomial for  $x = 3$  is  $p(3) = 0$ . The graph of  $p(x)$  must include the point (3,0).

14. (D) *Math/Geometry/Rectangles and Squares.* A rectangle has four sides, so the perimeter is length + length + width + width:

$$P = 2L + 2W$$

In this case, the width is 44 feet shorter than the length:  $W = L - 44$ . So the perimeter is:

$$P = 2L + 2(L - 44) = 4L - 88$$

Or you could substitute numbers for the variables into the choices, and it doesn't matter that you don't know the actual dimensions of a professional basketball court. Assume for working purposes that the length is 100 feet. (In fact, it is 94 feet, but that is irrelevant.) On the assumption that the length is 100 feet, the width is 56 feet, and the perimeter is:

$$P = 100 + 100 + 56 + 56 = 312$$

Substitute 100 for  $L$  into the choices, and the correct choice will return the value 312:

- A.  $L - 44 = 100 - 44 = 56$  ✗
- B.  $2L - 44 = 200 - 44 = 156$  ✗
- C.  $2L - 88 = 200 - 88 = 112$  ✗
- D.  $4L - 88 = 400 - 88 = 312$  ✓

15. (B) *Math/Geometry/Coordinate Geometry/Slope of a Line.* Put the equation into slope-intercept form:

$$2y - 2x = -6x + 3$$

$$2y = 2x - 6x + 3$$

$$2y = -4x + 3$$

$$\frac{2y}{2} = \frac{-4x + 3}{2}$$

$$y = -2x + \frac{3}{2}$$

So in the form  $y = mx + b$ ,  $m = -2$ .



16. (D) *Math/Data, Statistics, and Probability/Data Presentations/Bar, Cumulative, and Line Graphs*. When S has enough fuel to run for another 90 minutes, it has already run for 30 minutes. At 30 minutes, T has 2.0 gallons of fuel remaining.
17. (D) *Math/Data, Statistics, and Probability/Data Interpretation/Data Collection Methods*. The problem with the survey is that it may not be fair. The survey targeted students who drive, and those students may have an interest in a plan to increase parking spaces. Students who don't drive or teachers who do may prefer to keep the number of student parking spaces the same.
18. (B) *Math/Intermediate Algebra/Creating, Expressing, and Evaluating Algebraic Equations and Functions/Function Notation and Coordinate Geometry/Slope-Intercept Form of a Linear Equation*. Since this is a linear function, any two pairs of values will give you the information you need to create a slope-intercept form of the function. First, find the slope of the line:

$$m = \frac{2 - (-4)}{2 - 0} = 3$$

Next, find the  $y$ -intercept:

$$f(x) = mx + b$$

$$-4 = 3(0) + b$$

$$b = -4$$

So the function is:

$$f(x) = 3x - 4$$

And the value for  $x = 1$  is:

$$f(x) = 3(1) - 4 = -1$$

19. (D) *Math/Intermediate Algebra/Creating, Expressing, and Evaluating Algebraic Equations and Functions/Function Notation*. Plug in the two functions and simplify:

$$g(f(x)) = g(x - 1)$$

$$g(x - 1) = (x - 1)^2 + 2 = x^2 - 2x + 1 + 2 = x^2 - 2x + 3$$

20. (A) *Math/Data, Statistics, and Probability/Probability/Arithmetic Probability*. The chance that the first pick will be a blue marble is  $\frac{12}{36} = \frac{1}{3}$ . And of that  $\frac{1}{3}$  chance, the possibility of picking a blue marble from the second jar is  $\frac{24}{48} = \frac{1}{2}$ . So the chance of picking two blue marbles is  $\frac{1}{2}$  of  $\frac{1}{3} = \frac{1}{6}$ .

## Math Test—Calculator

1. (B) *Math/Elementary Algebra/Common Word Problems/Proportions and Direct-Inverse Variation.* This problem can be solved by setting up a direct proportion:  $\frac{\text{data}_1}{\text{data}_2} = \frac{\text{charge}_1}{\text{charge}_2} \Rightarrow \frac{30}{45} = \frac{\$18}{x} \Rightarrow 30x = \$810 \Rightarrow x = \$27.$

2. (C) *Math/Elementary Algebra/Multi-Step Word Problems.* You could create an equation:

$$\begin{aligned} T + F &= \$218 \\ \$143 + F &= \$218 \\ F &= \$75 \\ B &= \frac{\$75}{\$25} = 3 \end{aligned}$$

Or you can accomplish the same result by working step-by-step. The total charge was \$218. If you subtract the cost of the ticket, the difference will be the baggage fees:  $\$218 - \$143 = \$75$ . And since each bag costs \$25, the number of checked bags was  $\$75 / \$25 = 3$ .

3. (D) *Math/Elementary Algebra/Solving Simultaneous Equations.* Create a system of simultaneous equations. If  $x$  equals the number of hats and  $y$  equals the number of scarves, the total sales is  $\$250 = \frac{\$7}{\text{hats}}(x \text{ hats}) + \frac{\$11}{\text{scarf}}(y \text{ scarves}) \Rightarrow 250 = 7x + 11y$ . Use the given ratio of hats to scarves,  $x = 2y$ , to eliminate one of the variables:  $250 = 7(2y) + 11y = 25y \Rightarrow y = 10$ . A total of 10 scarves plus 20 hats were sold, for 30 items.
4. (C) *Math/Data, Statistics, and Probability/Counting Methods.* Use the formula for finding the number of permutations:  $3! = 3(2)(1) = 6$ .

5. (C) *Math/Intermediate Algebra/Solving Quadratic Equations and Relations.* The test-writers want you to solve this problem by recognizing that the given expression is the difference of two squares:

$(a + b)(a - b) = a^2 - b^2$ . Therefore,  $\left(\frac{2}{x} - x\right)\left(\frac{2}{x} + x\right) = \left(\frac{2}{x}\right)^2 - x^2 = \frac{4}{3} - 3 = -\frac{5}{3}$ . If you missed the shortcut, you would use the FOIL method to get to the last step.

Suppose you didn't see the algebra solution. Use your calculator:  $\sqrt{3} \approx 1.73$  and  $\frac{2}{\sqrt{3}} \approx 1.15$ , so

$\left(\frac{2}{\sqrt{3}} - \sqrt{3}\right)\left(\frac{2}{\sqrt{3}} + \sqrt{3}\right) \approx (1.15 - 1.73)(1.15 + 1.73) = (-0.58)(2.88) = -1.67$ . Evaluate the choices: only (C) matches:  $-\frac{5}{3} \approx -1.67$ .



6. (A) **Math/Intermediate Algebra/Solving Quadratic Equations and Relations.** Solve the quadratic equation by factoring:  $x^2 + 3x - 18 = 0 \Rightarrow (x - 3)(x + 6) = 0$ . So,  $x$  must equal 3 or  $-6$  for the equation to be true.

Therefore, possible values of  $m$  are  $\frac{x}{2} = \frac{3}{2}$  and  $\frac{x}{2} = \frac{-6}{2} = -3$ .

7. (B) **Math/Data, Statistics, and Probability/Measures of Center/Averages, Median, and Mode.** You could always use the calculator to find exact values. But there is an easier way. First, recognize that 34 is the highest value listed in the table. The *median* is the middle number of the set (or the average of the middle numbers if there is more than one). Deleting the highest value isn't going to change the order of the rest of the list when it is arranged from lowest to highest value.

As for the *mean* or *average*, since 34 is significantly higher than the other numbers, the mean will change when it is deleted. But remember, the average is calculated by dividing the total by 24 (or 23 when the correction is made), and  $34/24$  isn't a large value.

As for the *range*, deleting 34 will reduce the range from 10 to 34 to 10 to 23, a change of 9. So (B) is correct.

8. (D) **Math/Intermediate Algebra/Manipulating Algebraic Expressions/Factoring Expressions.** A manipulation shortcut is inherent in the design of this item: factor the numerator using the method for

the difference of two squares:  $\frac{x^2 - y^2}{x + y} = \frac{(x + y)(x - y)}{x + y} = x - y$ .

This item can also be solved using the "plug-and-chug" strategy. To use this strategy, choose a value for each variable and plug the values into the original equation, then into each answer choice until you find an answer choice that returns the same value as the original equation.

For example, if  $x = 2$  and  $y = 1$ , then  $\frac{x^2 - y^2}{x + y} = \frac{2^2 - 1^2}{2 + 1} = \frac{3}{3} = 1$ . Therefore, when  $x = 2$  and  $y = 1$ , the

correct answer choice must equal 1:

A.  $x^2 + y^2 : 2^2 + 1^2 \stackrel{?}{=} 1 \Rightarrow 5 \neq 1$  ✗

B.  $x^2 + y : 2^2 + 1 \stackrel{?}{=} 1 \Rightarrow 5 \neq 1$  ✗

C.  $x + y^2 : 2 + 1^2 \stackrel{?}{=} 1 \Rightarrow 3 \neq 1$  ✗

D.  $x - y : 2 - 1 \stackrel{?}{=} 1 \Rightarrow 1 = 1$  ✓

9. (A) **Math/Intermediate Algebra/Manipulating Algebraic Expressions/Evaluating Expressions.** Evaluate the expression using 32 feet/second<sup>2</sup> for  $a$  and 100 feet for  $d$ :  $v^2 = 2ad \Rightarrow$

$$v^2 = 2(32 \text{ feet/second}^2)(100 \text{ feet}) = 6,400 \text{ feet}^2/\text{second}^2 \Rightarrow v = 80 \text{ feet/second}.$$

10. (A) **Math/Intermediate Algebra/Solving Quadratic Equations and Relations.** The function is a quadratic in the standard form  $h(t) = at^2 + bt + c$ . The  $c$  value represents the  $y$ -intercept for  $t = 0$ , which in this scenario represents the height from which the goalie kicks the ball. Therefore, the 2 value indicates that the ball was at a height of 2 feet at  $t = 0$ , when the goalie's foot made contact with it.