ANSWER KEY

READING TEST

1. A	14. B	27. D	40. A
2. B	15. D	28. C	41. B
3. C	16. C	29. C	42. D
4. C	17. A	30. B	43. A
5. A	18. D	31. D	44. B
6. C	19. C	32. B	45. A
7. D	20. C	33. B	46. B
8. A	21. C	34. C	47. D
9. D	22. B	35. D	48. D
10. A	23. D	36. B	49. A
11. A	24. C	37. D	50. C
12. D	25. A	38. A	51. D
13. D	26. A	39. B	52. C

WRITING AND LANGUAGE TEST

1. C	12. B	23. C	34. B
2. D	13. B	24. B	35. A
3. B	14. B	25. D	36. C
4. C	15. A	26. B	37. C
5. A	16. A	27. B	38. B
6. C	17. C	28. C	39. C
7. B	18. A	29. B	40. C
8. D	19. B	30. C	41. A
9. C	20. C	31. B	42. D
10. C	21. D	32. D	43. D
11. A	22. D	33. A	44. C

MATH—NO CALCULATOR

1. C
2. A
3. D
4. C
5. B
6. D
7. D
8. B
9. B
10. A
11. C
12. B
13. A
14. D
15. A
16. 20
17. 1
18. 2
19. 14
20. 6

MATH—CALCULATOR

1. C
2. C
3. D
4. A
5. B
6. C
7. D
8. B
9. A
10. C
11. B
12. D
13. A
14. D
15. B
16. B
17. D
18. A
19. A
20. A
21. C
22. D
23. B
24. C
25. D
26. C
27. A
28. B
29. B
30. D
31. 1
32. 192
33. $7 < x < 7.5$
34. 40
35. 14
36. 45
37. 10
38. 12

ANALYZE YOUR PERFORMANCE

STEP 1

Calculate your percentage correct. Refer to the answer key to figure out the number right in each section. Enter the results in the chart:

Section	# Correct	Total # of Questions	% Correct
Reading		52	
Writing & Language		44	
Math w/out Calculator		20	
Math w/ Calculator		38	

STEP 2

Review the correlation.

Use the following table to determine which SAT content you need to review most. Check to find out the areas of study covered by the questions you answered incorrectly. For example, if you missed a lot of Development/Organization questions in the Writing and Language section, then you need to practice developing the skills required to answer that type of question.

Reading Test	Question Number
Analyzing details	1, 28
Command of evidence	4, 7, 12, 15, 23, 27, 35, 37, 44, 50
Determining the central idea	5, 32, 43
Drawing inference based on evidence	3, 6, 14, 19, 26, 30, 34, 36, 46, 49
Interpreting words and phrases in context	2, 8, 13, 16, 24, 29, 39, 40, 48, 51
Rhetoric	9, 10, 11, 17, 18, 20, 21, 22, 25, 33, 38, 41, 45, 47
Synthesis	31, 42, 52

Writing and Language Test	Question Number
Agreement/Pronoun-antecedent agreement	11, 40
Usage/Ambiguous pronoun	10
Conventions of punctuation/Nonrestrictive and parenthetical elements	5
Conventions of punctuation/Unnecessary punctuation	28
Conventions of punctuation/ Within-sentence punctuation	2, 13, 24

Writing and Language Test	Question Number
Development/Focus	22
Development/Organization	19, 26, 30, 41, 42, 44
Development/Proposition	7, 9
Development/Quantitative information	16, 38
Effective language use/Concision	14, 35, 36
Effective language use/Precision	18, 20, 23, 27
Effective language use/Style and tone	3, 4, 39, 43
Inappropriate shifts in construction/Verb tense, mood, and voice	1
Organization/Introductions, conclusions, and transitions	15
Effective language use/Syntax	17, 21
Sentence formation/Modifiers	29
Sentence formation/Parallel structure	6, 8, 12, 25, 34
Sentence formation/Sentence boundaries	31, 33, 37
Sentence formation/Verb tense	32

Math Test —Calculator	Question Number
Additional Topics in Math	11, 27, 34
Heart of Algebra	2, 3, 6, 8, 9, 10, 17, 21, 24, 28, 31, 33, 35
Passport to Advanced Math	4, 13, 16, 19, 20, 30, 32
Problem Solving and Data Analysis	1, 5, 7, 12, 14, 15, 18, 22, 23, 25, 26, 29, 36, 37, 38

Math Test—No Calculator	Question Number
Additional Topics in Math	3, 14, 19
Heart of Algebra	1, 5, 8, 10, 11, 12, 16, 17
Passport to Advanced Math	2, 4, 6, 7, 9, 13, 15, 18, 20

ANSWERS AND EXPLANATIONS

READING TEST

Anna Karenina

1. A
Difficulty: Easy

Category: Reading / Detail

Strategic Advice: Make sure to read the passage closely so events are clearly understood.

Getting to the Answer: The first paragraph explicitly states how Levin knew that Kitty was there. Choice (A) matches the information stated in the passage.

2. B
Difficulty: Medium

Category: Reading / Vocab-in-Context

Strategic Advice: Use context clues to help you distinguish the shades of meaning each word has.

Getting to the Answer: Two of the answer choices have a somewhat negative connotation. The author is not describing the scene in a negative way. In this passage, the word "swarmed" means "gathered." Therefore, (B) is the correct answer. The other words' connotations do not fit with the context of the sentence.

3. C
Difficulty: Hard

Category: Reading / Inference

Strategic Advice: Look for clues in the text that suggest what Levin is like.

Getting to the Answer: Emotionally charged phrases, such as "the rapture and the terror that seized on his heart," help reveal Levin's personality. Choice (C) reflects the depiction of Levin as a passionate person.

4. C
Difficulty: Hard

Category: Reading / Command of Evidence

Strategic Advice: Eliminate answer choices that don't include a description of Levin.

Getting to the Answer: Because the excerpt focuses on Levin's feelings toward Kitty, evidence of the kind of person he is will probably reflect this. Choice (C) provides the best evidence.

5. A
Difficulty: Medium

Category: Reading / Global

Strategic Advice: The central theme of a passage is the insight about life that the author is trying to get across to the reader. Eliminate any themes that are not revealed by the experiences of Levin.

Getting to the Answer: Though you may personally agree with more than one of the themes presented, (A) is only one answer choice that is supported by details in the passage. Levin's feelings and actions support this theme.

6. C
Difficulty: Medium

Category: Reading / Inference

Strategic Advice: Examine the passage to see what other characters do in response to Levin.

Getting to the Answer: The other skaters go about their business. Most take little notice of Levin. Therefore, (C) is the correct answer.

7. D
Difficulty: Medium

Category: Reading / Command of Evidence

Strategic Advice: Reread each quote in the context of the passage. This will help you decide the correct answer.

Getting to the Answer: Of all the answer choices, Nikolay's way of greeting Levin is the strongest evidence that people think Levin seems normal. Choice (D) is the correct answer.

8. A
Difficulty: Medium

Category: Reading / Vocab-in-Context

Strategic Advice: The context of the passage can help reveal the meaning of the word. Insert each choice in the sentence to see which one makes the most sense.

Getting to the Answer: Levin speaks directly to his heart, asking it to behave. Choice (A), "begged," comes closest to meaning the same thing as "conjured" in this context.

9. D
Difficulty: Medium

Category: Reading / Rhetoric

Strategic Advice: Think about the entire scene described in the passage and decide why the author chose to describe Levin's heart as "throbbing."

Getting to the Answer: Choice (D) is the correct answer. The author chose this word to capture Levin's agitated state.

10. A
Difficulty: Hard

Category: Reading / Rhetoric

Strategic Advice: Eliminate answer choices that are clearly not representative of the author's feelings, or attitude, about Levin.

Getting to the Answer: The author presents Levin's situation as one that is painful. The passage's tone suggests that Levin is worthy of the reader's empathy. Choice (A) fits this tone.

Franklin Delano Roosevelt Speech

11. A
Difficulty: Hard

Category: Reading / Rhetoric

Strategic Advice: Watch out for choices that indicate broad supporting goals. The correct answer will reflect the specific intent of President Roosevelt in giving this address.

Getting to the Answer: The introduction to the passage states that President Roosevelt reveals his intention to preserve and spread American democratic ideals. Roosevelt's remarks regarding taxation, patriotism, and sacrifice suggest that he wishes to gain the support of the American people for these goals and to persuade them to connect the fight for global democracy with their own democratic interests. Choice (A) makes clear the president's purpose in winning citizens' support for the battles abroad.

12. D
Difficulty: Hard

Category: Reading / Command of Evidence

Strategic Advice: Be careful of choices that do not provide direct evidence to support the president's purpose. The correct answer will relate specifically to the stated purpose, or intent, of the passage.

Getting to the Answer: President Roosevelt makes clear that his intention is to provide support for global efforts to end tyranny and spread democracy and to garner the support of the American people for these goals. In the previous question, his stated purpose is "to make its people conscious of their individual stake in the preservation of democratic life in America." The two elements of that purpose are the American people and the preservation of democratic life. Only (D) provides direct evidence for the previous question.

13. D
Difficulty: Easy

Category: Reading / Vocab-in-Context

Strategic Advice: All answer choices are alternate meanings of the word "sacrifice." The correct answer will relate directly to the context of the passage.

Getting to the Answer: Despite the fact that Roosevelt gave the speech on the eve of America's involvement in World War II, neither B nor C is the meaning he's after. Choice (D), "surrender of interests to a greater good," is the correct answer.

14. B
Difficulty: Hard

Category: Reading / Inference

Strategic Advice: Keep in mind that you're looking for a relationship that is suggested, not stated. To reach the correct answer, you must infer, or make a logical guess, based on information in the passage.

Getting to the Answer: The correct answer will provide support for the stated purpose of the passage while demonstrating a logical relationship. Choice (B) provides support for the stated goal of winning support among U.S. citizens for the spread of democracy abroad. It does so by suggesting that the security of U.S. democracy depends on the advancement of human rights and freedoms globally.

15. D
Difficulty: Medium

Category: Reading / Command of Evidence

Strategic Advice: Avoid answers that provide evidence for incorrect answers to the previous question. The correct answer will use language reflective of the correct answer above to demonstrate a relationship.

Getting to the Answer: Principles and ideas such as democracy, freedom, and protection of human rights are used interchangeably throughout Roosevelt's speech. The lines in (D) draw the connection between freedom at home and freedom everywhere.

16. C
Difficulty: Easy

Category: Reading / Vocab-in-Context

Strategic Advice: Substitute each answer choice for the word in question and decide which one fits the context provided in the passage.

Getting to the Answer: In the context of the passage, (C) works best. It draws a distinction between individual citizens' monetary interests, or their pocketbooks, and the cause of patriotism, or the greater good.

17. A
Difficulty: Medium

Category: Reading / Rhetoric

Strategic Advice: Keep in mind that the correct answer will relate directly to the meaning of the elements in the identified lines.

Getting to the Answer: President Roosevelt is arguing against those who would oppose the overarching goal of his speech, namely to recruit American public support for the war effort and the spread of democracy overseas. Choice (A) fits best; Roosevelt asserts that his goals are realistic and attainable, not just idealistic visions, as his opponents might claim.

18. D
Difficulty: Medium

Category: Reading / Rhetoric

Strategic Advice: Be wary of answers like A and B that seem to offer specific advice or state specific goals relevant to the purpose of the passage without suggesting how those goals might be achieved. The correct answer will offer a tool, a condition, or another asset for achieving the passage's claim—in this case, the spread of democracy.

Getting to the Answer: The previous question identifies that President Roosevelt considers the spread of global democracy achievable. This question asks you to identify how the president envisions achieving that purpose. Choice (D) matches the intent. In this line, President Roosevelt identifies "our unity of purpose" as an asset that will help achieve his goal.

19. C
Difficulty: Hard

Category: Reading / Inference

Strategic Advice: Be careful of answers that cite other policies that the president might support that are not related to the lines quoted. The correct answer will relate directly to the specific lines in question.

Getting to the Answer: In this speech, Roosevelt identifies four freedoms that he views the United States as obligated to defend. The freedom from want signifies a commitment to helping struggling populations at home and abroad. Choice (C) fits. The president urges economic understandings among nations to help those in need.

20. C
Difficulty: Medium

Category: Reading / Rhetoric

Strategic Advice: Be careful of answers like A that offer other viable uses of rhetoric within the larger passage. The correct answer will relate specifically to the text cited in the question.

Getting to the Answer: Roosevelt suggests that the preservation of American freedoms cannot exist without the preservation of human rights on a global scale. To cement this connection, he contrasts democratic movements with tyrannical movements occurring in the world. Choice (C) is the correct answer. President Roosevelt references "the so-called new order of tyranny" in order to show what might happen should the United States and the American people not support other nations in their fight against such tyranny.

Women's Suffrage

21. C
Difficulty: Medium

Category: Reading / Rhetoric

Strategic Advice: Keep in mind that the "stance" of an author refers to his or her perspective or attitude toward the topic written about.

Getting to the Answer: The passage is written by a secondary source, such as a scholar or a historian, who is looking back on the events that led to the adoption of the Nineteenth Amendment. It is not written by a primary source, such as a legislator or an advocate in the midst of the movement's events. For this reason, (C) is the correct answer. The author of the passage is most clearly a scholar evaluating not just the motivation of women's suffrage leaders but the key events and impact of the movement as a whole.

22. B
Difficulty: Hard

Category: Reading / Rhetoric

Strategic Advice: Avoid answers like (A) that refer to related issues not relevant to the passage's purpose and answers like (D) that go too far. The correct answer will identify a claim made explicitly in the quote.

Getting to the Answer: In the quote, the author notes that election laws following passage of the Nineteenth Amendment did not secure equal voting rights for all. From this statement, it is fairly clear that other groups of people still needed support for their voting rights. Answer (B) is correct.

23. D
Difficulty: Medium

Category: Reading / Command of Evidence

Strategic Advice: Reread the line quoted in the previous question and notice that it occurs in the

passage after ratification of the Nineteenth Amendment. Therefore, the evidence you're looking for will refer to an event that came later.

Getting to the Answer: The author suggests that the Nineteenth Amendment did not win equal voting rights for all citizens but that it did serve as an important step on the way to free and fair elections. Choice (D) demonstrates that a later event expanded voting rights further, to citizens regardless not only of gender but also of race.

24. C
Difficulty: Easy

Category: Reading / Vocab-in-Context

Strategic Advice: Consider the events that are being described in the paragraph in which the word appears. This will help you choose the best answer.

Getting to the Answer: It's clear in this paragraph that the women's suffrage movement was gaining momentum at this time. Events and tactics excited those who supported the movement and attracted more supporters. Therefore, (C) reflects the correct meaning of "galvanized."

25. A
Difficulty: Hard

Category: Reading / Rhetoric

Strategic Advice: Carefully review the paragraph in which the line appears before choosing the best answer.

Getting to the Answer: Choice (A) demonstrates the connection between successfully changing one element (people's minds) in order to change the other (laws).

26. A
Difficulty: Hard

Category: Reading / Inference

Strategic Advice: Be wary of answers like D that go too far in asserting unsubstantiated causal relationships. The correct answer will reference an idea or a relationship that is supported by the content of the passage.

Getting to the Answer: Choice (A) expresses the idea implicit in the passage that the American government responds, sometimes slowly, to the changing needs and sentiments of the American people.

27. D
Difficulty: Hard

Category: Reading / Command of Evidence

Strategic Advice: Watch for answers like A and C that cite specific changes or examples that might seem to support the implicit meaning but do not go far enough. The correct answer will reflect the full relationship or idea described in the implicit meaning.

Getting to the Answer: The correct answer to the previous question states the idea implicit in the passage that the government responds and adapts to changes in U.S. society. This suggests a change that takes place over time. Choice (D) demonstrates the idea that both society and the government have changed over time as the civil rights movement of the late twentieth century overcame social and legal inequalities inherited from earlier in the nation's history.

28. C
Difficulty: Medium

Category: Reading / Detail

Strategic Advice: Be careful of answers that aren't backed by sufficient evidence in the graphic.

Getting to the Answer: The graphic shows proof that women's suffrage unfolded through a series of events over a long period of time. Choice (C) is the correct answer.

29. C
Difficulty: Medium

Category: Reading / Vocab-in-Context

Strategic Advice: Read the sentence in which the word appears. The correct answer should be interchangeable with the word.

Getting to the Answer: The passage states that "Posters . . . called into question the authenticity of a free country with unjust laws." Choice (C) is the correct answer, as "legitimacy" refers to something that is in accordance with established rules or principles.

30. B
Difficulty: Medium

Category: Reading / Inference

Strategic Advice: Be cautious about answers that state true events but that do not directly relate to the content of the question.

Getting to the Answer: Choice (B) is the correct answer. Wilson's framing of the conflict abroad as a fight for democracy and freedom helped women suffragists draw attention to the fact that the U.S. government was fighting for justice abroad while denying justice at home.

31. D
Difficulty: Medium

Category: Reading / Synthesis

Strategic Advice: A question like this is asking you to compare information provided in the graphic with information provided in the passage text. Consider each answer choice as you make your comparison.

Getting to the Answer: Choice (D) is the correct answer. Both the graphic and the passage indicate that women's suffrage gained early victories in several states quite a few years before becoming law at the federal level through passage of the Nineteenth Amendment.

Paired Passages—Genomes

32. B
Difficulty: Medium

Category: Reading / Global

Strategic Advice: Look for the answer choice that describes an idea supported throughout the passage rather than a specific detail.

Getting to the Answer: Collectively, the details in the passage support the idea that the coffee market can be expanded and the profits generated from coffee sales can be increased by applying information gained in sequencing the genome of coffee plants. Choice (B) is the correct answer.

33. B
Difficulty: Hard

Category: Reading / Rhetoric

Strategic Advice: Avoid answers that are not directly supported by evidence in the passage.

Getting to the Answer: Eliminate answers such as A and C, which are not supported by the main idea of the passage. In contrast, there is evidential support for (B). The author would most likely agree that studying other nonhuman primates could be beneficial to people.

34. C
Difficulty: Medium

Category: Reading / Inference

Strategic Advice: Watch out for answer choices that seem plausible but are not directly implied by the evidence in the passage.

Getting to the Answer: Choice (C) is the correct answer. In the last paragraph, the author discusses how research that is currently being conducted could impact the future of coffee production.

35. D
Difficulty: Medium

Category: Reading / Command of Evidence

Strategic Advice: Look back at the previous question. Find the lines from the passage that describe research that could increase the profitability of coffee for producers.

Getting to the Answer: Choice (D) is the correct answer. In the last paragraph, the author describes how current research could lead to a way to produce coffee plants without caffeine in a more cost-effective manner.

36. B
Difficulty: Hard

Category: Reading / Inference

Strategic Advice: Eliminate any answer choices that may sound plausible but take the information presented in the passage too far.

Getting to the Answer: The passage states that the research being conducted on the DNA of gibbons could provide scientists with a way to start figuring out how to prevent cancer and other human ailments. Choice (B) is the correct answer.

37. D
Difficulty: Medium

Category: Reading / Command of Evidence

Strategic Advice: Look at your answer for the previous question. Skim the passage to find the paragraph you used to select your answer.

Getting to the Answer: Choice (D) is the quote from the passage that directly supports the idea that more research would be needed before current findings could be applied to curing diseases in humans.

38. A
Difficulty: Medium

Category: Reading / Rhetoric

Strategic Advice: Remember that you're looking for a statement that expresses the purposes of both passages, not just one.

Getting to the Answer: Both passages discuss how sequencing the genome of a nonhuman organism can benefit people. Therefore, (A) is the correct answer.

39. B
Difficulty: Medium

Category: Reading / Vocab-in-Context

Strategic Advice: Be careful of answer choices that are synonyms for "compelled" but do not make sense in the context in which they're used in the passage.

Getting to the Answer: Choice (B) makes the most sense in context. The scientists felt driven to pursue genome sequencing of the coffee plant.

40. A
Difficulty: Easy

Category: Reading / Vocab-in-Context

Strategic Advice: Replace the word in the sentence with each answer choice and eliminate those that do not make sense in context.

Getting to the Answer: In the context, (A) makes the most sense. "Maintenance" most nearly means "preservation."

41. B
Difficulty: Hard

Category: Reading / Rhetoric

Strategic Advice: Be careful of answer choices that are not directly related to the phrase being considered.

Getting to the Answer: The author of Passage 1 is making a generalization about the coffee industry in order to introduce the main topic to the reader. The author uses the phrase a "pillar of the world economy" to show that the coffee industry plays a vital role in the world economy. Choice (B) is the correct answer.

42. D
Difficulty: Hard

Category: Reading / Synthesis

Strategic Advice: Be careful of answer choices that make inferences based on only one of the passages.

Getting to the Answer: Each passage describes a way that genome sequencing of an organism other than a human has benefited people. Therefore, (D) is the correct answer.

Biomimicry Passage

43. A
Difficulty: Medium

Category: Reading / Global

Strategic Advice: Look for the answer choice that describes an idea supported throughout the passage rather than a specific detail.

Getting to the Answer: The passage cites several examples of biomimicry, the study of how materials and systems found in nature can be replicated to benefit humans. Therefore, (A) is the best summary of the central idea of the passage.

44. B
Difficulty: Medium

Category: Reading / Command of Evidence

Strategic Advice: Think back to why you chose your answer to the previous question. This will help you pick the correct quote as evidence.

Getting to the Answer: Choice (B) is the correct answer because it provides evidence for the central idea that the author presents about the field of biomimicry.

45. A
Difficulty: Hard

Category: Reading / Rhetoric

Strategic Advice: Think about the main idea of the quote. Eliminate any answer choices that don't support this main idea.

Getting to the Answer: The quote explains why architects turn to biomimicry for solutions in their work. Choice (A) is the correct answer.

46. B
Difficulty: Medium

Category: Reading / Inference

Strategic Advice: Reread the paragraph that the question is asking about. Look for specific details about the abalone shrimp shell and soft chalk.

Getting to the Answer: The passage clearly states that the abalone shrimp shell is harder than soft chalk because of the way the basic material composing each is arranged, so (B) is the correct answer.

47. D
Difficulty: Medium

Category: Reading / Rhetoric

Strategic Advice: In order to understand why an author includes a quote from another person,

examine the surrounding sentences. This often makes clear the author's reason for including the quotation.

Getting to the Answer: The author includes the quote from Pawlyn to support and strengthen his or her own view that energy efficiency "has never been more important." Therefore, (D) is the correct answer.

48. D
Difficulty: Easy

Category: Reading / Vocab-in-Context

Strategic Advice: Replace the word in question with each of the answer choices. This will help you eliminate the ones that don't make sense in the context.

Getting to the Answer: Choice (D), "theories," is the only answer choice that makes sense in this context.

49. A
Difficulty: Medium

Category: Reading / Inference

Strategic Advice: Keep in mind that you're being asked to make an inference, a logical guess based on information in the passage. Therefore, the correct answer is not stated in a passage.

Getting to the Answer: The variety of examples of biomimicry mentioned in the passage make it reasonable to infer that more scientists will utilize solutions developed through biomimicry in the future. Choice (A) is the correct answer.

50. C
Difficulty: Medium

Category: Reading / Command of Evidence

Strategic Advice: Reread each quotation in the context of the passage. Consider which one is the best evidence to support the inference made in the previous question.

Getting to the Answer: The examples cited in (C) provide strong evidence for the inference that more scientists will probably make use of biomimicry in years to come.

51. D
Difficulty: Medium

Category: Reading / Vocab-in-Context

Strategic Advice: Eliminate answer choices that are synonyms for the word in question but do not work in the context of the sentence.

Getting to the Answer: Because biomimicry is such an innovative approach, it makes sense that the meaning of "radical" in this context is closest to (D), "revolutionary."

52. C
Difficulty: Hard

Category: Reading / Synthesis

Strategic Advice: Remember that a graphic might not refer to something explicitly stated in the passage. Instead, it often provides a visual example of how an important concept discussed in the passage works.

Getting to the Answer: The graphic and its caption help illustrate an example of biomimicry not mentioned in the passage: that of a solar power plant designed to mimic the arrangement of petals in a sunflower. This directs more energy toward the power plant's central tower and improves the efficiency of the power plant. Choice (C) is the correct answer.

WRITING AND LANGUAGE TEST

The Age of the Librarian

1. C
Difficulty: Easy

Category: Writing & Language / Shifts in Construction

Strategic Advice: Examine the verb tense in the rest of the sentence. This will help you find the correct answer.

Getting to the Answer: As written, the sentence switches verb tense midsentence. Other verbs in the sentence, "worked" and "was," indicate that the events happened in the past. Choice (C) is the correct choice because it correctly uses the past tense of the target verb.

2. D
Difficulty: Medium

Category: Writing & Language / Punctuation

Strategic Advice: Pay attention to the quotation marks. Make sure a complete sentence is properly punctuated within the quotation marks.

Getting to the Answer: Reading through the sentence and the answer choices shows that two issues might need correcting. The sentence inside the quotation marks is a complete sentence. The correct answer needs to punctuate that sentence before closing the quote. Additionally, "however" is being used as a connector or transition word and needs to be followed by a comma after beginning the new sentence. Choice (D) appropriately uses a period prior to the end quotes and correctly inserts a comma after the transition "However."

3. B
Difficulty: Medium

Category: Writing & Language / Effective Language Use

Strategic Advice: Watch out for choices that distort the tone of the passage.

Getting to the Answer: The passage suggests that people expected or anticipated that Harris would become a librarian. Evidence for this idea is found in the statement that she was "constantly told" that she "should be studying to be a librarian." Harris was certainly aware that people anticipated this course of study for her, but the presence of the phrase "Little did she realize" tells you that she didn't expect to become one. The correct choice is (B), "imminent," meaning that becoming a librarian was about to occur despite her own expectations.

4. C
Difficulty: Hard

Category: Writing & Language / Effective Language Use

Strategic Advice: Read the sentence carefully for context clues. Also, think about the tone of what is being described. This will help you choose the best answer.

Getting to the Answer: Given the phrasing of the sentence, the answer must be close in meaning to "excited," which is used earlier in the sentence. Therefore, (C) is the correct answer.

5. A
Difficulty: Medium

Category: Writing & Language / Punctuation

Strategic Advice: Determine whether a clause is independent or dependent to decide between a comma and a semicolon.

Getting to the Answer: Choice (A) is the correct answer. The sentence is correctly punctuated as written because it uses a comma at the end of the introductory clause.

6. C
Difficulty: Medium

Category: Writing & Language / Sentence Formation

Strategic Advice: Read the sentence carefully. The sentence sounds clunky and awkward. Look for an answer choice that makes the sentence clear and easy to understand. Notice that the word "asking" is part of a participial phrase that modifies "Miguel."

Getting to the Answer: A participial phrase should be placed as close as possible to the noun it modifies. When a participial phrase begins a sentence, it should be set off with a comma.

Choice (C) is correct. The placement of commas and modifiers makes the content easy to understand, and the sentence is free of grammatical or punctuation errors.

7. B
Difficulty: Medium

Category: Writing & Language / Development

Strategic Advice: Read the entire paragraph carefully and predict the main idea. Then look for a close match with your prediction.

Getting to the Answer: The paragraph discusses how the role of librarian has changed due to an increased use of technology. Choice (B) is the correct answer, as it explicitly addresses the changing role of the librarian due to technology.

8. D
Difficulty: Medium

Category: Writing & Language / Sentence Formation

Strategic Advice: Read the sentence and note the series of examples. A series should have parallel structure.

Getting to the Answer: The sentence is not correct as written. The items in the series switch forms from participial phrases beginning with "enabling" and "offering" to "they house." All of the items need to fit the same pattern or form. Choice (D) is correct because it appropriately begins each item in the series with a participle.

9. C
Difficulty: Hard

Category: Writing & Language / Development

Strategic Advice: Don't be fooled by answer choices that are true statements but do not directly support the main idea of the paragraph.

Getting to the Answer: The paragraph concerns how the role of librarian has changed due to an increased use of technology. The correct answer needs to support the idea that librarians work with technology in new ways. Choice (C) works best. It offers a specific example of how teachers look to the librarian to be a "media mentor" and illustrates this new role for school librarians.

10. C
Difficulty: Easy

Category: Writing & Language / Usage

Strategic Advice: Read the sentence prior to the pronoun and determine whom the pronoun is referencing. Pronouns should not be ambiguous, and they must match the verb in number.

Getting to the Answer: The sentence is ambiguous as written. "She" would presumably refer back to the "young student" but it seems unlikely that the student would be laughing and thinking about the collections in the library after asking the librarian a question. Choice (C) is the best choice. It clearly indicates the subject of the sentence (Harris) and avoids ambiguity.

11. A
Difficulty: Medium

Category: Writing & Language / Usage

Strategic Advice: Figure out whom the pronoun refers to and make sure it matches the antecedent in number. Watch out for confusing contractions and possessives.

Getting to the Answer: The pronoun in the sentence needs to indicate who will have the ideas. Harris is talking to a single student, so you will need a singular possessive pronoun.

Choice (A) is correct. As it is, the sentence correctly uses a singular possessive pronoun.

Unforeseen Consequences: The Dark Side of the Industrial Revolution

12. B
Difficulty: Medium

Category: Writing & Language / Sentence Formation

Strategic Advice: Be careful of answers that sound correct when they stand alone but do not conform to the structure of the sentence as a whole.

Getting to the Answer: The existing text is incorrect, as it does not maintain parallel structure. Choice (B) is the correct answer, as it maintains the parallel structure of preposition ("into") + noun ("the role").

13. B
Difficulty: Easy

Category: Writing & Language / Punctuation

Strategic Advice: Eliminate answers that confuse the usage of commas and semicolons.

Getting to the Answer: Choice (B) is correct. Without the comma, the following clause modifies "urban areas" when it should modify the entire preceding clause.

14. B
Difficulty: Medium

Category: Writing & Language / Effective Language Use

Strategic Advice: Avoid choices that are redundant and imprecise. The correct answer will use the clearest, most concise terminology to communicate the idea.

Getting to the Answer: Choice (B) is correct. It is the most concise—and clearest—word choice. The other choices use more words than necessary to convey meaning.

15. A
Difficulty: Medium

Category: Writing & Language / Organization

Strategic Advice: The first sentence should function as a transition between ideas in the previous paragraph and ideas in the current paragraph.

Getting to the Answer: Choice (A) makes sense. This choice connects ideas from the previous paragraph with the content of paragraph 3. The sentences that follow provide details to support that introductory idea.

16. A
Difficulty: Hard

Category: Writing & Language / Development

Strategic Advice: Eliminate answers like B that fail to directly support the cited sentence.

Getting to the Answer: The underlined sentence references "unprecedented amounts of human-made carbon dioxide into the air." This suggests an increase in the amount of carbon dioxide in the atmosphere over time. Therefore, (A) is the correct answer.

17. C
Difficulty: Medium

Category: Writing & Language / Effective Language Use

Strategic Advice: Choose the answer that presents the correct relationship between ideas.

Getting to the Answer: Choice (C) is correct. It shows the causal relationship without adding unnecessary verbiage.

18. A
Difficulty: Easy

Category: Writing & Language / Effective Language Use

Strategic Advice: Plug in the answer choices and select the one that reflects a specific meaning relevant to the sentence.

Getting to the Answer: The paragraph focuses on the negative effects of industrialization and waste production. Therefore, (A) is the correct answer.

19. B
Difficulty: Hard

Category: Writing & Language / Development

Strategic Advice: Be careful of choices that relate to the underlined portion of the text without showing clearly how the underlined portion supports the full implication of the preceding sentence.

Getting to the Answer: The paragraph explains that industrialization resulted in the destruction of resources. The correct answer, (B), serves as clear evidence of the "process of destruction and reduced resources."

20. C
Difficulty: Medium

Category: Writing & Language / Effective Language Use

Strategic Advice: Be careful of answers that make sense but do not fully support the meaning of the content. The correct answer will not only flow logically but will also reflect the precise purpose and meaning of the larger sentence and paragraph.

Getting to the Answer: Choice (C) is the correct answer. "Substandard" communicates clearly that the working conditions were the cause of the health problems.

21. D
Difficulty: Medium

Category: Writing & Language / Sentence Formation

Strategic Advice: Eliminate choices that result in sentence fragments or fragmented clauses. The correct answer will maintain appropriate syntax without misusing punctuation.

Getting to the Answer: Choice (D) is correct. It sets off the dependent clause without using incorrect punctuation to signal a hard break before an independent clause or second complete sentence.

22. D
Difficulty: Hard

Category: Writing & Language / Development

Strategic Advice: Avoid answers that draw on similar ideas but combine those ideas in a way that communicates a proposition not supported by the essay as a whole. The correct answer will make sense within the larger context of the essay.

Getting to the Answer: The central idea of the entire essay is that industrialization and progress came at a cost that made the promise of a bright future difficult to fulfill. Choice (D) is the correct answer.

Remembering Freud

23. C
Difficulty: Hard

Category: Writing & Language / Effective Language Use

Strategic Advice: Consider the fact that there may be a choice that helps make the meaning of the sentence very precise.

Getting to the Answer: Choice (C) most accurately indicates that Freud led a whole movement.

24. B
Difficulty: Medium

Category: Writing & Language / Punctuation

Strategic Advice: Plug in each answer choice and select the one that seems most correct.

Getting to the Answer: Choice (B) makes it clear to the reader that this is extra information modifying the word "career."

25. D
Difficulty: Medium

Category: Writing & Language / Sentence Formation

Strategic Advice: Remember that in a list, all things listed should be presented with the same grammatical structure.

Getting to the Answer: "Id," "ego," and "Freudian slip" are all nouns. Choice (D) is the correct answer because it uses a parallel structure for all three nouns.

26. B
Difficulty: Hard

Category: Writing & Language / Development

Strategic Advice: Notice that the underlined sentence is the first sentence in the paragraph. Think about which choice would make the best topic sentence, given the content of the rest of the paragraph.

Getting to the Answer: Choice (B) correctly makes the free-speaking technique the focus of the paragraph's topic sentence, while suggesting that the technique was radical enough to earn Freud his title.

27. B
Difficulty: Medium

Category: Writing & Language / Effective Language Use

Strategic Advice: Eliminate any choices that don't seem as precise as others.

Getting to the Answer: Choice (B) is correct. The word "recesses" is more precise; it connotes smaller parts of the brain and a sense of being hidden.

28. C
Difficulty: Easy

Category: Writing & Language / Punctuation

Strategic Advice: Try reading the sentence in question aloud. This often helps you get a good sense of whether or not a comma is needed.

Getting to the Answer: Choice (C) would fit here. The sentence eliminates the unneeded comma and is a correct sentence.

29. B
Difficulty: Hard

Category: Writing & Language / Sentence Formation

Strategic Advice: Remember that a modifier should be adjacent to the noun it is modifying and set off by punctuation.

Getting to the Answer: Choice (B) is correct. The modifier "like neurosis or other psychological trauma" should come directly after "conditions."

30. C
Difficulty: Hard

Category: Writing & Language / Development

Strategic Advice: Consider how this sentence relates to the one before it and the one that follows it. Does it offer strong support of the connecting ideas?

Getting to the Answer: This section discussed the development and lasting influence of Freud's ideas. The best supporting sentence will provide details connecting these concepts. Choice (C) is correct. It emphasizes that Freud developed new ideas that have had a lasting influence on psychological practices.

31. B
Difficulty: Medium

Category: Writing & Language / Sentence Formation

Strategic Advice: Notice that you are dealing with a run-on sentence. Identify the point in the run-on where it appears two sentences have been fused together.

Getting to the Answer: Choice (B) is correct. This choice splits the run-on sentence into two separate, grammatical sentences.

32. D
Difficulty: Easy

Category: Writing & Language / Sentence Formation

Strategic Advice: Eliminate answer choices that are not complete sentences or do not maintain the correct verb tense.

Getting to the Answer: Choice (D) correctly changes the phrase "Freud's finding of a method" to "Freud found a method," making the sentence complete. It also corrects the verb tense.

33. A
Difficulty: Hard

Category: Writing & Language / Sentence Formation

Strategic Advice: Recall that when a dependent clause precedes an independent clause, it should be set off with a comma.

Getting to the Answer: Choice (A) is the best choice. Although lengthy, the dependent clause in the sentence ("So as long as occasions arise . . . ") is correctly combined with its independent clause ("Sigmund Freud will be remembered . . . ") by use of a comma.

Success in Montreal

34. B
Difficulty: Easy

Category: Writing & Language / Sentence Formation

Strategic Advice: Always check whether two or more verbs that serve the same function have a parallel structure.

Getting to the Answer: Choice (B) is correct. "To prevent" is in the infinitive form like the first verb in the sentence, "to reverse."

35. A
Difficulty: Hard

Category: Writing & Language / Effective Language Use

Strategic Advice: Look for the choice that most concisely and correctly joins the two sentences.

Getting to the Answer: Choice (A) is the best fit. This option joins the sentences concisely and correctly.

36. C
Difficulty: Medium

Category: Writing & Language / Effective Language Use

Strategic Advice: Remember that the best answer is the most concise and effective way of stating the information while ensuring that the information is complete.

Getting to the Answer: Choice (C) works best here. It uses the fewest necessary words to convey the complete information.

37. C
Difficulty: Medium

Category: Writing & Language / Sentence Formation

Strategic Advice: Eliminate any choices that use transition words inappropriately.

Getting to the Answer: Two complete thoughts should be separated into two different sentences. Therefore, (C) is the best choice.

38. B
Difficulty: Hard

Category: Writing & Language / Quantitative

Strategic Advice: Examine the graphic for details that suggest which answer is correct.

Getting to the Answer: Choice (B) accurately reflects the information in the graphic. Beginning in the 1990s, the size of the ozone hole began to level off.

39. C
Difficulty: Medium

Category: Writing & Language / Effective Language Use

Strategic Advice: Check each word to see how it fits with the context of the sentence.

Getting to the Answer: While all of the words have similar meanings, only one fits the context of the paragraph. Choice (C), "measured," has a connotation that corresponds to "gauge" in the following sentence.

40. B
Difficulty: Easy

Category: Writing & Language / Usage

Strategic Advice: Remember that the possessive form must agree with its antecedent.

Getting to the Answer: The correct answer will reflect the gender and number of its antecedent; in this case, the word "treaty." Therefore, (B) is correct.

41. A
Difficulty: Hard

Category: Writing & Language / Development

Strategic Advice: To find the central idea of a paragraph, identify important details and then summarize them in a sentence or two. Then find the choice that is the closest to your summary.

Getting to the Answer: Choice (A) most clearly states the paragraph's central idea.

42. D
Difficulty: Medium

Category: Writing & Language / Development

Strategic Advice: To find the correct answer, first determine the central idea of the paragraph.

Getting to the Answer: Choice (D) is the least essential sentence in the paragraph, so it is the correct answer.

43. D
Difficulty: Medium

Category: Writing & Language / Effective Language Use

Strategic Advice: Context clues tell which word is appropriate in the sentence. Check to see which word fits best in the sentence.

Getting to the Answer: The word "reverse," (D), fits with the context of the sentence and connotes a more precise action than does "change."

44. C
Difficulty: Hard

Category: Writing & Language / Organization

Strategic Advice: Examine the entire paragraph. Decide whether the sentence provides more information about a topic mentioned in one of the other sentences.

Getting to the Answer: This sentence provides more information related to sentence 1, "The Montreal Protocol is a living document"; it describes how the document is "living." Choice (C) is the correct answer.

MATH TEST: NO-CALCULATOR SECTION

1. C
Difficulty: Easy

Category: Heart of Algebra / Linear Equations

Strategic Advice: To determine what the *y*-intercept could mean in the context of a word problem, examine the labels on the graph and note what each axis represents.

Getting to the Answer: According to the labels, the *y*-axis represents cost, and the *x*-axis represents the number of games played. The *y*-intercept, (0, 5), has an *x*-value of 0, which means zero games were played, yet there is still a cost of $5. The cost must represent a flat fee that is charged before any games are played, such as an entrance fee to enter the arcade.

2. A
Difficulty: Easy

Category: Passport to Advanced Math / Exponents

Strategic Advice: To divide one rational expression by another, multiply the first expression by the reciprocal (the flip) of the second expression.

Getting to the Answer: Rewrite the division as multiplication, factor any factorable expressions, and then simplify if possible.

$$\begin{aligned}\frac{3x}{x+5} \div \frac{6}{4x+20} &= \frac{3x}{x+5} \cdot \frac{4x+20}{6} \\ &= \frac{3x}{\cancel{x+5}} \cdot \frac{4\cancel{(x+5)}}{6} \\ &= \frac{12x}{6} \\ &= 2x\end{aligned}$$

Note that the question also states that $x \neq -5$. This doesn't affect your answer—it is simply stated because the denominators of rational expressions cannot equal 0.

3. D
Difficulty: Easy

Category: Additional Topics in Math / Geometry

Strategic Advice: When the equation of a circle is written in the form $(x - h)^2 + (y - k)^2 = r^2$, the point (h, k) represents the center of the circle on a coordinate plane, and r represents the length of the radius.

Getting to the Answer: To find the area of a circle, use the formula, $A = \pi r^2$. In the equation given in the question, r^2 is the constant on the right-hand side (25)—you don't even need to solve for r because the area formula involves r^2, not r. So, the area is $\pi(25)$ or 25π.

4. C
Difficulty: Easy

Category: Passport to Advanced Math / Functions

Strategic Advice: When using function notation, $f(x)$ is simply another way of saying y, so this question is asking you to find the values of x for which $y = 0$, or in other words, where the graph crosses the x-axis.

Getting to the Answer: The graph crosses the x-axis at the points (–2, 0) and (3, 0), so the values of x for which $f(x) = 0$ are –2 and 3.

5. B
Difficulty: Medium

Category: Heart of Algebra / Linear Equations

Strategic Advice: Choose the best strategy to answer the question. You could start by cross-multiplying to get rid of the denominators, but simplifying the numerators first will make the calculations easier.

Getting to the Answer:

$$\frac{4(d+3)-9}{8}=\frac{10-(2-d)}{6}$$
$$\frac{4d+12-9}{8}=\frac{10-2+d}{6}$$
$$\frac{4d+3}{8}=\frac{8+d}{6}$$
$$6(4d+3)=8(8+d)$$
$$24d+18=64+8d$$
$$16d=46$$
$$d=\frac{46}{16}=\frac{23}{8}$$

6. D
Difficulty: Medium

Category: Passport to Advanced Math / Functions

Strategic Advice: This is a crossover question, so quickly skim the first couple of sentences. Then look for the relevant information in the last couple of sentences. It may also help to circle the portions of the graph that meet the given requirement.

Getting to the Answer: Because *greater* means *higher* on a graph, the statement $f(t) > g(t)$ translates to "Where is $f(t)$ above $g(t)$?" The solid curve represents f and the dashed curve represents g, so $f > g$ between the years 1960 and 1980 and again between the years 2000 and 2010. Look for these time intervals in the answer choices: $1960 < t < 1980$ and $2000 < t < 2010$.

7. D
Difficulty: Medium

Category: Passport to Advanced Math / Scatterplots

Strategic Advice: Use the shape of the data to predict the type of equation that might be used as a model. Then, use specific values from the graph to choose the correct equation.

Getting to the Answer: According to the graph, the population of the whales grew slowly at first and then more quickly. This means that an exponential model is probably the best fit, so you can eliminate A (linear) and B (quadratic). The remaining equations are both exponential, so choose a data point and see which equation is the closest fit. Be careful—the vertical axis represents *hundreds* of whales, and the question states that t represents the number of years since the study began, so $t = 0$ for 1995, $t = 3$ for 1998, and so on. If you use the data for 1995, which is the point (0, 100), the results are the same for both equations, so choose a different point. Using the data for 2007, $t = 2007 - 1995 = 12$, and the number of whales was 800. Substitute these values into C and D to see which one is true. Choice C is not true because $800 \neq 100 \times 2^{12}$. Choice (D) is correct because $800 = 100 \times 2^{\frac{12}{4}} = 100 \times 2^3 = 100 \times 8$ is true.

8. B
Difficulty: Medium

Category: Heart of Algebra / Linear Equations

Strategic Advice: Average rate of change is the same as slope, so use the slope formula.

Getting to the Answer: To find the average rate of change over the 5-year period, find the slope between the starting point (0, 1,200) and the ending point (5, 100).

$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{100-1{,}200}{5-0}=\frac{-1{,}100}{5}=-220$$

The average rate of change is negative because the laptop decreases in value over time.

Note: Because the question involves *straight-line* depreciation, you could have used any two points on the graph to find the slope. As a general rule, however, you should use the endpoints of the given time interval.

9. B

Difficulty: Medium

Category: Passport to Advanced Math / Exponents

Strategic Advice: When multiplying polynomials, carefully multiply each term in the first factor by each term in the second factor. This question doesn't ask for the entire product, so check to make sure you answered the right question (the coefficient of x^2).

Getting to the Answer:

$$\begin{aligned}&6x^2-\frac{2}{5}x+1\ \ 10x+\frac{1}{3}\\&=6x^2\ \ 10x+\frac{1}{3}\ -\frac{2}{5}x\ \ 10x+\frac{1}{3}\ +1\ 10x+\frac{1}{3}\\&=60x^3+2x^2-4x^2-\frac{2}{15}x+10x+\frac{1}{3}\end{aligned}$$

The coefficient of x^2 is 2 + (–4) = –2.

10. A

Difficulty: Medium

Category: Heart of Algebra / Linear Equations

Strategic Advice: Notice that there are no grid lines and no numbers on the axes. This is a great clue that the numbers in the equations don't actually matter.

Getting to the Answer: The line is decreasing, so the slope (*m*) is negative. The line crosses the *y*-axis below 0, so the *y*-intercept (*b*) is also negative. Put each answer choice in slope-intercept form, one at a time, and examine the signs of *m* and *b*. Begin with A:

$$\begin{aligned}-6x-4y&=5\\-4y&=6x+5\\y&=\frac{6x}{-4}+\frac{5}{-4}\\y&=-\frac{3}{2}x-\frac{5}{4}\end{aligned}$$

You don't need to check any of the other equations. Choice (A) has a negative slope and a negative *y*-intercept, so it is the correct equation.

11. C

Difficulty: Hard

Category: Heart of Algebra / Systems of Linear Equations

Strategic Advice: Graphically, a system of linear equations that has no solution indicates two parallel lines or, in other words, two lines that have the same slope. So, write each of the equations in slope-intercept form ($y = mx + b$) and set their slopes (m) equal to each other to solve for k. Before finding the slopes, multiply the top equation by 4 to make it easier to manipulate.

Getting to the Answer:

$$4\ \frac{3}{4}x-\frac{1}{2}y=12\ \rightarrow 3x-2y=48\rightarrow y=\frac{3}{2}x-24$$

$$kx-2y=22\rightarrow -2y=-kx+22\rightarrow y=\frac{k}{2}x-11$$

The slope of the first line is $\frac{3}{2}$, and the slope of the second line is $\frac{k}{2}$. Set them equal and solve for k.

$$\begin{aligned}\frac{3}{2}&=\frac{k}{2}\\2(3)&=2(k)\\6&=2k\\3&=k\end{aligned}$$

12. B
Difficulty: Hard

Category: Heart of Algebra / Inequalities

Strategic Advice: Pay careful attention to units, particularly when a question involves rates. The $4.00 for the first $\frac{1}{4}$ mile is a flat fee. Before you write the inequality, you need to find the per-mile rate for the remaining miles.

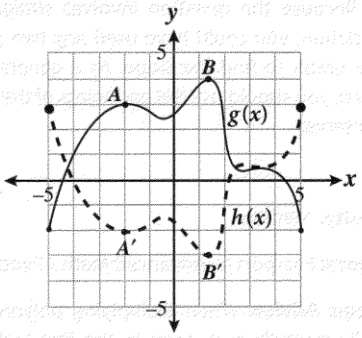
Getting to the Answer: The driver charges $4.00 for the first $\frac{1}{4}$ mile, which is a flat fee, so write 4. The additional charge is $1.50 per $\frac{1}{2}$ mile, or 1.50 times 2 = $3.00 per mile. The number of miles after the first $\frac{1}{4}$ mile is $m-\frac{1}{4}$, so the cost of the trip, not including the first $\frac{1}{4}$ mile, is $3\ m-\frac{1}{4}$. This means the cost of the whole trip is $4+3\ m-\frac{1}{4}$. The clue "no more than $10" means that much or less, so use the symbol ≤. The inequality is $4+3\ m-\frac{1}{4} \leq 10$, which simplifies to $3.25 + 3m \leq 10$.

13. A
Difficulty: Hard

Category: Passport to Advanced Math / Functions

Strategic Advice: Think about how the transformations affect the graph of $g(x)$ and draw a sketch of $h(x)$ on the same grid. Compare the new graph to each of the answer choices until you find one that is true.

Getting to the Answer: The graph of $h(x) = -g(x) + 1$ is a vertical reflection of $g(x)$, over the x-axis, that is then shifted up 1 unit. The graph looks like the dashed line in the following graph:



Now, compare the dashed line to each of the answer choices: the range of $h(x)$ is the set of y-values from lowest to highest (based on the dashed line). The lowest point occurs at point B' and has a y-value of –3; the highest value occurs at both ends of the graph and is 3, so the range is $-3 \leq y \leq 3$. This means (A) is correct and you can move on to the next question. Don't waste valuable time checking the other answer choices unless you are not sure about the range. (Choice B: The minimum value of $h(x)$ is –3, not –4. Choice C: The coordinates of point A on $h(x)$ are (–2, –2), not (2, 4). Choice D: the graph of $h(x)$ is decreasing, not increasing, between $x = -5$ and $x = -2$.)

14. D
Difficulty: Medium

Category: Additional Topics in Math / Imaginary Numbers

Strategic Advice: Multiply the two complex numbers just as you would two binomials (using FOIL). Then, combine like terms and use the definition $i^2 = -1$ to simplify the result.

Getting to the Answer:

$$\begin{aligned}(3+2i)(5-i) &= 3(5-i)+2i(5-i)\\ &= 15-3i+10i-2i^2\\ &= 15+7i-2(-1)\\ &= 15+7i+2\\ &= 17+7i\end{aligned}$$

The question asks for a in $a + bi$, so the correct answer is 17.

15. A
Difficulty: Hard

Category: Passport to Advanced Math / Exponents

Strategic Advice: Think of the rate given in the question in terms of the constant term you see on the right-hand side of the equation. Working together, the two treatment plants can filter the water in 72 hours. This is equivalent to saying that they can filter $\frac{1}{72}$ of the water in 1 hour.

Getting to the Answer: If $\frac{1}{72}$ is the portion of the water the two treatment plants can filter *together*, then each term on the left side of the equation represents the portion that each plant can filter *individually* in 1 hour. Because the new facility is 4 times as fast as the older facility, $\frac{4}{x}$ represents the portion of the water the new plant can filter in 1 hour, and $\frac{1}{x}$ represents the portion of the water the older plant can filter in 1 hour.

16. 20
Difficulty: Medium

Category: Heart of Algebra / Linear Equations

Strategic Advice: Only one equation is given, and it has two variables. This means that you don't have enough information to solve for either variable. Instead, look for the relationship between the variable terms in the equation and those in the expression that you are trying to find, $x + 2y$.

Getting to the Answer: First, move the y-term to the left side of the equation to make it look more like the expression you are trying to find. The expression doesn't have fractions, so clear the fractions in the equation by multiplying both sides by 4. This yields the expression that you are looking for, $x + 2y$, so no further work is required—just read the value on the right-hand side of the equation. The answer is 20.

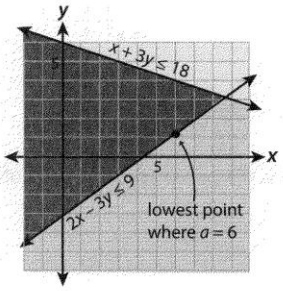
$$\begin{aligned}\frac{1}{4}x &= 5-\frac{1}{2}y\\ \frac{1}{4}x+\frac{1}{2}y &= 5\\ 4\left(\frac{1}{4}x+\frac{1}{2}y\right) &= 4(5)\\ x+2y &= 20\end{aligned}$$

17. 1
Difficulty: Medium

Category: Heart of Algebra / Inequalities

Strategic Advice: This question is extremely difficult to answer unless you draw a sketch. It doesn't have to be perfect—just need to get an idea of where the solution region is. Don't forget to flip the inequality symbol when you graph the second equation.

Getting to the Answer: Sketch the system.



If (a, b) is a solution to the system, then a is the x-coordinate of any point in the darkest shaded region and b is the corresponding y-coordinate. When $a = 6$, the minimum possible value for b lies

on the lower boundary line, $2x - 3y \leq 9$. It looks like the y-coordinate is 1, but to be sure, substitute $x = 6$ into the equation and solve for y. You can use $=$ in the equation, instead of the inequality symbol, because you are finding a point on the boundary line.

$$\begin{aligned} 2x - 3y &= 9 \\ 2(6) - 3y &= 9 \\ 12 - 3y &= 9 \\ -3y &= -3 \\ y &= 1 \end{aligned}$$

18. 2
Difficulty: Hard

Category: Passport to Advanced Math / Exponents

Strategic Advice: Rewrite the radicals as fraction exponents: $\sqrt{x} = x^{\frac{1}{2}}$ and $\sqrt[3]{x} = x^{\frac{1}{3}}$.

Getting to the Answer: Write each factor in the expression in exponential form. Then use the rules of exponents to simplify the expression. Add the exponents of the factors that are being multiplied and subtract the exponent of the factor that is being divided:

$$\begin{aligned} \frac{\sqrt{x} \cdot x^{\frac{5}{6}} \cdot x}{\sqrt[3]{x}} &= \frac{x^{\frac{1}{2}} \cdot x^{\frac{5}{6}} \cdot x^{1}}{x^{\frac{1}{3}}} \\ &= x^{\frac{1}{2}+\frac{5}{6}+\frac{1}{1}-\frac{1}{3}} \\ &= x^{\frac{3}{6}+\frac{5}{6}+\frac{6}{6}-\frac{2}{6}} \\ &= x^{\frac{12}{6}} = x^{2} \end{aligned}$$

Because n is the power of x, the value of n is 2.

19. 14
Difficulty: Hard

Category: Additional Topics in Math / Geometry

Strategic Advice: The shaded region is the area of the larger triangle minus the area of the smaller triangle. Set up and solve an equation using the information from the figure. Before you grid in your answer, check that you answered the right question (height of larger triangle).

Getting to the Answer: You don't know the height of the smaller triangle, so call it h. You do know the area of the shaded region—it's 52 square units.

Larger triangle: base = 12; height = $h + 3 + 3$

Smaller triangle: base = 8; height = h

Shaded area = large area – small area

$$\begin{aligned} 52 &= \frac{1}{2}(12)(h+6) - \frac{1}{2}(8)(h) \\ 52 &= 6(h+6) - 4h \\ 52 &= 6h + 36 - 4h \\ 52 &= 2h + 36 \\ 16 &= 2h \\ 8 &= h \end{aligned}$$

The question asks for the height of the *larger* triangle, so the correct answer is $8 + 3 + 3 = 14$.

20. 6
Difficulty: Hard

Category: Passport to Advanced Math / Quadratics

Strategic Advice: The highest power of x in the equation is 2, so the function is quadratic. Writing quadratic equations can be tricky and time-consuming. If you know the roots, you can use factors to write the equation. If you don't know the roots, you need to create a system of equations to find the coefficients of the variable terms.

Getting to the Answer: You don't know the roots of this equation, so start with the point that has the easiest values to work with, (0, 1), and substitute them into the equation $y = ax^2 + bx + c$.

$$1 = a(0)^2 + b(0) + c$$

$$1 = c$$

Now your equation looks like $y = ax^2 + bx + 1$. Next, use the other two points to create a system of two equations in two variables.

$$(-3, 10) \rightarrow 10 = a(-3)^2 + b(-3) + 1 \rightarrow 9 = 9a - 3b$$

$$(2, 15) \rightarrow 15 = a(2)^2 + b(2) + 1 \rightarrow 14 = 4a + 2b$$

You now have a system of equations to solve. None of the variables has a coefficient of 1, so use elimination to solve the system. If you multiply the top equation by 2 and the bottom equation by 3, the b-terms will eliminate each other.

$$\begin{aligned} 2[9a - 3b = 9] &\rightarrow 18a - 6b = 18 \\ 3[4a + 2b = 14] &\rightarrow \underline{12a + 6b = 42} \\ 30a &= 60 \\ a &= 2 \end{aligned}$$

Now, find b by substituting $a = 2$ into either of the original equations. Using the top equation, you get:

$$\begin{aligned} 9(2) - 3b &= 9 \\ 18 - 3b &= 9 \\ -3b &= -9 \\ b &= 3 \end{aligned}$$

The value of $a + b + c$ is $2 + 3 + 1 = 6$.

MATH TEST: CALCULATOR SECTION

1. C

Difficulty: Easy

Category: Problem Solving and Data Analysis / Rates, Ratios, Proportions, and Percentages

Strategic Advice: You can use the formula $\text{Percent} = \frac{\text{Part}}{\text{Whole}} \times 100\%$ whenever you know two out of the three quantities.

Getting to the Answer: The clue "all" tells you that the "whole" is what you don't know. The percent is 96.5, and the part is 321,000,000.

$$\begin{aligned} 96.5 &= \frac{321{,}000{,}000}{w} \times 100\% \\ 96.5w &= 32{,}100{,}000{,}000 \\ w &= \frac{32{,}100{,}000{,}000}{96.5} \\ w &= 332{,}642{,}487 \end{aligned}$$

The answer choices are rounded to the nearest thousand, so the answer is 332,642,000.

2. C

Difficulty: Easy

Category: Heart of Algebra / Linear Equations

Strategic Advice: A *one-time* fee does not depend on the variable and is therefore a constant. A unit rate, however, is always multiplied by the independent variable.

Getting to the Answer: The total cost consists of the site visit fee (a constant), an hourly cost (which depends on the number of hours), and the cost of the materials (which are taxed). The constant in the equation is 75 and is therefore the site visit fee; 45 is being multiplied by h (the number of hours), so \$45 must be the hourly rate. That leaves the remaining term, 1.06(82.5), which must be the cost of the materials (\$82.50) plus a 6% tax.

3. D
Difficulty: Easy

Category: Heart of Algebra / Inequalities

Strategic Advice: The intersection (overlap) of the two shaded regions is the solution to the system of inequalities. Check each point to see whether it lies in the region with the darkest shading. Don't forget to check that you answered the right question—you are looking for the point that is *not* a solution to the system.

Getting to the Answer: Each of the first three points clearly lies in the overlap. The point (3, 3) looks like it lies on the dashed line, which means it is *not* included in the solution. To check this, plug (3, 3) into the easier inequality: $3 \not> 3$ (3 is equal to itself, not greater than itself), so (D) is correct.

4. A
Difficulty: Easy

Category: Passport to Advanced Math / Quadratics

Strategic Advice: Quadratic equations can be written in several forms, each of which reveals something special about the graph. For example, the vertex form of a quadratic equation gives the minimum or maximum value of the function, while the standard form reveals the *y*-intercept.

Getting to the Answer: The factored form of a quadratic equation reveals the solutions to the equation, which graphically represent the *x*-intercepts. Choice (A) is the only equation written in this form and therefore must be correct. You can set each factor equal to 0 and solve to find that the *x*-intercepts of the graph are $x = \frac{5}{2}$ and $x = -1$.

5. B
Difficulty: Easy

Category: Problem Solving and Data Analysis / Rates, Ratios, Proportions, and Percentages

Strategic Advice: Break the question into steps. Before you can use the ratio, you need to find the percent of the students who answered either "Foreign Policy" or "Environment."

Getting to the Answer: The ratio given in the question is 5:3, so write this as 5 parts "Foreign Policy"and 3 parts "Environment." You don't know how big a *part* is, so call it *x*. This means that $5x + 3x$ = the percent of the students who answered either "Foreign Policy" or "Environment," which is 100% – all the other answers:

$$100 - (16 + 14 + 9 + 5) = 100 - 44 = 56$$
$$5x + 3x = 56$$
$$8x = 56$$
$$x = 7$$

Each part has a value of 7, and 3 parts answered "Environment," so the correct percentage is 3(7) = 21%.

6. C
Difficulty: Easy

Category: Heart of Algebra / Linear Equations

Strategic Advice: Don't peek at the answers. They may confuse you because the numbers look different from the ones given in the question. Instead, write your own equation in words first and then translate from English to math.

Getting to the Answer: Keep in mind that the shirts are on sale but the tie is not. The shirts are 40% off, which means that Marco only pays 100 – 40 = 60% of the price, or 0.6(35).

Cost = (Shirt price times how many) plus (Tie price times how many)

$$C = 0.6(35)x + 21(2)$$

This is not one of the answer choices, so simplify to get $C = 21x + 42$.

There are variables in the answer choices, so you could also use the Picking Numbers strategy to answer this question.

7. D

Difficulty: Easy

Category: Problem Solving and Data Analysis / Statistics and Probability

Strategic Advice: Your only choice for this question is to compare each statement to the figure. Don't waste time trying to figure out the exact value for each bar—an estimate is good enough to determine whether each statement is true.

Getting to the Answer: Choice A is incorrect because the price in 2008 was slightly less (not more) than \$3.50, while the price in 2013 was right around \$3.50. Choice B is incorrect because the price in 2003 was more than \$2.00, and the price in 2013 was not more than twice that (\$4.00). Choice C is incorrect because the price in 2008 was about \$3.25 and the price in 2009 was about \$2.75—this is not a difference of more than \$1.00. This means (D) must be correct. You don't have to check it—just move on. (Between 2003 and 2008, the change in price was about \$3.40 – \$2.30 = \$1.10; between 2008 and 2013, the change in price was only about \$3.50 – \$3.40 = \$0.10; the change in price was greater between 2003 and 2008.)

8. B

Difficulty: Medium

Category: Heart of Algebra / Systems of Linear Equations

Strategic Advice: Because none of the variable terms has a coefficient of 1, solve the system of equations using elimination by addition (combining the equations). Before you choose an answer, check that you answered the right question (the sum of x and y).

Getting to the Answer: Multiply the top equation by 2 to eliminate the terms that have y's in them.

$$\begin{aligned} 2[-2x+5y=1] &\rightarrow -4x+10y=2 \\ 7x-10y=-11 &\rightarrow \underline{7x-10y=-11} \\ 3x &= -9 \\ x &= -3 \end{aligned}$$

Now, substitute the result into either of the original equations and simplify to find y:

$$\begin{aligned} -2x+5y &= 1 \\ -2(-3)+5y &= 1 \\ 6+5y &= 1 \\ 5y &= -5 \\ y &= -1 \end{aligned}$$

The question asks for the *sum*, so add x and y to get $-3 + (-1) = -4$.

9. A

Difficulty: Medium

Category: Heart of Algebra / Systems of Linear Equations

Strategic Advice: Take a quick peek at the answers just to see what variables are being used, but don't study the equations. Instead, write your own system using the same variables as given in the answer choices.

Getting to the Answer: One of the equations in the system should represent the sum of the two resistors ($R_1 + R_2$), which is equal to 294. This means you can eliminate C and D. The second equation needs to satisfy the condition that R_2 is 6 less than twice R_1, or $R_2 = 2R_1 - 6$. This means (A) is correct.

10. C

Difficulty: Medium

Category: Heart of Algebra / Linear Equations

Strategic Advice: Use the distributive property to simplify each of the terms that contains parentheses. Then use inverse operations to solve for x.

Getting to the Answer:

$$\frac{2}{\cancel{5}}\left(\frac{\cancel{5}}{2}x\right)+2(x-1)=4(x+1)-2$$
$$2x+2x-2=4x+4-2$$
$$4x-2=4x+2$$
$$-2\neq 2$$

All of the variable terms cancel out, and the resulting numerical statement is false (because negative 2 does not equal positive 2), so there is no solution to the equation. Put another way, there is no value of x for which the equation is true.

11. B
Difficulty: Medium

Category: Additional Topics in Math / Geometry

Strategic Advice: Think about this question logically before you start writing things down—after it's transferred, the volume of the oil in the cylindrical container will be the same volume as the rectangular container, so you need to set the two volumes equal and solve for h.

Getting to the Answer: The volume of the rectangular container is $4 \times 9 \times 10$, or 360 cubic meters. The volume of a cylinder equals the area of its base times its height, or $\pi r^2 h$. Because the diameter is 6 meters, the radius, r, is half that, or 3 meters. Now we're ready to set up an equation and solve for h (which is the height of the cylinder, or in this case, the length of the transportation container):

$$\text{Volume of oil} = \text{Volume of rectangular container}$$
$$\pi(3)^2 h = 360$$
$$9\pi h = 360$$
$$h = \frac{360}{9\pi} = \frac{40}{\pi}$$

12. D
Difficulty: Medium

Category: Problem Solving and Data Analysis / Rates, Ratios, Proportions, and Percentages

Strategic Advice: Even though this question uses the word *percent*, you are never asked to find the actual percent itself. Set this question up as a proportion to get the answer more quickly. Remember, percent change equals amount of change divided by the original amount.

Getting to the Answer:

$$\frac{12-5}{5} = \frac{x-12}{12}$$
$$\frac{7}{5} = \frac{x-12}{12}$$
$$12(7) = 5(x-12)$$
$$84 = 5x-60$$
$$144 = 5x$$
$$28.8 = x$$

13. A
Difficulty: Medium

Category: Passport to Advanced Math / Exponents

Strategic Advice: Don't spend too much time reading the scientific explanation of the equation. Focus on the question at the very end—it's just asking you to solve the equation for d.

Getting to the Answer: First, cross-multiply to get rid of the denominator. Then, divide both sides of the equation by $4\pi b$ to isolate d^2. Finally, take the square root of both sides to find d.

$$b(4\pi d^2) = L$$
$$\frac{b(4\pi d^2)}{4\pi b} = \frac{L}{4\pi b}$$
$$d^2 = \frac{L}{4\pi b}$$
$$\sqrt{d^2} = \sqrt{\frac{L}{4\pi b}}$$
$$d = \sqrt{\frac{L}{4\pi b}}$$

Unfortunately, this is not one of the answer choices, so you'll need to simplify further. You can take the square root of 4 (it's 2), but be careful—it's in the denominator of the fraction, so it comes out of the square root as $\frac{1}{2}$. The simplified equation is $d = \frac{1}{2}\sqrt{\frac{L}{\pi b}}$.

14. D
Difficulty: Easy

Category: Problem Solving and Data Analysis / Statistics and Probability

Strategic Advice: You do not need to use all of the information presented in the table to find the answer. Read the question carefully to make sure you use only what you need.

Getting to the Answer: To calculate the percentage of men in each age group who reported being unemployed in January 2014, divide the number in *that* age group who were unemployed by the total number in *that* age group. There are six age groups but only four answer choices, so don't waste time on the age groups that aren't represented. Choice (D) is correct because 7 ÷ 152 ≈ 0.046 = 4.6%, which is a lower percentage than that for any other age group (20 to 24 = 12.5%; 35 to 44 = 4.9%; 45 to 54 = 6.1%).

15. B
Difficulty: Medium

Category: Problem Solving and Data Analysis / Statistics and Probability

Strategic Advice: The follow-up survey targets only those respondents who said they were unemployed, so focus on that column in the table.

Getting to the Answer: There were 6 respondents out of 44 unemployed males who were between the ages of 45 and 54, so the probability is $\frac{6}{44} = 0.\overline{136}$, or about 13.6%.

16. B
Difficulty: Medium

Category: Passport to Advanced Math / Quadratics

Strategic Advice: Taking the square root is the inverse operation of squaring, and both sides of the equation are already perfect squares, so take their square roots. Then solve the resulting equations. Remember, there will be two equations to solve.

Getting to the Answer:

$$(x-1)^2 = \frac{4}{9}$$
$$\sqrt{(x-1)^2} = \sqrt{\frac{4}{9}}$$
$$x-1 = \pm\frac{\sqrt{4}}{\sqrt{9}}$$
$$x = 1 \pm \frac{2}{3}$$

Now, simplify each equation: $x = 1 + \frac{2}{3} = \frac{3}{3} + \frac{2}{3} = \frac{5}{3}$ and $x = 1 - \frac{2}{3} = \frac{3}{3} - \frac{2}{3} = \frac{1}{3}$.

17. D
Difficulty: Medium

Category: Heart of Algebra / Linear Equations

Strategic Advice: The key to answering this question is to determine how many darts land in each color ring. If there are 6 darts total and x land in a blue ring, the rest, or $6 - x$, must land in a red ring.

Getting to the Answer: Write the expression in words first: points per blue ring (5) times number of darts in blue ring (x), plus points per red ring (10) times number of darts in red ring ($6 - x$). Now, translate the words into numbers, variables, and operations: $5x + 10(6 - x)$. This is not one of the answer choices, so simplify the expression by distributing the 10 and then combining like terms: $5x + 10(6 - x) = 5x + 60 - 10x = 60 - 5x$.

18. A
Difficulty: Medium

Category: Problem Solving and Data Analysis / Statistics and Probability

Strategic Advice: This is a science crossover question. Read the first two sentences quickly—they are simply describing the context of the question. The last two sentences pose the question, so read those more carefully.

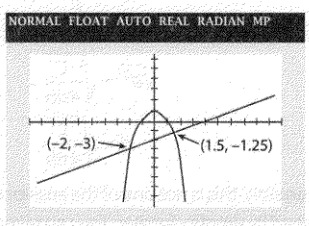
Getting to the Answer: In the sample, 184 out of 200 square feet were free of red tide after applying the spray. This is $\frac{184}{200} = 0.92 = 92\%$ of the area. For the whole beach, $0.92(10{,}000) = 9{,}200$ square feet should be free of the red tide. Be careful—this is *not* the answer. The question asks how much of the beach would still be covered by red tide, so subtract to get $10{,}000 - 9{,}200 = 800$ square feet.

19. A
Difficulty: Medium

Category: Passport to Advanced Math / Quadratics

Strategic Advice: The solution to a system of equations is the point(s) where their graphs intersect. You can solve the system algebraically by setting the equations equal to each other, or you can solve it graphically using your calculator. Use whichever method gets you to the answer more quickly.

Getting to the Answer: Both equations are given in calculator-friendly format ($y = \ldots$), so graphing them is probably the more efficient approach. The graph looks like:



The solution point in the question is given as (a, b), so b represents the y-coordinate of the solution. The y-coordinates of the points of intersection are -3 and -1.25, so choice (A) is correct.

20. A
Difficulty: Medium

Category: Passport to Advanced Math / Functions

Strategic Advice: Don't answer this question too quickly—you may be tempted to substitute 3 for x, but 3 is the output (range), not the input (domain).

Getting to the Answer: The given range value is an output value, so substitute 3 for $g(x)$ and use inverse operations to solve for x, which is the corresponding domain value.

$$g(x) = \frac{2}{3}x + 7$$
$$3 = \frac{2}{3}x + 7$$
$$-4 = \frac{2}{3}x$$
$$-12 = 2x$$
$$-6 = x$$

You could also graph the function and find the value of x (the domain value) for which the value of y (the range value) is 3. The point on the graph is $(-6, 3)$.

21. C
Difficulty: Medium

Category: Heart of Algebra / Linear Equations

Strategic Advice: Don't peek at the answers. Write your own equation using the initial cost and the rate of change in the value of the lawn mower. Remember—when something changes at a constant rate, it can be represented by a linear equation.

Getting to the Answer: When a linear equation in the form $y = mx + b$ is used to model a real-world scenario, m represents the constant rate of change, and b represents the starting amount. Here, the starting amount is easy—it's the purchase price, $2,800. To find the rate of change, think of the initial cost as the value at 0 years, or the point (0, 2,800), and the salvage amount as the value at 8 years, or the point (8, 240). Substitute these points into the slope formula to find that $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{240 - 2{,}800}{8 - 0} = \frac{-2{,}560}{8} = -320$, so the equation is $y = -320x + 2{,}800$.

22. D
Difficulty: Medium

Category: Problem Solving and Data Analysis / Functions

Strategic Advice: Determine whether the change in the number of bacteria is a common difference (linear function) or a common ratio (exponential function) or if the number of bacteria changes direction (quadratic or polynomial function).

Getting to the Answer: The question tells you that the number of bacteria is reduced by half every hour after the antibiotic is applied. The microbiologist started with 20,000, so after one hour, there are 10,000 left, or $20{,}000 \times \frac{1}{2}$. After 2 hours, there are 5,000 left, or $20{,}000 \times \frac{1}{2} \times \frac{1}{2}$, and so on. The change in the number of bacteria is a common ratio $\frac{1}{2}$, so the best model is an exponential function of the form $y = a\left(\frac{1}{2}\right)^x$. In this scenario, a is 20,000.

23. B
Difficulty: Medium

Category: Problem Solving and Data Analysis / Rates, Ratios, Proportions, and Percentages

Strategic Advice: Let the units in this question guide you to the solution. The speeds of the airplanes are given in miles per hour, but the question asks about the number of miles each airplane can travel in 12 seconds, so convert miles per hour to miles per second.

Getting to the Answer:

Slower airplane:

$$\frac{600 \text{ mi}}{\cancel{\text{hr}}} \times \frac{1 \cancel{\text{hr}}}{60 \cancel{\text{min}}} \times \frac{1 \cancel{\text{min}}}{60 \cancel{\text{sec}}} \times 12 \cancel{\text{sec}} = 2 \text{ mi}$$

Faster airplane:

$$\frac{720 \text{ mi}}{\cancel{\text{hr}}} \times \frac{1 \cancel{\text{hr}}}{60 \cancel{\text{min}}} \times \frac{1 \cancel{\text{min}}}{60 \cancel{\text{sec}}} \times 12 \cancel{\text{sec}} = 2.4 \text{ mi}$$

The faster plane can travel 2.4 – 2 = 0.4 miles farther, which is the same as $\frac{2}{5}$ miles.

24. C
Difficulty: Medium

Category: Heart of Algebra / Inequalities

Strategic Advice: The best way to answer this question is to pretend you are the worker. How much more would you earn for one hour in Oregon than in Idaho? If you worked 35 hours per week, how much more would this be? If you worked 40 hours per week, how much more would this be?

Getting to the Answer: Based on the data in the table, a worker would earn $9.10 – $7.25 = $1.85 more for one hour of work in Oregon than in Idaho.

If he worked 35 hours per week, he would earn 35(1.85) = $64.75 more. If he worked 40 hours per week, he would earn 40(1.85) = $74 more. So, the worker would earn somewhere between $64.75 and $74 more per week, which can be expressed as the compound inequality $64.75 \le x \le 74$.

25. D
Difficulty: Medium

Category: Problem Solving and Data Analysis / Rates, Ratios, Proportions, and Percentages

Strategic Advice: This is another question where the units can help you find the answer. Use the number of vehicles owned to find the total number of miles driven to find the total number of gallons of gas used to find the total tax paid. Phew!

Getting to the Answer:

$$1.75 \text{ vehicles} \times \frac{11{,}340 \text{ miles}}{\text{vehicle}} = 19{,}845 \text{ miles}$$

$$19{,}845 \text{ miles} \times \frac{1 \text{ gallon of gas}}{21.4 \text{ miles}} = 927.336 \text{ gallons}$$

$$927.336 \text{ gallons} \times \frac{\$0.184}{\text{gallon}} = \$170.63$$

26. C
Difficulty: Medium

Category: Problem Solving and Data Analysis / Scatterplots

Strategic Advice: The average rate of change of a function over a given interval, from a to b, compares the change in the outputs, $f(b) - f(a)$, to the change in the inputs, $b - a$. In other words, it is the slope of the line that connects the endpoints of the interval, so you can use the slope formula.

Getting to the Answer: Look at the quadratic model, not the data points, to find that the endpoints of the given interval, week 2 to week 8, are (2, 280) and (8, 400). The average rate of change is $\frac{400-280}{8-2} = \frac{120}{6} = 20$. On average, the dolphin's weight increased by 20 pounds per week.

27. A
Difficulty: Hard

Category: Additional Topics in Math / Geometry

Strategic Advice: In this question, information is given in both the diagram and the text. You need to relate the text to the diagram, one piece of information at a time, to calculate how long the lifeguard ran along the beach and how long he swam. Before you find the swim time, you need to know how *far* he swam.

Getting to the Answer: Whenever you see a right triangle symbol in a diagram, you should think Pythagorean theorem or, in this question, special right triangles. All multiples of 3-4-5 triangles are right triangles, so the length of the lifeguard's swim is the hypotenuse of a 30-40-50 triangle, or 50 feet. Add this number to the diagram. Now calculate the times using the distances and the speeds given. Don't forget the 1 second that the lifeguard paused.

$$\text{Run time} = 60 \text{ ft} \times \frac{1 \text{ sec}}{12 \text{ ft}} = \frac{60}{12} = 5 \text{ sec}$$

Pause time = 1 sec

$$\text{Swim time} = 50 \text{ ft} \times \frac{1 \text{ sec}}{5 \text{ ft}} = \frac{50}{5} = 10 \text{ sec}$$

Total time = 5 + 1 + 10 = 16 seconds

28. B
Difficulty: Hard

Category: Heart of Algebra / Linear Equations

Strategic Advice: Write an equation in words first and then translate from English to math. Finally, rearrange your equation to find what you're interested in, which is the initial amount of gasoline.

Getting to the Answer: Call the initial amount A. After you've written your equation, solve for A.

Amount now (x) = Initial amount (A) minus y, plus 50

$$x = A - y + 50$$
$$x + y - 50 = A$$

The initial amount was $x + y - 50$ gallons. Note that you could also use Picking Numbers to answer this question.

29. B
Difficulty: Hard

Category: Problem Solving and Data Analysis / Statistics and Probability

Strategic Advice: When a question involves reading data from a graph, it is sometimes better to skip an answer choice if it involves long calculations. Skim the answer choices for this question—A involves finding two averages, each of which is composed of 7 data values. Skip this choice for now.

Getting to the Answer: Start with (B). Be careful—you are not looking for places where the line segments are increasing. The y-axis already represents the change in prices, so you are simply counting the number of positive values for the imports (5) and for the exports (4). There are more for the imports, so (B) is correct and you don't need to check any of the other statements. Move on to the next question.

30. D
Difficulty: Hard

Category: Passport to Advanced Math / Exponents

Strategic Advice: The key to answering this question is deciding what you're trying to find. The question tells you that x represents the athlete's swim rate and you are looking for the number of kilometers he swam in one hour—these are the same thing. If you find x (in kilometers per hour), you will know how many kilometers he swam in one hour.

Getting to the Answer: Set the equation equal to the total time, 16.2, and solve for x. To do this, write the variable terms over a common denominator, $10x$, and combine them into a single term. Then cross-multiply and go from there.

$$16.2 = \frac{10}{10}\frac{3.86}{x} + \frac{180.2}{10x} + \frac{2}{2}\frac{42.2}{5x}$$
$$16.2 = \frac{38.6}{10x} + \frac{180.2}{10x} + \frac{84.4}{10x}$$
$$16.2 = \frac{303.2}{10x}$$
$$10x(16.2) = 303.2$$
$$162x = 303.2$$
$$x = \frac{303.2}{162} \approx 1.87$$

31. 1
Difficulty: Easy

Category: Heart of Algebra / Linear Equations

Strategic Advice: Choose the best strategy to answer the question. If you distribute the $\frac{2}{3}$, it creates messy calculations. Instead, clear the fraction by multiplying both sides of the equation by 3. Then use the distributive property and inverse operations to solve for x.

Getting to the Answer:

$$\frac{2}{3}(5x+7) = 8x$$
$$\cancel{3} \cdot \frac{2}{\cancel{3}}(5x+7) = 3 \cdot 8x$$
$$2(5x+7) = 24x$$
$$10x + 14 = 24x$$
$$14 = 14x$$
$$1 = x$$

32. 192
Difficulty: Medium

Category: Passport to Advanced Math / Exponents

Strategic Advice: This looks like a word problem, but don't let it intimidate you. Once you read it, you'll see that it boils down to substituting a few given values for the variables and solving the equation.

Getting to the Answer: Before you start substituting values, quickly check that the units given match the units required to use the equation—they

do, so proceed. The patient's weight (w) is 150 and the patient's BSA is $2\sqrt{2}$, so the equation becomes $2\sqrt{2}=\sqrt{\frac{150h}{3,600}}$. The only variable left in the equation is h, and you are trying to find the patient's height, so you're ready to solve the equation. To do this, square both sides of the equation and then continue using inverse operations. Be careful when you square the left side—you must square both the 2 and the root 2.

$$2\sqrt{2}=\sqrt{\frac{150h}{3,600}}$$

$$\left(2\sqrt{2}\right)^2=\sqrt{\frac{150h}{3,600}}^{\,2}$$

$$2^2\left(\sqrt{2}\right)^2=\frac{150h}{3,600}$$

$$4(2)=\frac{150h}{3,600}$$

$$28,800=150h$$

$$192=h$$

33. Any value greater than 7 and less than 7.5
Difficulty: Medium

Category: Heart of Algebra / Inequalities

Strategic Advice: You could solve the compound inequality for m and substitute the result into the expression $10m - 5$, but there is a quicker way to answer this question. Look for a relationship between what you're given, the possible values of $-2m + 1$, and what you're looking for, the possible values of $10m - 5$.

Getting to the Answer: Notice that $10m - 5$ is -5 times the expression $-2m + 1$. This means you can answer the question by multiplying all three pieces of the inequality by -5. (Don't forget to flip the inequality symbols because you are multiplying by a negative number.) Then write the inequality with increasing values from left to right.

$$-5\left(-\frac{3}{2}\right)<-5(-2m+1)<-5\left(-\frac{7}{5}\right)$$

$$\frac{15}{2}>10m-5>7$$

$$7<10m-5<7.5$$

You can enter any value between (but not including) 7 and 7.5, such as 7.1 or 7.2.

34. 40
Difficulty: Hard

Category: Additional Topics in Math / Geometry

Strategic Advice: Since $\overline{AB}$, $\overline{CD}$, and $\overline{EF}$ are diameters, the sum of x, y, and the interior angle of the shaded region is 180 degrees. The question tells you that the shaded region is $\frac{1}{5}$ of the circle, so the interior angle must equal $\frac{1}{5}$ of the degrees in the whole circle, or $\frac{1}{5}$ of 360.

Getting to the Answer: Use what you know about y (that it is equal to $2x - 12$) and what you know about the shaded region (that it is $\frac{1}{5}$ of 360 degrees) to write and solve an equation.

$$x+y+\frac{1}{5}(360)=180$$

$$x+(2x-12)+72=180$$

$$3x+60=180$$

$$3x=120$$

$$x=40$$

35. 14
Difficulty: Hard

Category: Heart of Algebra / Linear Equations

Strategic Advice: When you know the slope and one point on a line, you can use $y = mx + b$ to write the equation. Substitute the slope for m and the coordinates of the point for x and y and then solve for b, the y-intercept of the line.

Getting to the Answer: The slope is given as $-\frac{7}{4}$, so substitute this for m. The point is given as (4, 7), so $x = 4$ and $y = 7$. Now, find b.

$$y=mx+b$$

$$7=-\frac{7}{\cancel{4}}(\cancel{4})+b$$

$$7=-7+b$$

$$14=b$$

The *y*-intercept of the line is 14.

You could also very carefully graph the line using the given point and the slope. Start at (4, 7) and move toward the *y*-axis by rising 7 and running *to the left* 4 (because the slope is negative). You should land at the point (0, 14).

36. 45

Difficulty: Hard

Category: Problem Solving and Data Analysis / Rates, Ratios, Proportions, and Percentages

Strategic Advice: Make a chart that represents rate, time, and distance and fill in what you know. Then use your table to solve for distance. If it took Rory *t* hours to get to the airport, and the total trip took 2 hours and 30 minutes (or 2.5 hours), how long (in terms of *t*) did the return trip take?

Getting to the Answer:

	Rate	Time	Distance
To airport	45 mph	t	d
Back to home	30 mph	$2.5 - t$	d

Now use the formula $d = r \times t$ for both parts of the trip: $d = 45t$ and $d = 30(2.5 - t)$. Because both are equal to *d*, you can set them equal to each other and solve for *t*:

$$\begin{aligned} 45t &= 30(2.5 - t) \\ 45t &= 75 - 30t \\ 75t &= 75 \\ t &= 1 \end{aligned}$$

Now plug back in to solve for *d*:

$$\begin{aligned} d &= 45t \\ d &= 45(1) \\ d &= 45 \end{aligned}$$

37. 10

Difficulty: Medium

Category: Problem Solving and Data Analysis / Rates, Ratios, Proportions, and Percentages

Strategic Advice: You don't need to know chemistry to answer this question. All the information you need is in the table. Use the formula $\text{Percent} = \frac{\text{Part}}{\text{Whole}} \times 100\%$.

Getting to the Answer: To use the formula, find the part of the mass represented by the carbon; there is 1 mole of carbon, and it has a mass of 12.011 grams. Next, find the whole mass of the mole of chloroform; 1 mole carbon (12.011 g) + 1 mole hydrogen (1.008 g) + 3 moles chlorine ($3 \times 35.453 = 106.359$ g) = 12.011 + 1.008 + 106.359 = 119.378. Now use the formula:

$$\begin{aligned} \text{Percent} &= \frac{12.011}{119.378} \times 100\% \\ &= 0.10053 \times 100\% \\ &= 10.053\% \end{aligned}$$

Before you grid in your answer, make sure you follow the directions—round to the nearest whole percent, which is 10.

38. 12

Difficulty: Hard

Category: Problem Solving and Data Analysis / Rates, Ratios, Proportions, and Percentages

Strategic Advice: This part of the question contains several steps. Think about the units given in the question and how you can use what you know to find what you need.

Getting to the Answer: Start with grams of chloroform; the chemist starts with 1,000 and uses 522.5, so there are 1,000 – 522.5 = 477.5 grams left. From the previous question you know that 1 mole of chloroform has a mass of 119.378 grams, so there are $477.5 \div 119.378 = 3.999$, or about 4 moles of chloroform left. Be careful—you're not finished yet. The question asks for the number of moles of *chlorine*, not chloroform. According to the table, each mole of chloroform contains 3 moles of chlorine, so there are $4 \times 3 = 12$ moles of chlorine left.