Section 1 – Reading

1. **A** The question asks for the main purpose of the passage. Since there is no reference window to use for this question, it should be answered last. The passage first introduces Sir Walter Elliot, and then describes his personality traits and his personal history: primarily the death of his wife, which left him alone with three children. Although (C) may seem well supported, this answer is too specific, as it only discusses Sir Walter’s personality traits and not the passage as a whole. Choice (D) is also much too specific, as only the last paragraph of the passage discusses the relationship between Sir Walter and Lady Russell. Choice (B) is too vague; the overview is focused primarily on Sir Walter, not the entire family. Only (A) provides a description of the main purpose of the passage.

2. **D** The question asks for a summary of the first two paragraphs. In general, and in this case, these usually introduce and provide insight into the main topic of the story, which makes (D) the best match, as the story is focused on Sir Walter and his habits. Choices (A) and (B) are not supported by the passage, as there is no true indication that the family is “important” or that the book it appears in is “one of the most popular.” Although (C) may be true based on the passage, it is not the best summary of the two paragraphs, only a minor detail.

3. **A** The question asks why the author included the phrase “with all the Marys and Elizabeths they had married.” The paragraph this phrase appears in summarizes the part of the family history that is not directly quoted from the Baronetage, and this phrase is included as part of that summary. Choice (D) is the opposite of a “summary,” so it is not the best match. Choices (B) and (C) are too far-reaching; there is no information provided about “common British names” nor a “type of woman.” The best match is (A), as it indicates the same information is repeated over and over again.

4. **C** The question asks how Sir Walter can best be described, so the best match will be supported by the passage. In the sixth paragraph Sir Walter is described as caring about his rank and his appearance above all else, which best matches (C). Since it is Sir Walter who is described as vain, not his family, (D) does not work. Since the passage states that Sir Walter “never took up any book but the Baronetage” (B) cannot be correct. Although Sir Walter is described as the head of a family, there is no support for its being one of the “foremost” in England, eliminating (A) as well.

5. **D** This question asks for the evidence used to answer the previous question, so if you can’t find lines to support your answer to Question 4, take a moment to reassess. The correct answer should support the idea that Sir Walter is one who values personal beauty second only to title. In the sixth paragraph Sir Walter is described as caring about his rank and his appearance above all else, which best matches (D). Although the passage states that Sir Walter “never took up any book but the Baronetage,” this evidence does
not connect to any of the descriptions from the previous question, so (A) can be eliminated. Although Sir Walter is described as the head of a family in both (B) and (C), there is no support for his being one of the “foremost” in England.

6. B The question asks what “fine” means in this context. Read the window around line 47 and it should be clear that these sentences are discussing Sir Walter’s vanity and pride in his personal appearance. Since the word “fine” is being used to match “handsome” as used earlier in the sentence, (B) is the best match. The other choices can be used as synonyms of “fine” but do not match the meaning of “handsome” as it is used here.

7. A The question asks what can be inferred about Lady Elliot, so the answer must match the passage as closely as possible. The seventh paragraph shows that Lady Elliot was of “superior character” compared to Sir Walter and did her best to improve him during their marriage. This best matches (A). Although she is referred to as “not the very happiest being in the world” it would be too extreme to say she suffered from unhappiness most of her life, eliminating (C). The passage does reference a single friend who guided her, Lady Russell, but does not refer to many friends she could rely on, eliminating (D). Although it is clear that Lady Elliot died, a long illness such as in (B) is never mentioned.

8. B This question asks for the evidence you used to answer the previous question, so if you can’t find lines to support your answer to Question 7, take a moment to reassess. The seventh paragraph shows that Lady Elliot was of “superior character” compared to Sir Walter and did her best to improve him during their marriage. This best matches (B).

9. A The question asks what can be inferred from the last paragraph, so the answer must match the information provided in that paragraph as closely as possible. Reading the window reveals that Sir Walter and Lady Russell continue to live in same neighborhood, remaining both friends and single. There is no mention of beauty in the last paragraph, so (D) is not supported. There is also no indication that Sir Walter made an offer to be accepted by Lady Russell, nor is there anything about Lady Russell’s friendship with Lady Elliot in this paragraph, so (C) is also not supported. There is no mention of what Sir Walter and Lady Russell are or are not likely to do in the future, so (B) can be eliminated. Be careful about answer choices that include predictions. No matter how logical they may seem, you can’t prove the future, and you can always prove a correct SAT answer. The paragraph does state that the two did not marry despite “whatever might have been anticipated on that head by their acquaintance,” indicating that some may have anticipated that they would marry. This best matches (A).

10. C Remember to use the context of the passage when considering the definition of a word, and not your own definition of “head.” Read the window around line 80 to determine a synonym that works within the context of the passage. Something like “idea” would work, as the sentence is referring to the idea that Sir Walter and Lady Russell may have married one another. This is most synonymous with “possibility,” (C). “Inevitability” could have worked if the couple did marry, but since such an event never actually happened “possibility” is the best choice. “Face” and “countenance” in (A) and (B) are synonyms for “head” but do not work in this specific context.
11. **A** The question asks about the position of the author. This passage is an informative review of how adolescents divide their time over various activities, and it references “studies” on that topic multiple times. This best supports (A), a social scientist presenting findings. There is no indication in the passage that the author is a parent or an educator, eliminating (B) and (D). Since the author is not focused on his time as an adolescent, but on current adolescents, (C) should be eliminated as well.

12. **D** The question asks for how a very common word, “commit,” is being used in a specific context. Remember to use the context of the passage when considering the definition of a word, and not your own prior usage of “commit.” In this context “commit” is being used synonymously with “dedicate” or “al-lot.” The best match for this meaning of “commit” and those synonyms is “give,” (D). “Entrust,” “require,” and “pledge” do not match that meaning in this context.

13. **A** The question asks what the references to various factors serve to do. Within this window the passage discusses the different focuses of studies on adolescent time use and the factors that influence that time use. This reference serves as an example of those influences on adolescent time use, indicated by the phrase’s location between a pair of dashes, clearly serving as examples of the “circumstances which serve as a backdrop”. This best matches (A). It does not necessarily include all of the differences that determine time use, eliminating (B). It is not a list of activities, eliminating (C). And that reference applies only to studies on adolescent time use, not adult time use, eliminating (D).

14. **B** The question asks what purpose the discussion of how boys and girls spend their time serves. This part of the passage discusses the “increasing divergence in the activity sets of boys and girls,” which makes (B) the best match. There is no discussion of societal roles, only a social use of time, eliminating (A). There is also no discussion of biological differences between boys and girls, only social ones, eliminating (D). The author does not indicate that there is anything “disturbing” about this trend, so (C) is also incorrect. Be careful about trying to apply outside information or prior knowledge. Stick with what’s in the text.

15. **C** Remember to use the context of the passage when considering the definition of a word, and not your own prior usage of “reflect.” In this context “reflect” is being used synonymously with “show” or “demonstrate.” “Reveal,” (C), best matches this meaning. “Return,” “redirect,” and “imitate” do not match that meaning in context.

16. **C** The question asks what is indicated about chores and jobs, which is a very open-ended question. By reading the paragraph under that section heading, it is clear that the focus of this paragraph is on the differences that exist between boys and girls when it comes to chores and jobs. Neither (A) nor (D) focuses on this difference, and (D) is a direct contradiction of what’s stated in the text. Eliminate them both. Choice (B) references the different social stereotypes related to chores and jobs, which may seem like a well-supported answer choice. But (B) also says that chores and jobs create those stereotypes, which is not supported by the passage (in which it says they reinforce those stereotypes). This leaves (C), which matches the discussion of different activities boys and girls engage in.
17. **B** The previous question asked what is indicated about chores and jobs. Using line references to support answer choices to the previous question, answer choices to this question can be quickly eliminated. Choice (A) refers to a different paragraph of the passage that is not concerned with chores or jobs, so eliminate it. The passage mentions that money is a greater motivating factor than experience, which eliminates both (C) and (D) as support for (C) in the previous question. The only line that supports an answer from the previous question is found in (B): chores and jobs tend to be divided along gender lines as boys and girls engage in different types of those activities.

18. **C** This question asks about which of the answers would NOT affect student participation. Lines 80-85 mention factors that do affect participation. Gender is mentioned in line 81, so eliminate (A). Autonomy, mentioned in line 85, means doing things for themselves, so eliminate (B). Involvement of friends is mentioned in lines 83-84, so eliminate (D). Parental support is not mentioned, so (C) is the best answer.

19. **C** This question requires using the text and the table. Listening to Music is not an activity listed on the table, but it is mentioned in lines 66-70. The text says that “adolescents spend as much as four to six hours a day listening to music... and it begins to emerge as a significant backdrop to other activities.” Because they are listening to music 4-6 hours a day, (A) and (B) can be eliminated. We know the researchers asked about the activity because there are specifics in the text. Eliminate (D). Choice (C) is supported by the text and is the best answer.

20. **B** The question asks for a summary of the information presented on the graphic, so the best approach is likely POE. The graphic provides information on only one set of adolescents; it does not compare one set of adolescents to another set a decade earlier. Eliminate (C). Since more than a dozen activities are listed in the graphic, (A) can be eliminated, since that indicates adolescents divide their time over only a dozen. The graphic does not account for why there is a difference between the time boys and girls spend sleeping, so (D) can be eliminated. The graphic does indicate that the majority of time spent by both boys and girls is on school and sleeping, which best supports (B).

21. **D** Just like the previous question, this question asks for information presented on the graphic. Checking each answer choice against the graphic demonstrates that (A) is incorrect, as a number of hobbies are not indicated, only the amount of time spent on them. Although boys do spend less time on household work than girls, this does not account for the stereotypical gender roles that exist, eliminating (B). Choice (C) is incorrect, as girls spend one hour and eleven minutes on personal care while boys spend a total of two hours and twenty-five minutes on sports and TV combined. There is only one activity on which boys and girls spend the exact same amount of time (0:10 Outdoors), which supports (D).

22. **A** The first paragraph describes a rule—aggravated murder is the only crime punished by death—and then states that “we are even now deliberating whether the extreme penalty should be retained in that solitary case.” The second paragraph gives the parameters for the application of the rule: “by conclusive evidence, the greatest crime known to the law; and when the attendant circumstances suggest no palliation of the guilt.” Choice (A) best describes this structure. Neither history nor counterarguments are offered
in relation to the rule, so (B) and (C) are incorrect. Additionally, the paragraphs never reject the rule, so (D) is incorrect.

23. **C** In these lines, the author states that to “deprive the criminal of the life of which he has proved himself to be unworthy...is the most appropriate punishment” for his crimes. The author does not advocate for the value of his life; in fact, he does the opposite. Choice (A) is incorrect. The author does not discuss exonerating evidence or criminal remorse, so (B) and (D) are incorrect. Choice (C) best matches the information provided in the text.

24. **D** The question asks for the purpose of the third paragraph. The author does not include an anecdote or offer a concession to the opposition, eliminating (A) and (C). While the author does present an argument in opposition to those who attack the penalty, he does not attack a specific rival, eliminating (B). The author starts the paragraph by stating “I defend this penalty, when confined to atrocious cases, on the very ground on which it is commonly attacked.” Choice (D) summarizes this purpose.

25. **B** The author states that imprisonment with hard labor for life is “less severe indeed in appearance” than capital punishment but “far more cruel in reality.” Choice (A) states the opposite, so it is incorrect. The author does not state if imprisonment with hard labor for life is the best deterrent, just that capital punishment is the least cruel deterrent, so (C) is incorrect. The author states that life imprisonment with hard labor “is the fate to which a murderer would be consigned by the mercy which shrinks from putting him to death.” This text matches (B) in that life imprisonment is a likely alternative, but not necessarily the next best alternative as in (D). Choice (B) is correct.

26. **C** This question asks for the evidence you used to answer the previous question, so if you can’t find lines to support your answer to Question 25, take a moment to reassess. In this case, only (C) supports the idea that life imprisonment with hard labor is the likely alternative to capital punishment.

27. **C** This question asks why the author poses a question at the beginning of the fourth paragraph. The first line asks: “But has it been sufficiently considered what sort of a mercy” life imprisonment with hard labor is “and what kind of life it leaves to” criminals? The author goes on to answer his question by pointing out possible lives a criminal of this sort might lead. Therefore, he is not actually petitioning his audience for help, eliminating (D). While the author states that one possible outcome of life imprisonment—immuring him in a living tomb—is far more severe than capital punishment, he does not accuse his opponents of being innately cruel. Choice (A) is incorrect. Choice (B) contradicts the passage, so it can be eliminated. The question does point out that there are additional questions that need to be answered, indicating life imprisonment could be more cruel than its advocates assume. Choice (C) is the correct answer.

28. **A** This question asks for what point the author makes in his comparison of life imprisonment and capital punishment. The author does not discuss the relative economic benefits of either punishment, so (B) is incorrect. The author favors capital punishment and does not believe that life imprisonment in its current form lends any redemptive benefit to criminals. Therefore, (C) is incorrect. The author describes
both modes of punishment as adequate deterrents, so (D) is incorrect. The author asks “what comparison can there really be, in point of severity, between consigning a man to the short pang of a rapid death, and immuring him in a living tomb,” suggesting that capital punishment is both briefer and more merciful than the alternative. Choice (A) is correct.

29. C This question asks for the evidence you used to answer the previous question, so if you can’t find lines to support your answer to Question 28, take a moment to reassess. In this case, only (C) supports the idea that capital punishment is more merciful than life imprisonment.

30. C The author compares life in prison to a “living tomb” because the criminals are “debarred from all pleasant sights and sounds, and cut off from all earthly hope.” The phrase “earthly hope” means that there is room for other kinds of hope, so (A) is incorrect. The author makes no reference to a fear of the unknown, so (B) is incorrect. Life imprisonment is defined against capital punishment, so (D) can be eliminated. Choice (C) best matches the language used in the text.

31. B Remember to read for the phrase in context and not just to leap to a conclusion based on your prior knowledge. The passage says “Yet even such a lot as this, because there is no one moment at which the suffering is of terrifying intensity.” From the context, this phrase refers to life imprisonment with hard labor, which can best be described as “a condition.” Choice (B) is correct.

32. B This question asks from whose perspective the article is written. The author references the research of Sean O’Donnell, a biology professor at Drexel, throughout the piece, and discusses O’Donnell’s findings at length. This perspective is best summarized by (B). The author himself is not conducting this research, so (A) is incorrect. The author neither advocates for public understanding for wasps nor ascribes deep personal meaning to the passage’s subject. Choices (C) and (D) are incorrect.

33. A The passage discusses the relative brain size of wasps and compares the brains of social and solitary wasps. The goal in (A) best matches the research discussed in the passage. While the passage does mention a relationship between brain size and complexity of society, the example of the wasps goes against a direct relationship: “the brains of wasps in simple societies showed no significant size differences between those in complex societies.” Choice (B) can be eliminated. While the passage does discuss some benefits of smaller brains, it does not say that these benefits outweigh those of a larger brain. Choice (C) can be eliminated. There is no discussion of wasp eradication, so (D) can be eliminated.

34. D This question asks for the evidence you used to answer the previous question, so if you can’t find lines to support your answer to Question 33, take a moment to reassess. In this case, (D) best supports the idea that O’Donnell’s goal is to establish a general pattern between invertebrate insect socialization and brain size.

35. C Remember to read for the phrase in context and not just to leap to a conclusion based on your prior knowledge. The passage states that scientists have come up with an idea called the “social brain
hypothesis.” The passage then says “Generally, it goes something like this: Social interaction presents challenges that require a lot of brain power, as that interaction requires organisms to navigate complicated territory, including avoiding conflict and building alliances.” These lines do not provide a mocking or jovial tone, so choices (B) and (D) can be eliminated. The idea had not been previously explained, so (A) can be eliminated. The lines do explain a scientific concept with straightforward language, so (C) is correct.

36. **C**  
Remember to read for the word in context and not just to leap to a conclusion based on your prior knowledge. The passage states that “scientists believe the complexity of human societies may be one of the reasons we have such large, developed brains.” In context, the word “complexity” refers to the nuanced sophistication of modern society, which best matches (C). Choice (B) offers the opposite meaning, and there is no evidence for (A) or (D) in context.

37. **A**  
This paragraph expands the discussion of the social brain hypothesis: “vertebrates that live in societies have bigger brains.” This best supports (A). The distinction between vertebrates and invertebrates appears to be clearly established outside of this specific research and no invertebrate species are mentioned in this paragraph, eliminating (B). This paragraph is focused on brain size rather than how vertebrates interact so (C) can be eliminated. There is no indication of differences in individual brain sizes based on intelligence, eliminating (D).

38. **B**  
The question asks what the author indicates about the wasp. The author never mentions a central queen, so (A) can be eliminated. The passage states that “Insect societies…are made up of groups of cooperating close relatives with shared objectives.” This means insects do not need “the type of negotiation” required in vertebrate societies. Choice (B) best matches this text. The author does not indicate that it is the simplicity of the wasps’ society that lead to smaller brains, but rather the wasps’ relation to each other. Choice (C) is incorrect. Lines 42–45 state that the complexity of the wasp society does not impact the size of the brain. Choice (D) is incorrect because the passage clearly indicates that the wasp society does require cooperation.

39. **C**  
This question asks for the evidence you used to answer the previous question, so if you can’t find lines to support your answer to Question 38, take a moment to reassess. In this case, only (C) supports the idea that wasps are related and so do not have to address varying goals.

40. **B**  
The graph shows the correlation between residual brain size in primates and the level of societal complexity. This relates most directly to the lines “The more complex the organism’s society, the bigger its brain regions for processing complex information will be,” which is (B). The graph does not compare insect societies and vertebrate societies, so the lines in (A) are not relevant. The graph does not address wasp colonies, so (C) and (D) are also incorrect.

41. **D**  
This question asks which statement is supported by the graph. The graph shows a direct correlation between brain size and societal complexity, so (A) is incorrect. A harem is listed as the type of society linked to the second largest residual brain, so it can be assumed that it is a complex type of society. Choice
(B) is incorrect. The bars show a clear difference between the brain size of a solitary versus pair-bonded organism, so (C) is incorrect. The question tells you that lemurs have “relatively large residual brain size as compared to those of other animals.” When you look at the graph, the largest relative brain size occurs in multi-male groups, making (D) the correct answer.

42. D After suggesting the possible unsuccessfulness of wetland mitigation, the passage states that “placing mitigation projects in areas distant from the destroyed wetland will result in the wetland functions being replaced in areas away from where they are needed and/or in areas that are not wetland deficient.” This text is best summarized in (D). While increasing population growth is partially responsible for the loss of natural wetlands, it is not responsible for the failure of wetland mitigation. Choice (A) is incorrect. While the passage does address the percentage of natural wetland out of total land, this fact is not why wetland mitigation is unsuccessful. Choice (B) is incorrect. The passage does not address the wastefulness of mitigation banks, so (C) is incorrect.

43. C This question asks for the evidence you used to answer the previous question, so if you can’t find lines to support your answer to Question 42, take a moment to reassess. In this case, only (C) supports the idea that wetland mitigation may be unsuccessful because the distance that may exist between created wetlands and destroyed natural wetlands.

44. B Remember to read for the phrase in context and not just to leap to a conclusion based on your prior knowledge. The passage states “Increasing population, development, farming, and landowners’ rights have resulted in increasing amounts of our wetland resource being destroyed and have increased the pressure on the wetlands that remain.” Since many wetlands have been destroyed, “pressure” refers to the strain put on the remaining wetlands to fulfill their ecological function. Choice (B), “demands,” best matches this meaning.

45. D This question asks for the primary purpose of the second paragraph. The paragraph does not argue against the efficacy of wetland mitigation projects or detail the mechanics by which specific projects are accomplished, so (A) and (B) are incorrect. The paragraph lists the three things on which wetland mitigation focuses, not on the three reasons it is necessary. Choice (C) is incorrect. The second paragraph describes the focus and function of wetland mitigation, as best matched by (D).

46. D The passage states that the historical “flooding pattern of W29 Impaired Marsh illustrated the most optimistic flooding regime that could have been expected in the absence of augmentation.” These lines suggest that flooding is usually more effective in the presence of augmentation, so (A) is incorrect. The passage presents W29 Impaired Marsh as an example of non-augmented flooding, not as the establishing event for a historical flood pattern, so (B) is incorrect. Although W29 Impaired Marsh suffered negative effects, it was not destroyed. Choice (C) is incorrect. Choice (D) best matches the evidence provided in the text.
47. C Remember to read for the phrase in context and not just to leap to a conclusion based on your prior knowledge. The passages states that “the historical flooding pattern of W29 Impaired Marsh illustrated the most optimistic flooding regime that could have been expected in the absence of augmentation.” In this context, regime refers to the status of the wetlands during the non-augmented flooding. It does not refer to any manufactured hierarchy or scenario, so (A), (B), and (D) can be eliminated. Choice (C) best matches the meaning in context.

48. A The paragraph states that without augmentation the wetlands would have lacked “the soil moisture conditions necessary for aquatic algae, wetland plants, and freshwater macroinvertebrates to survive.” These lines support (A) as the correct answer. Additionally, cypress tree mortality “would have been widespread” in the absence of augmentation. Choice (B) states the opposite and can be eliminated. The paragraph indicates that without augmentation the water table would have been too deep for certain plants to survive. This suggests that (C) is incorrect. The paragraph states that all wetlands experienced withdrawals, indicating that augmentation does not force withdrawals. Choice (D) is incorrect.

49. B This question asks for the evidence you used to answer the previous question, so if you can’t find lines to support your answer to Question 45, take a moment to reassess. Only (B) supports the idea that wetland augmentation helped prevent plants associated with dry land from developing within the wetland area.

50. A Passage 1 describes wetland mitigation and then lists several reasons as to why wetland mitigation might not be successful. Passage 2 uses the example of the non-augmented flood of the W29 Impaired Marsh to indicate the benefits of augmentation, a type of wetland mitigation. This relationship is best summarized by (A). Passage 1 does not describe wetland mitigation in favorable terms, so (B) is incorrect. Passage 1 and 2 do not discuss the same research study, so (C) can be eliminated. Passage 2 offers a practical, rather than a theoretical, approach to a problem, and Passage 1 discusses the potential failure of that practical approach. Choice (D) is incorrect.

51. B Passage 2 discusses a study in which augmented wetlands were shown to have particular benefits. Choice (A) is therefore incorrect. However, while Passage 2 does see augmentation as beneficial, it does not propose that it solves the problem of wetland deterioration. Choice (C) is incorrect. Passage 1 is not discouraging people from saving the wetlands; it is merely questioning the efficacy of a particular restorative strategy. Choice (D) is incorrect. Choice (B) is the best answer.

52. A The correct lines need to refer to the importance of retaining certain wetland species. Choices (B), (C), and (D) refer to the definition of wetland mitigation, different wetland types, and the meaningfulness of wetland mitigation, respectively. Only (A) tells us that “more than one-third of our endangered species are associated with wetlands even though wetlands comprise less than five percent of the landscape.” It is the correct answer.
Section 2 – Writing & Language

1. C  When STOP or HALF-STOP punctuation is used in the answer choices, use the vertical line test. The first idea (A new type...arenas) is complete, and the second part (they are...organism) is also complete. Eliminate (A) and (B) since neither a comma by itself nor a FANBOYS by itself can separate two complete ideas. Since they are is part of the underlined portion, (D) is incorrect because a semicolon cannot be followed by an incomplete idea. HALF-STOP punctuation can be followed by a complete or incomplete idea; therefore, (C) is the correct answer.

2. D  This question tests concision. The non-underlined part of the sentence includes the word “altered,” which is redundant with the word “changed” in (A), “different” in (B), and “has been altered” in (C). The best and most concise answer is (D).

3. A  The proposed addition is consistent with the information in the passage and should be added for the reason stated in (A). The idea is further explaining ideas already presented in the passage, eliminate (B). The addition does not fit the structure of the paragraph, so eliminate (C). The proposed addition is not redundant, so eliminate (D).

4. C  Since the verbs are changing in the answer choices, check the subject to be sure the subject and verb are consistent in number. Products is the subject, so the verb should be plural. Eliminate (A) and (B), which both contain singular verbs. Using the verb phrase in (D) would make the sentence incomplete. Only (C) has a subject and verb that are consistent in number and make the sentence complete, so it is the correct answer.

5. D  When the answers all say essentially the same thing, look for the shortest. In this case that is the single word harm that appears in (D). Choice (B) may say a similar thing, but it does so in a less efficient way. Choices (A) and (C) cannot work because they are not consistent with written or spoken English expressions.

6. C  The correct idiom when using the phrase not only is but also, making (C) the correct answer.

7. B  The underlined portion is part of a list, so it should be consistent in structure with the other items in the list: animal treatment and environmental stewardship. Because the items in the list contain an adjective followed by a noun, eliminate (A) and (C) which do not match this pattern. None of the other items in the list is preceded by a possessive pronoun, so eliminate (D). The correct answer is (B).

8. D  Use POE. Sentence 3 should not be placed between sentences 2 and 4 because the general confusion mentioned in sentence 4 should follow sentence 2 (labels are...misleading and uninformative). Eliminate (A). Sentence 3 should not be placed in between sentences 1 and 2 since those ideas are connected. Eliminate (B). Sentence 5 refers to these issues, issues that are mentioned in sentence 4 (limited space and limited knowledge), so (C) is incorrect. Placing sentence 3 after sentence 5 would conclude the ideas discussed in this paragraph and provide the most clarity. Therefore, (D) is the correct answer.
9. **A** Notice the question and be sure to choose the answer that *provides a specific detail that reinforces the main point of the previous sentence*. The previous sentence states that most foods *have contained GMOs since the early 1990s*. The only answer choice that specifically reinforces this idea is (A).

10. **B** *Whether* is used to express a choice between alternatives. In this case, whether the bill is passed or not. *If* is used to show that one thing depends on another. *When* is used to refer to a time. Thus, the correct answer is (B).

11. **B** Use POE. In order to fulfill the writer’s the goal, the concluding sentence should restate the main argument of the paragraph. The writer never discusses cheapness of food or argues that people should look up how food is grown. Eliminate (A) and (D). The writer briefly mentions in the third paragraph that labels, according to proponents of the bill, would provide important information and allow people to choose products that align with their beliefs; however, this idea is not the main argument of the last paragraph. Eliminate (C). Choice (B) restates the author’s point that so many products already contain GMOs that people are not buying products based on the information available (or lack thereof), but rather they’re buying what is available to them. The correct answer is (B).

12. **A** Since all the phrases essentially mean the same thing, choose the one that is most concise and is in keeping with the style and tone of the passage. Eliminate (C) and (D) because they are informal in tone and are inconsistent with the style of the passage. Choice (B) is awkward when inserted into the sentence and is not as concise as (A). The best answer is therefore (A).

13. **B** Notice that the pronouns are changing in the answer choices. Since a possessive pronoun is needed, (A) and (C) are incorrect. *There* refers to a location, and *they’re* is the contraction form for *they are.* To see if the pronoun should be singular or plural, look at the non-underlined portion. The sentence begins with *Many businesses have been*…. Therefore, a plural pronoun is needed. Eliminate (D), and the correct answer is (B).

14. **D** Notice that the use of *more* versus *most* is changing in the answers choices. *More* is used when comparing two things while *most* is used when comparing more than two things. In the context of the passage, there are many employee concerns, one of which the writer is about to discuss, so eliminate (A) and (B). Since the underlined phrase needs to be incomplete, (C) is incorrect because it is a complete idea. Choice (D) is consistent with the non-underlined portion (*one of the most regularly dismissed*) and makes the phrase incomplete by dropping the subject, so it is the correct answer.

15. **B** The sentence in the question refers to a diversified workforce and why this has made the metabolic equivalent measurement inaccurate. It also includes the transitional word *however* at the beginning of the sentence, indicating a shift from the previous sentence. Since this information provides an explanation as to why a measurement based on a 155-pound man is a flawed approach to workplace temperature determinations, (B) is the best answer. Choice (A) is wrong because the new sentence doesn’t support the previous sentence, which has as much to do with the average man becoming larger and heavier than in the 1930s as it has to do with women in the workplace. Since this sentence directly connects to the last sentence
of the paragraph, (C) is not correct; this sentence would not be better placed elsewhere. And since this sentence is aligned with the overall topic of temperature in the workplace, (D) is also incorrect.

16. C When STOP punctuation is used in the answer choices, use the vertical line test. The first idea (While the human…sitting) is incomplete, so eliminate (A), (B), and (D). In (C), the idea after the comma is complete. Since a comma can separate an incomplete and a complete idea, (C) is the correct answer.

17. A Notice the question and be sure to choose the answer that will effectively introduce the writer’s discussion of temperature and worker productivity. An introductory sentence is necessary to maintain the flow between the previous paragraph and this paragraph, so eliminate (D). Choice (B) doesn’t offer a smooth or effective transition since the writer never previously or later refers to the “many people” who have asked this question. Choice (A) is more precise than (C). Choice (A) clearly states the connection between temperature, the body, and worker productivity that seamlessly connects the discussion of temperature and the body in the previous paragraph with the discussion of its effect on workplace productivity in this paragraph.

18. B When STOP or HALF-STOP punctuation is used in the answer choices, use the vertical line test. The first idea (The longer…temperatures) is incomplete, so eliminate (C) and (D), which both include STOP punctuation. Because a colon is a HALF-STOP, it must be preceded by a complete idea, so eliminate (A). In (B), the idea after the comma is complete. Since a comma can separate an incomplete and a complete idea, (B) is the correct answer.

19. B When the verbs are changing in the answer choices, check the subject to be sure the verb and subject are consistent. The subject in this sentence is influences, so the verb should be plural. Eliminate (C) and (D). The original sentence contains a diction error. Affect used as a noun means an emotion or desire. Effect used as a noun means a result of something. In this context, the result of the influences on the room temperature is a large amount of cost savings for the company. Therefore, (B) is correct.

20. A Use POE and be sure the choice is consistent with the graph provided. Choice (A) is supported by the data. Space heating, ventilation, and cooling account for 28% of electricity consumed by office buildings while space heating accounts for 86% of the natural gas consumed by office buildings. Eliminate (B) since it states the opposite of (A). The percentages used for HVAC in (C) are not supported by either pie graph. Finally, (D) is incorrect since HVAC does not account for the majority of the electricity consumed by office buildings. Choice (A) is the correct answer.

21. D Read the chart as literally as possible. The questions that deal with visual representations of data are typically fairly straightforward. Choice (A) can be eliminated because lighting makes up 39% of electrical usage to cooling’s 14%. Choice (B) can be eliminated because office equipment uses very little electricity and an unidentified or very small amount of natural gas. Choice (C) can be eliminated because cooling is only specifically identified in terms of its electricity use—its natural-gas use is not specified, so we can’t make any assumptions about it. Only (D) remains, as it correctly states that cooling (14%) uses a larger share of electricity than computers (10%).
22. D Notice the question and be sure to choose the answer that addresses the future of efforts to decrease workplace expenditures and agrees with the main idea of the passage. Choices (B) and (C) do not offer conclusions that agree with the main idea of the passage. Choice (A) does not address efforts that would lead to a decrease in workplace expenditures since lowering temperatures is more costly. Therefore, (D) is the best answer choice since it fulfills both of the writer’s objectives.

23. D Notice that the pronouns are changing in the answer choices. Since a possessive pronoun is not needed, (B) and (C) are incorrect. To see if the pronoun and verb should be singular or plural, look at the non-underlined portion. The sentence begins with Google is taking… In order for the second part of the sentence to be consistent with the first, the correct answer is (D).

24. B Since all the answer choices mean essentially the same thing, choose the most concise option that makes sense in context. The date 1900 has the same meaning as at the beginning (or turn) of the century, so the additional phrases in (A), (C), and (D) are redundant. The correct and most concise answer is (B).

25. C Notice the question: it asks for the most specific information on the safety of elevators. Only (C) makes reference to what made the first safety-elevator safe—it wouldn’t fall in the event of a broken cable. While the other choices could be true, they are not consistent with the question being asked. The correct answer is (C).

26. A Since there is a colon in the underlined portion, check to see if the first part of the sentence is a complete idea. In this case, the first part (These were…functions) is complete, so a colon can be used. The second part of the sentence (these operators…hand) is also complete. Therefore, eliminate (B) and (D) because neither a comma by itself nor a FANBOYS by itself can separate two complete ideas. Choice (C) is incorrect because it contains no punctuation, leaving (A) as the correct answer.

27. A Notice that one of the answer choices is to DELETE the underlined portion. Check to see if a transition word is needed at the beginning of the sentence. If the sentence begins without a transition word, then there would be two complete ideas separated by a comma. Eliminate (D). Next pay attention to the type of transition words used. Choices (B) and (C) are same direction transition words while (A) indicates a contrast. A contrast is needed to show that even though success was expected, the public did not embrace the idea of the new technology. Therefore, (A) is the correct answer.

28. B The question specifically asks for the most effective way to set up the paragraph. The next sentence begins with That year…, so the paragraph should begin with a reference to the year that is discussed. Only (B) directly states in what year the strike occurred and is the correct answer.

29. C As written, the sentence is awkward. The phrase upwards to is not idiomatically correct. Choice (B) is also awkward when inserted into the sentence, so (A) and (B) should be eliminated. The remaining two choices are synonymous, so choose the most concise option, which is (C).
30. **B** Notice the question: it asks for an additional example to emphasize the importance of lessening public fear towards automated elevators. Choice (B) provides a supporting example of how people were able to test automated elevators in a safe environment (at state fairs, away from tall buildings) in order to become more comfortable using them. The other answer choices do not provide examples or introduce information that is off topic. Therefore, (B) the correct answer.

31. **C** Since apostrophes appear in the answer choices, check to see if the word *industry* should be possessive. The *experience* belongs to the *elevator industry*, so an apostrophe is needed. Eliminate (A) and (D). The industry is singular, so (B) is incorrect. Thus, (C) is the correct answer.

32. **A** The previous sentence states that Google is applying the lessons of history in a few *creative ways*. This sentence then goes on to give some examples of those creative ways. As such, *For example*, choice (A), provides the most suitable transition between the sentences. Choice (B) suggests a contrast where one does not belong. Choice (C) inserts the ambiguous pronoun *that*, which does not have a clear role within the sentence. Choice (D) uses the word *surprisingly*, but nothing in what follows is presented as particularly *surprising*.

33. **A** Read the question carefully. The writer wants something that will conclude the paragraph while emphasizing the fact that skepticism continues to exist. Choice (A) is the only one of the choices that addresses this skepticism among users. Choices (B), (C), and (D), while all potentially true, address the functionality of the cars, not the attitudes people have about those cars. Therefore, (A) is the best of the answers in that it fulfills the goal stated in the question.

34. **B** Notice that the pronouns are changing in the answer choices. Since a possessive pronoun is needed, (C) is incorrect. The pronoun should be consistent in number with the noun it refers to, so (A) is incorrect because *Congus magus* is a singular noun. The use of *his* would not be inappropriate here, since the writer is discussing snails as a species or group. The correct answer is (B).

35. **A** The underlined portion should be consistent with the non-underlined portion. Check to see which transition would be appropriate in context. Choices (B), (C), and (D) all contain same direction transition words. However, the sentence is setting up a contrast—this species of snail is very interesting, but there’s one particular aspect of it that is very interesting to humans. Therefore, (A) is the correct answer because a transition word that sets up a contrast (*while*) is needed.

36. **B** Since the transition word is changing, check to see which one is consistent with the sentence as a whole. A contrast is needed to show the opposition between lethal and beneficial peptides. The only answer choice that contains a word that would set up a contrast is (B).

37. **C** When a pronoun is underlined, remember to check for precision. The use pronouns in (A) and (D) would not be as precise as the nouns used in (B) or (C), so eliminate (A) and (D). Between (B) and (C), choose the more concise option since the previous sentence already stated that ziconotide is a synthetic chemical. The best answer is (C).
38. D  The underlined portion is part of a list, so it should be consistent in structure with the other items in the list: brain, heart, nervous system, and bone. Eliminate (A) because of the article the in front of nervous system. The remaining answer choices alter the comma placement. Nervous system is one item of the list and should not be separated by a comma, so (B) and (C) are incorrect. Therefore, (D) is the correct answer.

39. A  Since all the answer choices mean essentially the same thing, choose the most concise one that makes sense in context. Choice (D) is not consistent in tone with the rest of the passage, and (B) and (C) are wordier than (A). The correct and most concise answer is therefore (A).

40. C  Since the transition word is changing, check to see which transition would be appropriate in context. Choices (A), (B), and (D) all contain same direction transition words. In context, the writer has indicated that though the painkiller is very effective, it has not gained the same widespread use as other (and less potent) painkillers. Therefore, a contrast word is needed, making (C) the correct answer.

41. B  Since the verbs are changing in the answer choices, check for consistency with the other verbs in the sentence. The main verb of the sentence is in present tense (is); therefore, eliminate (C) which is in the past tense. Also, since the word to is preceding the verb, the infinitive form is needed (inject). The best answer is therefore (B).

42. C  The sentence should not be deleted, so eliminate (A) and (B)—the information is relevant and is not previously stated. The sentence does not give an example of a blood-brain barrier but rather defines what a blood-brain barrier is. Thus, the correct answer is (C).

43. D  In order to find the most logical placement for the added sentence, check to see what this carrier refers back to. The carrier is referring to what the “Trojan Horse strategy” is attempting to accomplish—creating a container constructed from viral proteins that can transport the Prialt across the blood-brain barrier. Logically, the added sentence should follow sentence 4, so this carrier can refer back to the container constructed from viral proteins. The correct answer is (D).

44. A  The question is testing the difference between which word is appropriate (resolution versus solution) and which verb is appropriate (could versus would). In this context, the researchers are trying to develop a solution in order to administer Prialt in a less painful way, so eliminate (B) and (D). In order to choose the appropriate verb, the correct choice will be consistent with the other verbs. In the following sentence, could is used, so the correct answer is (A).
Section 3 – Math (No Calculator)

1. **C** Start by isolating the $x$ term in the equation. Subtract 3 from both sides to get $14 = 8x$. Now, you want to find $4x + 9$, so instead of solving for $x$, divide by 2 to solve for $4x$: $7 = 4x$. Add 9 to both sides to get $16 = 4x + 9$, which is (C).

2. **B** Plug In! Start with $h = 2$. One hour after sunrise, the temperature will equal $5(2) + 61.4 = 10 + 61.4 = 71.4$. One hour later, $h = 3$, so the temperature will be $5(3) + 61.4 = 15 + 61.4 = 76.4$. The temperature increased $76.4 - 71.4 = 5$ degrees in one hour, which matches (B).

3. **D** Start by RTFQ: you want to know what “4” represents in the model. Next, label what you know: $H$ is the number of houses left, and $t$ is the number of hours worked. Next, try POE. “4” is associated with time; (C) doesn’t have anything to do with time, so eliminate it. Try Plug-and-Play. Make $t = 2$, so $H = 35 - 4(2) = 35 - 8 = 27$, so after 2 hours, Lee has 27 houses left to inspect. Choice (A) isn’t fitting in; it’s going to take longer than 4 hours to finish all the houses if he still has 27 left after 2 hours, so eliminate (A). Choice (B) doesn’t make sense, as Lee has already inspected 8 houses, not 4, so eliminate (B) and choose (D).

4. **C** There are a couple of approaches that work here. One is to Plug In. Make $x = 2$. The problem becomes $y = 4(3(2) - 1)(5(2) - 1) = 4(5) = 180$. This is your target; circle it. Make $x = 2$ in each answer choice and eliminate any choice which doesn’t equal 180. The only choice that works is (C).

Alternatively, you can FOIL the right side of the equation: $y = 4(15x^2 - 3x - 5x + 1) = 4(15x^2 - 8x + 1) = 60x^2 - 32x + 4$, which is (C).

5. **B** Start by cross-multiplying: $7x = 2(2x - 30)$ . Distribute the 2 on the right side of the equation: $7x = 4x - 60$. Subtract $4x$ from both sides: $3x = -60$. Divide both sides by 3: $x = -20$. Be careful! The question is asking for $\frac{x}{2}$, so you need to divide both sides by 2: $\frac{x}{2} = -10$, which is (B).

6. **D** You could Plug In the Answers on this question, but the answer choices are not nice to Plug In, so solve the question algebraically instead. Start by multiplying both sides by $y - 7$ to clear the fraction: $4(y - 7) = y + 7$ . Distribute the 4 on the left side of the equation: $4y - 28 = y + 7$. Subtract $y$ from both sides: $3y - 28 = 7$. Add 28 to both sides: $3y = 35$. Finally, divide both sides by 3 to find that $y = \frac{35}{3}$ , which is (D).

7. **A** Find the slope-intercept forms of the equations of the two lines, $y = mx + b$, where $m$ stands for slope and $b$ stands for the $y$-intercept. First, use the slope formula to find the slope of line $l$: $\frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 3}{2 - 1} = 2$ . To find the $y$-intercept, plug in a point for the $x$ and $y$ values. Using $(1, 3)$, you get 3 = $2(1) + b$, or $3 = 2 + b$. Subtract 2 from both sides to find $b = 1$, so the equation of line $l$ is $y = 2x + 1$. You are
already given the slope of line \( m \), so you can do the same with the point \((1, 4)\) to find \( b \): \( 4 = 1 + b \). Subtract 1 from both sides and \( b = 3 \), so the equation of line \( m \) is \( y = x + 3 \). At the point of intersection the \( x \) and \( y \) values are equal, so you can set the \( x \) portions of the equations equal to each other: \( 2x + 1 = x + 3 \). Subtract \( x \) from both sides to get \( x + 1 = 3 \). Subtract 1 from both sides to find \( x = 2 \). To find the \( y \)-value at the point of intersection, plug \( x = 2 \) into one of the original equations: \( y = 2(2) + 1 \), so \( y = 5 \). Therefore, \((a, b)\) is \((2, 5)\).

Finally, the question wants \( a - b \), so \( 2 - 5 = -3 \), which is (A).

8. D When two graphs intersect, the \( x \)-values are equal and the \( y \)-values are equal. The \( y \)-values of the points of intersection are 36 (because all points on the line \( y = 36 \) have a \( y \)-value of 36). Make \( y = 36 \) in the equation of the parabola and solve for the \( x \)-values of the points of intersection. If \( 36 = (x + 4)^2 \), you can solve by first taking the square root of both sides (remember that you’ll get positive AND negative values on the left side!): \( ±6 = x + 4 \). It will be easier to break this into two equations: \( 6 = x + 4 \) and \( -6 = x + 4 \). Subtract 4 from both sides of both equations to get \( 2 = x \) and \( -10 = x \). That gives you two points: \((2, 36)\) and \((-10, 36)\). You don’t need the distance formula because the \( y \)-values are equal; simply take the positive difference of the \( x \)-values: \( 2 - (-10) = 12 \), (D).

9. C If \( f(2) = 6 \), then when \( x = 2 \), the function is equal to 6. Put these values into the equation and solve for \( c \): \( 6 = -2(2^2) + c; 6 = -8 + c; c = 14 \). Then, make \( x = -2 \) with the known value of \( c = 14 \): \( f(-2) = -2(-2)^2 + 14 = -8 + 14 = 6 \), which is (C).

10. D Apply the Geometry Basic Approach, but use some flexibility and Plugging In. Because there is already a diagram, start with labeling what you can. There are no values given in the question, but you do have a relationship among the angles with measures \( a^\circ \), \( b^\circ \), \( c^\circ \), and \( d^\circ \). Because the angles with measures \( a^\circ \) and \( d^\circ \) are opposite angles, they must be equal; make \( a = d = 50 \) and label it in the diagram. Plugging those values into the equation gives you \( 50 + c = b + 50 \). If you subtract 50 from both sides, you get \( c = b \). Angles with measures \( b^\circ \) and \( c^\circ \) also complete the straight angle with the angle with measure \( a^\circ \). \( a + b + c = 180 \), and because \( a = 50 \) and \( b = c \), \( 50 + b + b = 180; 50 + 2b = 180; 2b = 130; b = 65 \). Label \( b = 65 \) and \( c = 65 \). Because the angle with measure \( c^\circ \) is opposite the angle with measure \( b^\circ \), the angle with measure \( c^\circ \) must also equal 65°. Because the angle with measure \( c \) is opposite the angle with measure \( f^\circ \), \( f \) must equal 65°. Now that you have all angles indicated, you can go to the answers. You’re looking for the choice that could be false, so eliminate anything that must be true. Both \( b \) and \( c \) are 65°, so eliminate (A). The same is true for \( e^\circ \) and \( f^\circ \); eliminate (B). Angles with measures \( e^\circ \) and \( f^\circ \) are also both 65°, so eliminate (C) and choose (D).

11. A This problem is a bit on the wordy side, so be sure to start with Reading the Full Question. The question wants the average price of a cup of coffee when the two prices are equal; in other words, what’s the value of \( T \) when \( T = M? \) To find this, set the two right sides of the equations equal to each other to find \( y \), then plug that value back in to either equation to find \( T \). First, setting the two equations equal to each other yields \( 1.35 + 0.75y = 2.25 + 0.60y \). You want to isolate \( y \), so start by subtracting 0.60\( y \) from both
sides: \(1.35 + 0.15y = 2.25\). Subtract 1.35 from both sides: \(0.15y = 0.90\). Now, dividing with decimals can be tricky, so multiply both sides by 100 to get rid of the decimals: \(15y = 90\). Divide both sides by 90 and you get \(y = 6\). The question wants the value of \(T\) (or \(M\), as they’re equal), so you need to plug \(y = 6\) back into one of the equations. It’s probably easier to use the \(T\) equation, based on what you’re multiplying, so make \(y = 6\) in the second equation: \(T = 2.25 + 0.60(6)\). Multiply 0.60 by 6: \(T = 2.25 + 3.60\). Add, and you get \(T = 5.85\), which is (A).

12. D There are a few ways to find the vertex of this quadratic. In this case, the equation is given in its factored form; this makes it easiest to find the zeros of the quadratic. The \(x\)-value of the vertex of a quadratic is the midpoint of its zeros (or any two points on the quadratic which share a \(y\)-value); from there, you can find the \(y\)-value. First, to find the zeros, set \(y = 0\): \(0 = a(x + 6)(x - 2)\). The question indicates that \(a\) is nonzero, so either \((x + 6)\) or \((x - 2)\) is equal to zero, which means \(x = -6\) or 2. Find the midpoint by finding the average of \(-6\) and 2: \(-\frac{-6 + 2}{2} = -2\). This is the \(x\)-value of the vertex. To find \(k\) (the \(y\)-value at the vertex), plug in \(x = -2\) into the equation and solve: \(y = a(-2 + 6)(-2 - 2) = a(4)(-4) = -16a\), which matches (D).

13. B A line passing through the origin has a \(y\)-intercept of 0, so the slope-intercept form of the equation of this line is \(y = 6x\). Plug in the \(x\) and the \(y\) from each answer choice until one works in the equation. Remember that the \(x\) value comes first in the \((x, y)\) pair. The only choice that works is (B).

14. D While you could Plug In on this question, it is easier to solve this problem algebraically.

Use the bow tie to add the two fractions in the denominator to get \(\frac{1}{a + 4 + \frac{5}{a + 5}} = \frac{1}{\frac{2a + 9}{(a + 5)(a + 4)}}\).

When dividing fractions remember to flip the second fraction and multiply to get:

\[
1 \times \frac{a^2 + 9a + 20}{2a + 9} = \frac{a^2 + 9a + 20}{2a + 9}.
\]

15. A The answer choices all resemble the quadratic formula (the square roots and the ± signs help you recognize this). Start by putting the original equation into the \(ax^2 + bx + c = 0\) form of the equation to get \(x^2 + \frac{q}{3}x + \frac{1}{2}r = 0\). This means that \(a = 1\), \(b = \frac{q}{3}\), and \(c = \frac{1}{2}r = \frac{1}{2}\). Plug these values into the quadratic formula, \(\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\), to get \(\frac{-\frac{q}{3} \pm \sqrt{\left(\frac{q}{3}\right)^2 - 4(1)\left(\frac{1}{2}\right)}}{2(1)}\). Simplify this expression to get \(\frac{-\frac{q}{3} \pm \sqrt{\frac{q^2}{9} - 2r}}{2}\).
Next split the fraction into two to get \(-\frac{q}{3} + \frac{\sqrt{q^2 - 2r}}{2}\). Use Bite-Sized Pieces to solve. The first fraction becomes \(-\frac{q}{3} + 2 = -\frac{q}{3} + \frac{1}{2} = -\frac{q}{6}\). Eliminate (C) and (D). Next, determine a way to get rid of the fraction in the numerator of the second fraction. To do so, multiply \(2r\) by \(\frac{9}{9}\) to get \(\frac{q^2 - 2r}{9} = \frac{q^2 - 18r}{9}\). Factor out a \(\frac{1}{9}\) to get \(\sqrt{\frac{1}{9}(q^2 - 18r)} = \frac{1}{3}\sqrt{q^2 - 18r}\). Now it’s clear that the radical in the numerator should be \(\sqrt{q^2 - 18r}\), which means the correct answer is (A).

16. 5 Isolate \(x\) by first adding 25 to both sides of the equation to get \(x^2 = 25\). Next, take the square root of both sides to get \(x = \pm 5\). Because the question indicates that \(x > 0\), \(x\) must equal the positive value 5.

17. \(\frac{5}{13}\) or \(0.384\) or \(0.385\) Remember SOHCAHTOA. \(\cos = \frac{\text{adjacent}}{\text{hypotenuse}}\). Therefore, the adjacent side of angle \(a\) is equal to 5, and the hypotenuse of the triangle is equal to 13. \(\sin = \frac{\text{opposite}}{\text{hypotenuse}}\). The opposite side of angle \(b\) is equal to 5, and the hypotenuse of the triangle is 13. Therefore, \(\sin \theta = \frac{5}{13}\).

18. 130 Start by labeling the angle with measure \(c\) as 65. Because two sides of the triangle are equal, you also know that the other angle adjacent to line \(m\) is also equal to 65. Because these angles are part of a triangle, and all triangles have 180°, the measure of the remaining angle is 180 – 65 – 65 = 50; label that as well. To find \(b\), use the equation given; if \(c = 65\), then 180 – 2(65) = \(b\), so 180 – 130 = 50 = \(b\); label the angle with measure \(b\) as 50. Finally, to find \(a\), you know that the full circle around the middle of the two triangles is 360°, so 50 + 50 + \(a + a = 360\), or 100 + 2\(a = 360\). Subtract 100 from both sides: 2\(a = 260\). Divide both sides by 2, and you get \(a = 130\).

19. 2 To find \(a\), you want to find a way to clear the \(b\) terms from the system of equations. The coefficients on the \(b\) terms are 3 and 1, so you can multiply the second equation by \(-3\) and add the equations together. Multiplying the second equation by \(-3\) gives you \(-3a - 3b = 6\). Stack the equations and add:

\[
\begin{align*}
  a + 3b &= -10 \\
  (+ (-3a - 3b = 6))
\end{align*}
\]

\[-2a = -4\]

Divide both sides by \(-2\) and you find that \(a = 2\).
20. \( \frac{17}{4} \) or 4.25 There are many ways to isolate \( y \) in this question. One of the more straightforward ways is to actually find \( x \) first by clearing the \( y \) terms. The coefficients on \( y \) are 8 and \(-4\), so if you multiply the second equation by 2 and add the two equations together, the \( y \) terms cancel. Multiplying the second equation by 2 gives you \( 6x - 8y = 86 \); stack this with the first equation and add:

\[
\begin{align*}
2x + 8y &= 74 \\
+ 6x - 8y &= 86 \\
8x &= 160
\end{align*}
\]

Divide both sides by 8 to find that \( x = 20 \). Now, go back to one of the original equations to find \( y \). In the first equation, make \( x = 20 \): \( 2(20) + 8y = 74 \); \( 40 + 8y = 74 \). Isolate \( y \) by first subtracting 40 from both sides: \( 8y = 34 \). Next, divide both sides by 8: \( y = \frac{34}{8} \), or 4.25. The fraction will fit into the Grid-In boxes, so you don't need to simplify.

Section 4 – Math (Calculator Allowed)

1. C If Casey stopped for breakfast, then she isn’t moving relative to her home. Therefore, you want the point on the graph where the \( y \)-value (distance from home) isn’t changing for 45 minutes. That can be found between the hours of 10 A.M. and 11 a.m. It looks as though she stopped somewhere shortly after 10 A.M., making (C) the best answer.

2. B As with any Math question with figures, start by reading the axes. The vertical axis is “Sales (in thousands of homes)” and the horizontal axis is “Years since 2002.” Next, Read the Full Question. Because the question wants the trend in home sales from 2002 through 2014, and the vertical axis is years since 2002, the answer should describe the behavior of the entire graph. This graph increases until 5 years after 2002 (which would be 2002 + 5 = 2007), then decreases. This matches (B).

3. A Because both pairs of lines are parallel, all big angles are equal, all small angles are equal, and any big angle plus any small angle equals 180°. Angle 1 is a big angle, and angle 2 is a small angle, so \( \angle 1 + \angle 2 = 180° \). If angle 1 is 135°, then 135° + \( \angle 2 = 180° \). Subtract 135 from both sides to find that \( \angle 2 = 45° \), (A).

4. B Use values from the chart to see which equation works. According to the chart when \( x = 2 \), \( g(x) = 4 \). So, in the answers plug in 2 for \( x \) and see which answer returns a value of 4. Choice (A) becomes 2(2) – 1 = 3. Eliminate (A). Choice (B) becomes 3(2) – 2 = 4. Keep (B) but check the remaining answers just in case. Choice (C) becomes 4(2) – 3 = 5. Eliminate (C). Choice (D) becomes 5(2) – 4 = 6. Eliminate (D).
5. A The question might be a little messy, but the answer choices help you figure out that you want to solve the equation for $d$. Start by dividing both sides by $4\pi b$, giving you $\frac{L}{4\pi b} = d^2$. Take the square root of both sides to get $d = \sqrt{\frac{L}{4\pi b}}$, which is (A).

6. D A positive association between two variables means that as one variable increases, the other variable also increases. Choice (B) has $w$ decreasing as $n$ increases, so eliminate it. Additionally, (C) has $w$ increase then decrease, rather than just increase; eliminate (C). For a weak positive association, $w$ should increase slowly as $n$ increases; (A) has $w$ increasing rapidly when compared to (D). Choose (D).

7. C Plug In the Answers! The question wants the number of games Salazar played. Start with (B). If Salazar played 27 games, and he played 13 more games than Perry, then Perry played $27 - 13 = 14$ games, giving the two of them a total of $27 + 14 = 41$ games. However, they played a total of 53 games, which means you need a higher number; eliminate (A) and (B). Try (C). If Salazar played 33 games, then Perry played $33 - 13 = 20$ games, giving a total of $33 + 20 = 53$ games between the two of them, which is what you want. Choose (C).

8. B Whenever you have a graph question, always consider the axes. Here, the question wants you to label the horizontal ($x$-) axis, which only has numbers so far. The question stem tells you the total population is $3,489,000,000$, so if you determine the total of the six countries as given in the graph, you can determine the label. Adding up the six countries gives you about $3,500$ as a population. $3,489,000,000$ is about a million times bigger than $3,500$ ($3,489,000,000 \div 3,500 \approx 1,000,000$), so the label on the horizontal axis should be in millions of people, which is (B).

9. A Sketch a graph. Quadrant III is the lower-left quadrant of the $xy$ plane, so draw a line which goes through the other three quadrants but avoids quadrant IV:

To do so, you need to make line $l$ have a negative slope, so $m$ must be negative. This matches (A).
10. **A** Start by labeling what you know: \( D \) is the dollars remaining, and \( x \) is the number of days since payday. Because 165.29 is multiplied by \( x \) it is something that happens each day after payday. Use POE. Choice (B) is about payday, not something that happens every day after payday. Eliminate (B). Choice (D) is a fixed number and therefore not something that happens every day after pay day, so eliminate (D). Given that \( D \) is the amount of dollars remaining in Kabir's bank account \( x \) days after payday, Kabir must have had 2,314.05 in his account on payday. Therefore, the difference between the amount of money in the Kabir's account at payday and the amount of money in his account must be 2,314.05 – \( D \). Eliminate (C).

11. **D** With functions, remember to follow PEMDAS, especially working from inside to outside. To find the value of \( g(f(6)) \), start with the innermost pair of parentheses. The question tells you that \( f(6) = 5 \), so you can substitute 5 for \( f(6) \): \( g(f(6)) = g(5) \). The question then tells you that \( g(5) = 7 \), so \( g(f(6)) = g(5) = 7 \), which is (D).

12. **A** Use the equation \( f = \mu N \) and the chart to determine the friction. The value of \( \mu \) will be the coefficient between two pieces of wood, which is 0.28, and the value of \( N \) is the force pressing the two pieces of wood together, 30 Newtons. Plugging these values into the equation gives you \( f = (0.28)(30) = 8.4 \), which is (A).

13. **B** \( N \) is the force pressing the bodies together in Newtons, and according to the question the force pressing two stacked objects together is equal to the weight of the object on top. Begin by finding the weight of the piece of wood. The given equation for friction is \( f = \mu N \). The value of \( f \) is 22.5, and from the chart the coefficient of friction between wood and stone, \( \mu \), is 0.30. Plug these values into the equation: \( 22.5 = 0.30 N \). Divide both sides by 0.30 to find the value of \( N \): \( \frac{22.5}{0.30} = 75 \). Since the piece of wood will be placed on another surface, its weight of 75 \( N \) remains the force pressing the two bodies together. To determine the new surface, find the new coefficient of friction by using the value of \( N \), 75, and the new value of friction, 46.5: \( 46.5 = \mu(75) \). Divide both sides by 75 to isolate \( \mu \): \( \frac{46.5}{75} = 0.62 \). The chart indicates that the coefficient of friction equals 0.62 between wood and concrete, so the new surface must be concrete, which is (B).

14. **A** Work this problem in Bite-Sized Pieces. You want to find the difference between compounding monthly and compounding quarterly. The question indicates that \( n \) is the number of times per year interest is compounded. If the interest is compounded monthly, then that would be 12 times per year, so \( n = 12 \). In the expression, that is \( 1 + \frac{0.05}{12} \)^{12} – 1. If the interest is compounded quarterly, then that
would be 4 times a year, so \( n = 4 \) and the expression is \( \left( 1 + \frac{0.05}{4} \right)^4 - 1 \). The question wants the difference between these two amounts, so you would subtract: \[ \left( 1 + \frac{0.05}{12} \right)^{12} - 1 - \left( 1 + \frac{0.05}{4} \right)^4 - 1 \], which matches (A).

15. **B** The \( P \)-intercept will be when items sold, \( s \), equals 0. When \( s = 0 \), \( P = 10 \), which means Jack’s pay when he sells no items is 1,000 dollars (remember to check your units on each axis). Because this is Jack’s pay when he sells no items, any answer choice which refers to items doesn’t fit; the only choice which does fit is (B).

16. **D** To find the expression that describes the graph, plug in a point on the graph. When \( s = 10 \), \( P = 15 \). Plug these values into each choice and eliminate what is not true; the only choice that is true with those values is (D).

17. **C** Plug in! Make \( w = 2 \). If the car costs $25.50 per day, and 2 weeks is 14 days, then the total cost would be $25.50 \times 14 = $357.00. This is your target; circle it. Make \( w = 2 \) in each answer choice and eliminate any answer that doesn’t equal $357.00. Only (C) works.

18. **D** When confronted with a bunch of text in a Math section, start with the question first. The question asks for the best conclusion “based on the design and results of the research.” So determine the important facts about the design and results of the research and underline them. There was a “wide range of vehicle makes, models, and model years” and “400 vehicles were randomly selected.” Which vehicle received which oil was “random,” and the vehicles which receive oil \( E \) had “substantial improvements in gas mileage” compared to the other group. Now, work POE in the answer choices. You don’t know about other available engine oils, so you cannot claim that \( E \) is better than “any other available engine oil”; eliminate (A). Choice (B) seems to fit the facts, so keep it. Choice (C) is extreme; even though there was a random sampling of vehicles, you don’t know about “any vehicle,” (“any” implies “any and all”—every single vehicle without exception) whereas (B) doesn’t have this issue. Eliminate (C). Choice (D) is similar to (B). Comparing the two choices, (B) indicates that oil \( E \) was the “cause” of the improvement in the gas mileage, but (D) only says that it is “likely to improve” gas mileage. Choice (D) is a safer conclusion than (B) because it makes a less strong, less sweeping conclusion, so the best answer is (D).

19. **A** The place where \( h(x) \) is at its maximum is when the \( y \)-value of the graph is at its highest. The graph’s \( y \)-value is highest at (1, 2). (Be careful: the origin is NOT in the middle of the grid!) Therefore, the \( x \)-value is 1, which is (A).
20. **B** The median household income represents the middle income if all incomes were listed consecutively. The mean household income is the average (total income divided by number of people). For the mean to be higher than the median, there must be some values above the median (to “pull” the mean above the median). In this case, that means there needs to be some incomes greater than the rest to “pull” the mean above the median; this matches (B).

21. **D** Be sure to start by Reading the Full Question! You are given $2x - 3$, and you want $2x + 3$. To get from $2x - 3$ to $2x + 3$, you would add 6, so add 6 to both sides of the inequality to get $2x + 3 \leq 11$. The greatest value of $2x + 3$ would therefore be 11, (D).

22. **A** This question may look scary, but the answers give you a hint: you want to solve for $\varepsilon_0$. Start by getting $\varepsilon_0$ out of the denominator by multiplying both sides by $\varepsilon_0$: $E \varepsilon_0 = \frac{q}{4\pi R^2}$. Divide both sides by $E$ and you get $\varepsilon_0 = \frac{q}{4\pi R^2 E}$, which matches (A).

23. **B** Distance in the equation is given by $R$. If the electric field strength at point $x$ is $E_x$ and the electric field strength at point $y$ is $E_y$, then $E_x = \frac{1}{25} E_y$. Make $R_x$ and $R_y$ the distances at points $x$ and $y$, respectively, and substitute the equations for the electric field strengths: $\frac{q}{4\pi \varepsilon_0 (R_x)^2} = \frac{1}{25} \left( \frac{q}{4\pi \varepsilon_0 (R_y)^2} \right)$. Multiply both sides by $\frac{4\pi \varepsilon_0}{q}$ to clear these elements from both sides of the equation, leaving you with $\frac{1}{(R_x)^2} = \frac{1}{25} \left( \frac{1}{(R_y)^2} \right)$. Cross-multiply to get $25(R_y)^2 = (R_x)^2$. Take the square root of both sides to get $5R_y = R_x$. This means $x$ must be 5 times further than $y$, which is (B).

24. **C** Work the problem in Bite-Sized Pieces. The standard form of the equation of a circle is $(x - h)^2 + (y - k)^2 = r^2$, where $(h, k)$ is the center of the circle and $r$ is the radius. If the center of the circle is at $(5, 0)$, then the left side of the equation should be $(x - 5)^2 + (y - 0)^2$, which is the same as $(x - 5)^2 + y^2$. This must be part of the answer; eliminate (B) and (D). Next, you need to find the radius. If $\left(6, \frac{12}{5}\right)$ is on the circle, then the distance from $(5, 0)$ to $\left(6, \frac{12}{5}\right)$ will be the radius. Use the distance formula:
\[ d = \sqrt{(6 - 5)^2 + \left(\frac{12}{5} - 0\right)^2} = \sqrt{1^2 + \left(\frac{12}{5}\right)^2} = \sqrt{1 + \frac{144}{25}} = \frac{\sqrt{169}}{5} = \frac{13}{5}. \] But be careful! The standard form of the equation is equal to \( r^2 \), not \( r \), so the right side of the equation should be \( \left(\frac{13}{5}\right)^2 \) or \( \frac{169}{25} \), which gives you (C).

25. **D** Start by using Process of Elimination. The question wants the grams of methyl alcohol of solution \( T \) and solution \( S \) was 25% less than solution \( T \), which means if solution \( S \) had 120 grams, solution \( T \) must have more than 120 grams; eliminate (A) and (B). Next, Plug In the Answers. Between (C) and (D), it will be easier to work with (D) because 160 is an easier number. The question is asking for grams of methyl alcohol in solution \( T \), so if solution \( T \) has 160 grams, and solution \( S \) is 25% less, then solution \( S \) must be \( 160 - (0.25)(160) = 120 \) grams. This fits the information in the question; choose (D).

26. **C** There are a lot of words here, so start with RTFQ. The question wants the statement which correctly compares the average rates of infection for the two populations of trees. Looking at the graph, at first grapefruit increases faster than orange, but at the end orange has increased its rate to catch up to grapefruit. Eliminate choices (A) and (B) because both indicate that the difference in the rates was constant, which contradicts one getting ahead then the other catching up. Choice (C) says that grapefruit was faster first, so keep it. Choice (D) says that orange was faster first, which contradicts what the graph shows, so eliminate (D) and choose (C).

27. **C** There’s a lot going on here, but the answer choices give you a clue: you want to solve the equation for \( R \). Start by clearing the fraction by multiplying both sides by \( \sqrt{1 + R} : \sqrt{1 + R} = PT \). Divide both sides by \( I \): \( \sqrt{1 + R} = \frac{PT}{I} \). Clear the radical by squaring both sides: \( 1 + R = \left(\frac{PT}{I}\right)^2 \). Subtract 1 from both sides to get \( R = \left(\frac{PT}{I}\right)^2 - 1 \), which is (C).

28. **A** Draw the lines into the given xy-plane. Both inequalities are written in slope-intercept form \( y = mx + b \), where \( m \) is the slope and \( b \) is the \( y \)-intercept. The first line has a slope of \( \frac{1}{2} \) and a \( y \)-intercept of \( -5 \). Because \( y \) is greater than or equal to the other side of the inequality, the line is solid, and all of the \( y \)-values above the line are shaded. The second line has a slope of \( 3 \) and a \( y \)-intercept of \( -2 \). Because of the less than
sign, the second line is a dotted line, and the portion under the line is shaded. Your drawing should look like this:

The only quadrant that has no portion of it shaded is quadrant II, (A).

29. **B** By telling you that \( f(-5) = 3 \), the problem is telling you that when \( x = -5 \), the function \( y \) is equal to 3. Choices (A), (C), and (D) all talk about the factors of the polynomial; factors are when the function is equal to 0. You do not know when the function is equal to 0, so you cannot know about any of the factors of \( f(x) \); eliminate (A), (C), and (D) and choose (B). (Note: The Remainder Theorem states that the remainder when function \( f \) is divided by the binomial \( (x - a) \) is equal to \( f(a) \); (B) essentially states this theorem as the answer.)

30. **B** Plug In the Answers to solve this question. First, solve for \( y \): \( 2y = 10 \), which means \( y = 5 \).

Next, plug in 5 for \( y \) and the values for \( c \) and \( d \) given in the answers into the first equation to see if the values work. Choice (A) gives you \( 5 = -6x^2 + 6 \). Solve for \( x \) to get \( -1 = -6x^2 \), \( \frac{1}{6} = x^2 \), and \( \pm \sqrt{\frac{1}{6}} = x \). This is a real solution, so eliminate (A). Choice (B) gives you \( 5 = -5x^2 + 4 \). Solve for \( x \) to get \( 1 = -5x^2 \), \( -\frac{1}{5} = x^2 \), and \( \pm \sqrt{-\frac{1}{5}} \). Since the value of the square root of a negative number is imaginary, these values will for \( c \) and \( d \) will have no real solution, and the answer is (B).
31. 5, 6, or 7  Work Bite-Sized Pieces and translate English to math. If Al buys 1 milkshake and \(x\) cheeseburgers, then he spends 1 times the cost of a milkshake ($4) and \(x\) times the cost of a cheeseburger ($6), which translates to 4 + 6\(x\). This must be at least $30; “at least” translates to \(\geq\) in math, so 4 + 6\(x\) \(\geq\) 30. Subtract 4 from both sides to get 6\(x\) \(\geq\) 26. Divide both sides by 6 to get \(x \geq 4.3\). You can’t order a fractional number of cheeseburgers, so try 5 cheeseburgers. This would give a total of 4 + 6(5) = $34, which satisfies the question. Input 5 as your answer.

32. 650  Break the problem into Bite-Sized Pieces. First, determine how much water is added in 50 minutes. \(Rate = \frac{Amount}{Time}\), so \(Rate \times Time = Amount\). 7 \(\times\) 50 = 350 milliliters added over 50 minutes. Add this to the original 300 milliliters: 350 + 300 = 650.

33. 64.1  To find the mean, find the sum of all the ages and divide by the number of people:
\[
\frac{57 + 59 + 65 + 48 + 81 + 76 + 40 + 58 + 63 + 69 + 71 + 63 + 77 + 71 + 898}{14} = \frac{898}{14} = 64.1.
\]

34. 365  To solve for Siham, translate from English to math and solve the system of equations. Make the number of minutes Rama ran \(r\) and the number of minutes Siham ran \(s\). If Rama and Siham ran for a total of 670 minutes, then the number of minutes Rama ran plus the number of minutes Siham ran equals 670, or \(r + s = 670\). For the second equation, Rama’s total amount of time was 60 minutes less than Siham’s, so \(r = s - 60\). Because you want to solve for \(s\), you can substitute \(s - 60\) for \(r\) in the first equation: \((s - 60) + s = 670\). Combine like terms: 2\(s\) – 60 = 670. Add 60 to both sides: 2\(s\) = 730. Divide both sides by 2, and you get \(s = 365\).

35. 8  Use the Geometry Basic Approach. First, write down the formula you need: the volume of a cone, which is \(V = \frac{1}{3} \pi r^2 h\). Plug in what you know: 48\(\pi\) = \(\frac{1}{3} \pi r^2(9)\). Solve for \(r\); start by combining like terms on the right: 48\(\pi\) = 3\(\pi\)\(r^2\). Divide both sides by 3\(\pi\): 16 = \(r^2\). Take the square root of both sides, and you find \(r = 4\). Be careful! The question is asking for diameter, so double the radius to find the diameter is 8.

36. 5  For this function to be undefined, the denominator must be equal to 0. So, set the denominator equal to 0 and solve: \((x - 12)^2 + 14(x - 12) + 49 = 0\). Start by FOILing the first parenthesis and distributing 14 in the second: \(x^2 - 24x + 144 + 14x - 168 + 49 = 0\). Combine like terms: \(x^2 - 10x + 25 = 0\). You might recognize this as a perfect square; it factors to \((x - 5)(x - 5) = 0\). Therefore, the value of \(x\) that makes function \(f\) undefined is 5.
37. Use the formula provided and the information given. If it costs $900 for 150 customers, then \( C_1 = 900 \) and \( Q_1 = 150 \). Similarly, if it would cost $1,600 for 200 customers, then \( C_2 = 1,600 \) and \( Q_2 = 200 \). Plug these values into the equation and solve:

\[
M = \frac{1,600 - 900}{200 - 150} = \frac{700}{50} = 14.
\]

38. Take this in Bite-Sized Pieces. If the actual cost is 50% greater than expected, and Carol expected the cost to be $1,600 (as question 37 tells us), then the actual cost was \( 1,600 + 0.50(1,600) = 2,400 \). This is new value of \( C_2 \). Plug this value into the equation, using the same values as before for \( C_1, Q_2, \) and \( Q_1 \):

\[
M = \frac{2,400 - 900}{200 - 150} = 30.
\]

To find the percent increase in marginal cost, use the equation

\[
\text{percent change} = \frac{\text{difference}}{\text{original}} \times 100.
\]

In question 37 you determined the original value was 14, so the percent change is

\[
\frac{30 - 14}{14} \times 100 = 114\%.
\]