

Answer Key: TEST 4

SAT

SECTION 1—READING

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

SECTION 2—WRITING

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

SECTION 3—MATH

- | | |
|-------|------------------------------------|
| 1. B | 12. B |
| 2. C | 13. C |
| 3. D | 14. A |
| 4. B | 15. A |
| 5. C | |
| 6. D | Fill-Ins: |
| 7. B | 16. $\frac{3}{2}$ or 1.5 |
| 8. C | 17. 4 |
| 9. B | 18. 48 |
| 10. D | 19. 144 |
| 11. C | 20. $\frac{5}{12}$, .416, or .417 |

SECTION 4—MATH

- | | | | |
|-------|-------|-------|---------------------------|
| 1. A | 13. D | 24. A | Fill-Ins: |
| 2. A | 14. B | 25. B | 31. 7 |
| 3. C | 15. D | 26. C | 32. 5, 10, or 15 |
| 4. B | 16. C | 27. C | 33. $\frac{7}{4}$ or 1.75 |
| 5. D | 17. A | 28. A | 34. 8 |
| 6. A | 18. B | 29. D | 35. 86 |
| 7. D | 19. C | 30. D | 36. 64 or 128 |
| 8. D | 20. B | | 37. 76.5 |
| 9. B | 21. A | | 38. 13 |
| 10. D | 22. C | | |
| 11. C | 23. B | | |
| 12. C | | | |

Answer Explanations

SAT Practice Test #4

Section 1: Reading

QUESTION 1.

Choice A is correct. The passage depicts a conversation between Catherine, who becomes “impassioned” (line 26) when the topic of hunting is raised, and Edmond, who often challenges her views. The abundant quotations and descriptions of tones and gestures support A, while B (“nationwide”) and D (“contemporary society”) both raise topics that are much too broad for the content. C wrongly describes a “compromise”: Catherine and Edmond simply terminate their dispute with “silence” (line 65), not with negotiation or mutual understanding.

QUESTION 2.

Choice C is correct. Although Edmond identifies himself as one of “We French” (line 33), he also speaks “flawless” (line 63) English. This information supports C and can be used to quickly eliminate A and B, which misidentify Edmond as an individual of ENGLISH descent. D rightly notes Edmond’s country of origin, but makes a faulty assumption about his place of residence: it is not clear where exactly he lives, and, if anything, throughout the passage he voices familiarity with the FRENCH countryside.

QUESTION 3.

Choice D is correct. The word “aim” refers to hunting “food for the table” (line 39) and should thus be taken as a description of a purpose, goal, or “objective”. A and B both refer to literal or physical “aiming”, while C is out of context: people have the GOAL of hunting food, but are not necessarily ORDERED to hunt food or given a “direction” by others.

QUESTION 4.

Choice B is correct. In lines 30-33, Edmond raises a viewpoint on hunting and food that is attributed to Catherine as a “modern Englishwoman”. This information supports B: A is too extreme (since Edmond learns in lines 25-29 that Catherine opposes English hunting) and C is too balanced (since Edmond does bluntly point out what he sees as flaws in Catherine’s reasoning, and does NOT succeed in making her change her views). D involves a misreading of lines 65-67: the argument has ENDED by this point, so the new proposal cannot rightly be described as a distraction.

QUESTION 5.

Choice B is correct. See above for the explanation of the correct answer. A explains the ownership of the French national forests, C explains the view taken by the French, and D describes a period of relative calm AFTER the discussion between Catherine and Edmond. Keep in mind that A and C offer general factual statements, not strong attitudes towards Catherine.

QUESTION 6.

Choice D is correct. The line reference begins with an allusion to the “way” (line 46) hunting is performed in England, then goes on to describe hunting practices “In France” (line 47). This information supports D and eliminates A, since the comparison ONLY involves the practices surrounding hunting. B is out of scope, since Edmond cites a difference but not a form of conflict; C is also out of scope, since it is not clear that Edmond’s information, which he could have gotten indirectly, is based on personal experience.

QUESTION 7.

Choice B is correct. The word “clean” refers to a “shot” that quickly and efficiently kills wildlife, in a manner that is NOT “barbaric” (line 44) or “akin to murder” (line 47). B is the best answer; A refers to morality and D refers to appearance (while the context primarily involves EFFECTIVENESS or ACCURACY). C means “free of infection” or “free of unpleasantness” and highlights the wrong priority. The animals are still killed, but quickly.

QUESTION 8.

Choice B is correct. The author explains that Catherine’s French is not “as flawless” as Edmond’s English (lines 63-64); Catherine would thus be cross (lines 68-69) because Edmond is using an unfamiliar French word in the wake of their argument. This information supports A and eliminates B (since Catherine is cross) and C (since Catherine is HERSELF irritated and displays no motive for irritating Edmond). D is out of scope: the author does not explain Catherine and Edmond’s destinations, which may well be known to Catherine.

QUESTION 9.

Choice C is correct. In lines 9-10, Catherine criticizes French women who are foraging in the forest; later, she criticizes the presence of hunting in France. This information supports C and eliminates B (because Catherine is outspoken in her criticisms) and D (because Catherine does formulate strong, decisive opinions). A is a trap answer: although Catherine does not seem fully informed about French forestry and hunting practices, she may be informed about OTHER elements of the French attitude towards nature that are not mentioned.

QUESTION 10.

Choice A is correct. See above for the explanation of the correct answer. B captures momentary confusion and raises the topic of English hunting, C notes differences in Catherine’s and Edmond’s language aptitudes, and D indicates a flaw in Catherine’s French. Make sure not to wrongly take B as a justification for Question 9 A or D.

QUESTION 11.

Choice C is correct. The paragraph begins by explaining why the Olympic Games were “originally held” (line 1), goes on to explain “recent budgets” (line 7) and recent motives, and concludes with three reasons (lines 11-17) that would justify hosting the games. This information supports C. A is too broad (since the Games in general, not “particular Olympic Games”, are considered), B introduces a faulty specific (since “different host cities” are never named), and D introduces a faulty source (since only the author’s voice is presented and a “diplomat” is never quoted or cited).

QUESTION 12.

Choice D is correct. In lines 2-4, the author explains that the Olympics originally acted as both “a religious ritual” and a celebration of the “feats of the human body”: now, only the “latter motivation” remains, so that the Olympics have lost their spiritual motivation. This information supports D, while other answers distort the actual arguments of the passage. The Olympics are seen as a strategy for luring tourists (but are not determined by existing tourist numbers, eliminating A), but can actually hurt tourism (eliminating B). Moreover, the author does not consider DECLINES in profits for the Olympics, only PROBLEMS faced by host cities: thus, eliminate D as out of scope.

QUESTION 13.

Choice A is correct. See above for the explanation of the correct answer. B indicates that the Olympics budget has increased, C indicates that host cities are seen as economically viable, and D indicates that there are few short-term economic rewards to hosting the Olympic games. None of these answers aligns with an answer to the previous question, though make sure not to falsely align B with Question 12 B, C with Question 12 A, or D with Question 12 C.

QUESTION 14.

Choice C is correct. The word “meaningfully” refers to the ability to “repurpose” (line 24) Olympic Games structures, or to successfully find new uses. C is thus on topic, while A, B, and D all refer to how PEOPLE act or think, not to the process of changing the use of a STRUCTURE.

QUESTION 15.

Choice B is correct. In lines 33-36, the author explains that Olympics host cities can drive away tourism, since prospective visitors would attempt to “avoid the crowds and chaos”. This information supports B: A and D both present positive outcomes that clash with the author’s overall, negative thesis, while C raises issues (culture and commercialization) that are tangential to the author’s focus on economics and profits.

QUESTION 16.

Choice B is correct. See above for the explanation of the correct answer. A presents an assumption about the benefits of hosting the Olympics, C indicates that a country does not actually need to host the Olympics in order to benefit from a hosting bid, and D indicates that only long-term economic benefits will make an attempt to host the Olympics acceptable to residents of a host country. Although some of these answers raise topics not discussed in the previous question, be careful of falsely aligning D with Question 15 A, which also discusses long-term benefits.

QUESTION 17.

Choice D is correct. The word “realized” refers to “gains”, which may or may not materialize or “be fulfilled”. D is the only acceptable answer, while A, B, and C all refer to processes that involve THOUGHT or PERCEPTION rather than FINANCES.

QUESTION 18.

Choice D is correct. The “scholars” are not convinced that the Olympics are economically beneficial, even though long-term economic gains and psychological benefits have been cited. For its part, the “study” describes an increase in trade, indicating that the Olympics may have tangible economic benefits. The scholars would react to this study in a clearly negative manner, so that D is an effective answer and A and B must both be eliminated as too positive. While negative, C is incorrect because there is no clear indication that the scholars would be indignant about or be OFFENDED by a conclusion that they would not accept: they would be more likely to clearly and strongly disagree.

QUESTION 19.

Choice A is correct. While the author voices many doubts about the true benefits of hosting the Olympics, one clear benefit is an increase in “national pride and public satisfaction” (line 66). This information supports A. The author would be skeptical of a purely economic benefit such as that described in B, while C (information among foreigners) and D (social issues and the media) both raise topics that are unrelated to the passage’s focus on economics.

QUESTION 20.

Choice D is correct. According to the graph, each Olympic host country exhibited an increase in GDP ten years after hosting the games: eliminate B and C, which do not indicate increases. However, an “exponential” increase would require the initial GDP to increase several times, not by a small margin or increment as shown for each country: eliminate A and choose D as the best answer.

QUESTION 21.

Choice C is correct. While the graph records increased GDP for Olympics host countries, the author argues that countries that bid on the games but did not actually host saw “a far greater increase in overall economic benefit” (lines 50-52). This information supports C. Keep in mind that the author is SKEPTICAL of the benefits of hosting the Olympics: thus, eliminate the extreme positive answer A and the extreme negative answer D. B considers the whether Olympic host countries have “stable markets”, an issue of little interest to the author: eliminate this answer as out of scope.

QUESTION 22.

Choice A is correct. In the first paragraph, the author explains that Leukemia “is a cancer that targets and afflicts blood cells” (line 1), then goes on to discuss existing treatments such as “chemotherapy, radiation, and bone marrow transplants” (line 8). This content supports A. The author simply states FACTS about Leukemia at this stage, rather than urging a new approach (eliminating B), offering a “speculation” (eliminating C), or presenting an “argument” (eliminating D).

QUESTION 23.

Choice C is correct. In lines 21-25, the author refers to the research introduced earlier, arguing that the utilization of tumor suppressor genes offers both “promise” and “negative side effects”. This awareness of both positives and negatives supports C and eliminates A (entirely positive) and B (entirely negative). D must be eliminated because the author is describing a tested “treatment” (line 23) not a theoretical approach that has not been “tested experimentally”.

QUESTION 24.

Choice C is correct. See above for the explanation of the correct answer. A describes earlier research approaches, B simply explains the use of tumor suppressor genes, and D introduces a new approach. While neither A nor D refer to the “tumor suppressor genes” research, B offers a mostly neutral description that does not fit any of the answers to the previous question.

QUESTION 25.

Choice A is correct. The word “assail” refers to “myeloid cells” that keep the body healthy by attacking negative influences, and is moreover aligned with the words “fight” (line 31) and “stop” (line 32). A, “combat”, is thus the best answer: B and C both refer to acts undertaken only by PEOPLE, while D does not introduce an appropriately negative tone.

QUESTION 26.

Choice D is correct. In lines 42-43, the author describes natural killer cells as “a key part of how the body ensures good health” outside the context of leukemia experiments. This information supports D and contradicts the negative answer A. B is out of scope, since the author of the passage is interested entirely in leukemia and other forms of cancer; C is problematic because the researchers in the passage have cultivated the adaptive natural killer cells and find them “potentially useful” (line 48).

QUESTION 27.

Choice B is correct. The word “trigger” explains how the activity of “immune cells” is caused or initiated, making B the best answer. While A and D are typically negative in meaning, C can only refer to an action that involves talking and reasoning, not to a biological process.

QUESTION 28.

Choice B is correct. In lines 56-60, the author explains that the researchers were “intrigued” by a new transformation observed in “matured cells”. This new and “unforeseen” result justifies B as the best answer. Although the leukemia research described in the article is broadly applicable and went through a few different phases, the author does not specify any un-removed obstacles, disputes, or humanitarian applications: thus, do not assume that these topics are relevant, and eliminate A, C, and D.

QUESTION 29.

Choice C is correct. See above for the explanation of the correct answer. A describes the basic nature of the research undertaken by the team, B describes the objective of the Scripps team, and D describes a possible new avenue for research. None of these answers are negative, and thus Question 28 A and Question 28 C should be readily eliminated.

QUESTION 30.

Choice A is correct. In lines 69-70, the author indicates that the Scripps researchers hope that their “specialized method” for treating leukemia could help to combat “other types of cancer”. This information supports A, while B refers to an objective that (even if true) is nowhere mentioned in the passage. C refers to an objective that is never named and that might in fact have been accomplished (since the author focuses on the problems with Dickins’s research). D wrongly shifts the emphasis from fighting cancer to dendritic cells, a topic incidental to the Scripps team’s research.

QUESTION 31.

Choice C is correct. According to the graph, 2% of AML cells were destroyed during the first time interval (A), 3% during the second (B), 8% during the third (C), and 2% during the fourth (D). C is thus the best answer: even if the first and second time intervals decrease the overall AML cell count, the decrease is so INSIGNIFICANT that 8% of a slightly smaller number would still be the largest decrease recorded.

QUESTION 32.

Choice C is correct. The author of the passage notes that “dendritic cells” (line 59) mature further into the natural killer cells that target AML cells. It can be reasonably inferred that dendritic cells were present in the stages immediately BEFORE the highest rate of AML cell destruction: C, the timeframe between 3PM and 9PM, is situated at exactly this stage. A places the dendritic cell generation AFTER the creation of natural killer cells, B places this stage much too early, and D wrongly assumes that the stage of highest natural killer cell activity is ALSO the stage of highest dendritic cell activity.

QUESTION 33.

Choice D is correct. In the passage, Agnew notes that the media is dominated by “A small group of men” (lines 9-10) and, despite mentioning a few of the media’s valuable purposes, criticizes the media elite for “provincialism” and “parochialism” (lines 61-62) that render its authority problematic. This evidence supports D. A misstates the focus of Agnew’s critique (the media, not politics), B mistakes a tactic discussed in the passage (“media distortion”) for the main target of Agnew’s discussion (the elite behind the media), and C does not capture the passage’s negative tone.

QUESTION 34.

Choice A is correct. In lines 9-12, Agnew explains that “a small group of men” dictate the few minutes of news that will reach the public, thus omitting a large amount of information. This information supports A and contradicts B (since topics are available, but omitted) and D (since the coverage is restrictive, not overwhelming). The “political correctness” mentioned in C is not a concern of the passage: if anything, the networks may not be “politically correct” because they approach “difficult social problems” (line 34) in a dramatic way.

QUESTION 35.

Choice B is correct. See above for the explanation of the correct answer. A records the number of Americans who watch the news, and C and D both describe the functions of the networks. However, none of these answers describes a “problem”: A is neutral and C and D are positive in their assessments.

QUESTION 36.

Choice D is correct. In lines 6-8, Agnew contrasts an earlier situation (the prominence of newspapers) with the new reality that Americans are guided by “what they see and hear on their television sets”. This information supports D. A and C both refer to capabilities of network news that Agnew cites in lines 13-40, yet that he does not designate as NEW or RECENT developments. B relies on a faulty inference: while Agnew notes that the network news has grown more popular, he never argues that newspapers have grown LESS popular in consequence.

QUESTION 37.

Choice C is correct. The word “broad” refers to the “powers” (line 14) of the men who determine what network news Americans will encounter: these men thus have enormous or “extensive” power in shaping public opinion. C is the best answer: A refers to physical powers or military buildup, B is inaccurate (because Agnew explains EXACTLY how the powers work), and D describes a temperament or a political affiliation, not the extent of an ability.

QUESTION 38.

Choice B is correct. In lines 33-35, Agnew explains that news networks have called attention to “our most difficult social problems”: much of the rest of the paragraph describes problems in public health, war, and the environment that have been highlighted by the news. B thus best captures the mostly positive tone and function of this paragraph, which only changes in the final few lines. While A and C both wrongly assume that the paragraph is PRIMARILY negative, D misstates the logic of the passage: Agnew indeed endorses how the news networks approach social problems, but finds a different aspect of the news (the limited nature of the network leadership) problematic.

QUESTION 39.

Choice B is correct. See above for the explanation of the correct answer. A describes how reporters can be influential (but primarily addresses problems not considered in the fourth paragraph), C highlights a negative aspect of the news, and D transitions away from the discussion in the fourth paragraph. None of these answers capture the positive tone of the fourth paragraph (and allude to the issues that it considers at length) in the manner of B.

QUESTION 40.

Choice B is correct. Agnew establishes that the “communities” rely on “intellectual confines” (line 58), “provincialism” (line 61), and “parochialism” (line 62). This information supports B and eliminates C, which wrongly indicates that the “communities” are in fact broad-minded and take a global approach. A misconstrues Agnew’s critique: the “communities” are geographically and intellectually distinct, but social class is never explicitly mentioned. D is a misinterpretation of the passage: the “communities” are AWARE of politics, but DISTORT political news in a way that Agnew dislikes.

QUESTION 41.

Choice B is correct. The word “draw” is used to explain the “sources” of political and social views: a view would naturally be obtained or “derived” from such a source. B is the best answer, while A is out of scope (since Agnew is referencing the sources of views, not the FINAL depiction of views on the news) and C and D both refer to ways of winning others over, not to the basic process of how a view originates.

QUESTION 42.

Choice C is correct. In the passage, Agnew explains that network news involves a problematic “concentration of power over American public opinion” (lines 48-49) because a relatively small group decides what news will be prioritized and presented. This information supports C. A mentions the wrong problem (since Agnew criticizes the isolation of the media elite, not its links to business), and B and D are contradicted by the fact that Agnew IS positive about how the news can “constructively and creatively” (line 29) address social problems.

QUESTION 43.

Choice A is correct. Passage 1 raises the question “Are viruses alive?” (line 1) and goes on to explain the stances of experts such as Paul Berg and Ronald Ross; Passage 2 begins by referencing “the question of whether viruses are organisms or not” (line 34) and then explains the stances of experts such as Luis P. Villarreal and Mark Vincent. This information supports A. Only Passage 1 argues strongly that viruses could be organisms (eliminating B), while only Passage 2 raises the topic of tumors (eliminating D). Neither passage indicates that the question “are viruses alive?” cannot be answered, only that perhaps it HAS NOT been answered definitively so far: thus, eliminate C as a misreading of the content.

QUESTION 44.

Choice D is correct. The word “machinery” refers to life structures that can be found within a cell and that are influenced strongly by a virus: “vital functions” is an appropriate choice. A, B, and C all refer to topics that involve human activity and initiative, NOT to the operations of a cell, and must all be deleted as irrelevant.

QUESTION 45.

Choice C is correct. In lines 10-12, the author of Passage 2 points out that viruses do not “possess autonomous genetic material”; similarly, Villarreal notes that a virus is “devoid of genetic material” (lines 35-36). This information supports C. Keep in mind that the author of Passage 1 is open to the idea that viruses may be classified as life forms, while Villarreal is not: A is only applicable to Villarreal, while B and D would only be remotely applicable to the author of Passage 1 (and in any event over-state the author’s claims).

QUESTION 46.

Choice B is correct. See above for the explanation of the correct answer. A explains how bacteria reproduce, C explains that many parasitic organisms require hosts for reproduction, and D indicates that the author of Passage 1 is not convinced that viruses are non-living. Only D mentions viruses directly, and CONTRADICTS Villarreal’s stance.

QUESTION 47.

Choice A is correct. The first paragraph of Passage 1 describes how organisms “reproduce” (line 2); the second paragraph begins with a direct reference to this topic, so that the “biology fundamentals” in question are facts about reproduction. While the author’s general topic is whether viruses are alive, the SPECIFIC reference deals with reproduction, a topic that sets up this broader discussion: eliminate B and D as misdirected. Eliminate C (“single-cell organisms”) as too narrow, since the author also discusses human reproduction in the first paragraph.

QUESTION 48.

Choice D is correct. The author of Passage 1 presents Plasmodium as an example of an organism that requires a host “in order to reproduce” (lines 18-19) just as a virus does, but that is nonetheless “classified as an organism” (line 30), much unlike a virus. This information supports D. Although Plasmodium is a malaria parasite that enters human blood, the author of Passage 1 never EXPLICITLY links both viruses and Plasmodium to either blood or epidemics. Eliminate B and C, but also eliminate A, since only the particulars of Ross’s research (not the overall status of the research) are discussed.

QUESTION 49.

Choice B is correct. In lines 51-54, the author of Passage 2 explains that “pop culture hype”, particularly a “science fiction novel” by Michael Crichton, has shaped perceptions of viruses and their role in evolution. This information supports B, while A is contradicted by the passage: the author in fact argues BEYOND Villarreal’s ideas to link viruses to tumors. C is out of scope, since viruses and tumors are simply COMPARED and debates about the status of viruses are “settling down” (line 63); D is a distortion of the passage, because researchers such as Philip Bell (line 47) have in fact linked viruses and living cells.

QUESTION 50.

Choice C is correct. See above for the explanation of the correct answer. A indicates that Villarreal continued to discuss viruses after delivering a strong assessment, B indicates that viruses do resemble life forms in some respects, and D sets forward an idea about how tumors are generated. Make sure not to mistake A as evidence for Question 49 A or B as evidence for Question 49 D.

QUESTION 51.

Choice A is correct. The word “generation” describes the cancer genome that appears during a speciation event: such a genome is thus “created”. A is an effective choice, while B refers to human emotions or motives and C and D both refer to PEOPLE or OBJECTS, not to a PROCESS of generation.

QUESTION 52.

Choice A is correct. The author of Passage 2 associates viruses with the “struggle for dominance” (lines 56-57) in the natural world, but also notes that tumors struggle “for survival” (line 74) to the detriment of their hosts. This information supports A, while neither tumors nor viruses are definitively described as capable of independence (eliminating B), only tumors appear to be capable of “speciation events” (eliminating C), and only viruses are directly related to cell nuclei (eliminating D).

Section 2: Writing

Passage 1, Marine Biology: Combining Industry, Ecology, and Nutrition

QUESTION 1.

Choice A is correct. The paragraph as a whole points out the kinds of careers that attract marine biologists: the underlined portion should thus be a concise and logical phrase that captures how “careers in education and research” appeal to marine biologists. A fits such requirements, while B is needlessly elevated in diction and C and D are both awkward and too colloquial or informal for the tone of the passage.

QUESTION 2.

Choice C is correct. As a whole, the sentence calls attention to “industry and applied science careers” for marine biologists. One example would be work in the “aquaculture industry”, making C, which sets up an example, an appropriate transition. A and B both indicate surprise, yet there is no context to show WHY the writer’s information would be surprising; D wrongly assumes that the author is establishing a difference, not expanding upon a point.

QUESTION 3.

Choice B is correct. The subject of the underlined verb is the singular “demand”: eliminate plural answers A and C. Because the proper past participle form of “to rise” is “risen”, eliminate the faulty wording in D and choose B as the only grammatically correct answer.

QUESTION 4.

Choice D is correct. The table lists five seafood-producing countries by rank according to metric tons produced: the United States is ranked fifth of all countries, so that D is the best answer. A (past seafood production) and B (purchases from abroad) both deal with factors addressed nowhere in the table, while C understates a difference in seafood production: the United States produces roughly ten times less seafood than China does.

QUESTION 5.

Choice D is correct. For effective parallelism at the underlined portion, provide another noun that is in series with “oysters” and “clams”: “and mussels” is a concise and effective choice. A introduces the noun “production” rather than designating another type of shellfish, B introduces the ambiguous pronoun “that”, and C introduces the phrase “are produced”, which is redundant because “production” has been mentioned earlier in the sentence.

QUESTION 6.

Choice C is correct. The underlined word should refer to a “location”, as required by the sentence: “site” is the only choice that does so, since all the other choices introduce diction errors. A refers to the act of referencing (or citation), while B and D both refer to vision.

QUESTION 7.

Choice A is correct. The underlined portion should be in present tense (eliminating A), since the “shellfish farms” are described earlier in present tense. In addition, the underlined portion should provide a verb for the subject “shellfish” to create a full subject-verb clause after the linking phrase “to which”: C creates a fragment and D distorts the grammar with a second “which”. Only B provides a concise, effective verb phrase as needed.

QUESTION 8.

Choice D is correct. The question requires a reference to a “practical benefit” of the tanks: D indicates that the tanks give farmers a considerable degree of “control” and are useful in this way. While B provides a drawback and C indicates a timeline (NOT a benefit), A is a trap answer: how CONTROVERSIAL the tanks are and how USEFUL they are should be understood as two different issues. Controversial methods, in fact, could have enormous practical benefits.

QUESTION 9.

Choice C is correct. For this sentence, provide the correct idiomatic phrase to describe “solutions” that are provided: “solutions to” is the accepted usage. A should not be confused for the idiomatic phrase “problems with”, B wrongly compares problems and solutions, and D, which at first seems to indicate that the solutions proceed “from problems”, is not a standard English idiom.

QUESTION 10.

Choice C is correct. The underlined possessive should refer to “seaweed”, which “grows” and is thus singular. Eliminate A and choose C: B only refers to placement or situation and is not a possessive, while D does not exist in English.

QUESTION 11.

Choice D is correct. This sentence should pair the descriptions “productive” and “sustainable” with the standard phrase “not only . . . but also”. D does so, while A places a fragment after a semicolon, B creates a comma splice, and C distorts the standard phrase with “although also”.

Passage 2, Furnishing Your Room with Mushrooms

QUESTION 12.

Choice B is correct. The underlined verb should be paired with the subject “fields”, since “of home decoration and architectural design” is an interrupting descriptive phrase that must be factored out. B uses the correct plural form: A is singular, while C and D both create sentence fragments by introducing the needless transitional pronoun “which”.

QUESTION 13.

Choice C is correct. The underlined portion of the sentence should be in parallel with the noun “founder”, which describes Phil Ross: A and B introduce adjectives and must be eliminated. Idiomatically, the correct phrase for someone who is a pioneer in a specific pursuit is “pioneer in”: D would wrongly indicate that Ross is “with” or ACCOMPANIES “mushroom-based home decoration”. C is thus the best answer.

QUESTION 14.

Choice A is correct. While the author has begun the sentence with a subordinate clause (introduced by “While”), the underlined portion requires a full subject-verb combination: A, “mycotecture has yielded”, is the best choice. B (“although”) and C (“if”) both create fragments by introducing new, needless transitions, while D creates a fragment by providing an -ing form rather than a proper verb form for the sentence’s subject.

QUESTION 15.

Choice C is correct. In A, B, and D, different forms of the words “unveil” and “reveal” appear: because these words are interchangeable, all of these answers are redundant. C rightly uses only “unveiled”, and also makes effective use of the standard phrase “both . . . and” when describing two items.

QUESTION 16.

Choice B is correct. Sentence 5 explains “mycelium” and its properties at length: however, sentences 2 and 3 both explain APPLICATIONS of mycelium and thus assume that the reader already possesses the knowledge provided in sentence 5. Thus, sentence 5 should occur after sentence 1 and introduce sentence 2: C interrupts the description of mycelium applications while A and D place the information in sentence 5 much too late in the paragraph.

QUESTION 17.

Choice D is correct. The underlined verb should refer to “creations” that are made of “mycelium” and feature “elegant touches”, or “combine” these traits. The other answer choices introduce diction errors: A refers to working together, B refers to supporting a position, and C is an inappropriate negative.

QUESTION 18.

Choice A is correct. In the previous paragraph, the author describes a mycelium-based furniture project: this evidence would SUPPORT the idea that mycelium is a design element, so that the positive relationship in A (“indeed”) is correct. B and C both wrongly introduce contrasts, while D wrongly assumes that the writer or readers would see the use of mycelium as shocking. If anything, the writer indicates that mycelium is APPROPRIATE to design projects.

QUESTION 19.

Choice D is correct. Earlier in the paragraph, the author points out that mycelium is “an environment friendly substance”: the use of recycled material, as described in D, would support a claim about mycelium’s environment-friendly “appeal”. Nowhere does the author describe the mycelium production process as part of the material’s “appeal”, and the use of mycelium in high-end design indicates that the substance may in fact be expensive. Together, this information can be used to eliminate A, B, and C, which are concerned primarily with such factors.

QUESTION 20.

Choice B is correct. Assess the structure and grammar of each answer choice: A involves a misplaced modifier (since the “polyominoes” are wrongly described as “traditional building elements”), C involves subject-verb disagreement (“innovation . . . are”), and D involves a comma splice. Only B avoids such grammatical problems while properly describing the “polyominoes” as “oddly-angled bricks”.

QUESTION 21.

Choice C is correct. The paragraph indicates that the appeal of mycelium MAY be limited: while B is too positive and D is too negative for the author’s discussion, C rightly indicates that the cost of mycelium objects could be a drawback and leads into the discussion of other “perceptions”. A introduces incorrect reasoning: even if the price has not been mentioned, there is no reason why this specific evidence cannot be used to strengthen the author’s argument.

QUESTION 22.

Choice A is correct. The underlined verb should agree with the singular noun “team”, so choose A and eliminate the plural B. Because the underlined verb should ALSO be in parallel with “continues”, eliminate the future-tense C and the past-tense D.

Passage 3, A Late Start, and a Better Start

QUESTION 23.

Choice D is correct. The original sentences explain that “biological clocks” are “rhythms”, so that the phrase “These rhythms” should refer back to “biological clocks and can be replaced by “which”. A wrongly introduces a contrast, B refers to clocks (things) as though they are events (“when”), and D distorts the use of the verb “dictate”. The “clocks” dictate: “Humans” do NOT “have circadian rhythms . . . and dictate”.

QUESTION 24.

Choice C is correct. The sentence indicates that negative effects will result if the systems are changed, or “disrupted”. The other answers introduce diction errors: A refers to argumentation, B refers to human emotion, and D refers to a PHYSICAL thing that cannot be restored, not to a rhythm that may return.

QUESTION 25.

Choice B is correct. The underlined portion should be in parallel with the earlier verbs “feel” and “do . . . learn” and must describe a further negative effect: while A and C both wrongly introduce CONTRASTS, D breaks parallelism. B both adds a new present tense verb and shows that the sentence relationship involves addition or simultaneity.

QUESTION 26.

Choice C is correct. This sentence creates a comparison between “adolescents” and the underlined portion: use “than” as the standard comparison phrasing (not “then”, which indicates time) and eliminate B and D. The “adolescents” must also be compared to other “people”, not to “ages”: eliminate A and choose C as the best answer.

QUESTION 27.

Choice A is correct. At this point, the passage describes the tendencies of adolescents using a series of present-tense verbs: for the best possible verb agreement, eliminate past-tense answers B, C, and D and choose the present-tense answer A.

QUESTION 28.

Choice C is correct. The sentence that contains the underlined portion pairs off “school time” and “biological” time using the standard phrase “between . . . and”. C is the only answer that correctly implements this standard phrase: make sure to temporarily disregard the information in parentheses in order to see the expected construction and quickly eliminate A, B, and D.

QUESTION 29.

Choice A is correct. The final sentence of the paragraph lists the optimal wake-up and school-start times for teens: on the basis of the times listed in A, the start times for “Many high schools” and the corresponding wake-up times for teens are several hours earlier. This information supports the author’s argument about “schedules”, while B focuses on diet choices, C indicates that teenagers are energetic but avoids the issue of school scheduling, and D lists PREFERENCES, rather than DRAWBACKS as demanded by the prompt.

QUESTION 30.

Choice A is correct. Check the answers for sentence structure errors: B wrongly introduces a fragment after a semicolon while C and D both introduce comma splices. Only A creates an effective transition (“involving”) into the discussion of the details of the experiment.

QUESTION 31.

Choice B is correct. Sentence 1 refers to the “promising” results of changing a specific school time to 8:40; sentence 2 introduces an “experiment” that involved exactly this time change. Because the experiment should be introduced BEFORE its results are described, eliminate A and choose B. Both C and D would both wrongly place the initial reference to “promising” results after the description of WHY the results were promising.

QUESTION 32.

Choice D is correct. Use the commas to properly coordinate ideas: in D, two commas properly offset the phrase “along with other scientific data” from the subject-verb combination “results . . . suggest”. While A and B both wrongly interrupt the subject and verb with only a single comma, C wrongly splits the proposition “along” from the noun to which it refers, “data”.

QUESTION 33.

Choice C is correct. The underlined portion must begin by mentioning a group that would have “happier and more successful children” in order to avoid a misplaced modifier. The best choice is C, “parents”: “start times” (A), “benefits” (B), and “high schools” (D) would not logically have children of their own.

Passage 4, Richard Brinsley Sheridan: *A Man for All Comedies*

QUESTION 34.

Choice A is correct. The underlined pronoun must be replaced by a reference to people who would “claim” in the “present day”. While B and D both refer to things or qualities, C refers to two playwrights who lived centuries ago. Only A, critics, properly fits the meaning of the sentence.

QUESTION 35.

Choice D is correct. Idiomatically, the underlined portion must refer to the act of denying a specific idea: to “deny that” is the best English usage. A uses the wrong transition, B indicates cause and effect (not an assertion), and C indicates a hypothetical condition (not a statement).

QUESTION 36.

Choice A is correct. The writer is here pointing out a negative characteristic of Comedy of Manners plays, their superficiality: A properly registers the negative tone of the sentence. Although the writer never indicates that this negative quality is unexpected (eliminating B), the writer does not provide the reasoning behind or specific examples of superficial Comedy of Manners plays: thus, eliminate C and D, respectively.

QUESTION 37.

Choice C is correct. “To forbid” is an irregular verb that takes the past tense form “was forbidden” as in answer C. While A wrongly repeats the present tense “forbid”, B and D both create wordy constructions that appear to be present-tense -ing uses: avoid these since the paragraph is describing seventeenth-century British history.

QUESTION 38.

Choice B is correct. Find an answer that addresses the “delights of the new theaters” and “comedies” in relation to King Charles: A deals with Charles’s exile, C is redundant (since Charles is already described as the “Merry Monarch”), and D deals with earlier Shakespearean theaters, NOT the “new theaters”. B calls attention to the “revelry” Charles enjoyed in a “more frivolous” country, and thus explains why he would have a temperament suited to delightful and comic theater.

QUESTION 39.

Choice C is correct. Throughout this sentence, the writer uses the pronoun “us” to describe the effect of Sheridan’s Comedy of Manners writings: C preserves this usage, while A (“one”) and B (“you”) disrupt it. D results in the phrase “allows how laughter can lead us”, which is disjointed in phrasing and disrupts the meaning of the original sentence.

QUESTION 40.

Choice A is correct. The underlined portion should be in parallel with the other past-tense verbs that occur in this sentence: “became” on its own keeps parallelism, while “he became” adds a needless pronoun. Eliminate B and D, and then eliminate C, since “eventual” should be the adverb “eventually”, which describes HOW or WHEN Sheridan “became”. A is thus the best answer.

QUESTION 41.

Choice C is correct. This sentence should present a contrast between how the names seem at first and the important information that they ultimately “reveal”: pointing out that the names “seem rather superficial” creates exactly such a contrast. A, B, and D all indicate that the names are STRANGE, not that they seem SIMPLISTIC as demanded by the contrast contained in the sentence. Some of these answers can also be eliminated as too informal or imprecise for the style of the essay.

QUESTION 42.

Choice C is correct. The underlined portion must begin with a noun designating “A playwright of multi-faceted intelligence”: “Sheridan” is an acceptable choice. Eliminate A and B, which create misplaced modifiers. D must be eliminated because it employs the wrong verb tense: “has . . . known” indicates that the action is continuing into the present, yet Sheridan lived and died centuries ago. C, which simply indicates that Sheridan “knew”, is thus the best answer.

QUESTION 43.

Choice B is correct. Create an effective transition that avoids redundancy: while B helpfully indicates EXACTLY when the action is taking place, A simply repeats the fact that the theater “burned to the ground” and C repeats the fact that Sheridan is “across the road” from the theater. D should only be used when presenting two linked or complementary IDEAS, not when coordinating a description of TIME and EVENTS.

QUESTION 44.

Choice B is correct. While paragraph 2 describes the new “comedies” that originated under Charles II and that mock “manners and foibles”, paragraph 1 explains the reception of “Comedy of Manners” after Charles’s time. Paragraph 2 should thus be placed immediately BEFORE paragraph 1, since paragraph 2 explains the origins of Comedy of Manners. Eliminate A, but also eliminate C and D, since these placements would interrupt the passage’s later focus on a single playwright, Richard Brinsley Sheridan.

Section 3: Math Test - No Calculator

QUESTION 1.

Choice B is correct. If x is the total number of text messages that Kiley wrote, then since Resha sent 4 less than twice the number of text messages Kiley sent, Resha sent $2x - 4$ text messages. Since Resha and Kiley sent a total of 842 text messages together, then $x + 2x - 4$ must be equivalent to 842, or $3x - 4 = 842$.

Choice A is incorrect and may result from neglecting Kiley's text messages as a part of the total. Choices C and D are incorrect and may result from errors in translating the context to mathematical equations.

QUESTION 2.

Choice C is correct. The expression $b\sqrt{b}$ can be rewritten as $b^1 \cdot b^{\frac{1}{2}}$. Exponent rules state that when one is multiplying powers, the exponents are added together. Therefore, $b^1 \cdot b^{\frac{1}{2}} = b^{\frac{3}{2}}$. The division rule for exponents states that when dividing powers, one subtracts the exponents. Therefore, the expression $\frac{b^3}{b^2}$ can be rewritten as b^1 and since $b^{\frac{3}{2}}$ is not equivalent to b^1 , choice C is the correct answer.

Choice A is incorrect because $\sqrt{b^3}$ can be rewritten as $b^{\frac{3}{2}}$, which is equivalent to $b\sqrt{b}$.

Choice B is incorrect because $b^{\frac{3}{2}}$ is equivalent to $b\sqrt{b}$. Choice D is incorrect because $\sqrt{\frac{b^5}{b^2}}$ can be rewritten as $\sqrt{b^3}$, which can be rewritten as $b^{\frac{3}{2}}$, which is equivalent to $b\sqrt{b}$.

QUESTION 3.

Choice D is correct. Adding 17 to both sides of $4x^2 - 17 = 11$ yields $4x^2 = 28$. Multiplying both sides by 4 yields $16x^2 = 112$.

Choice A is incorrect and may result from subtracting 17 from 11, yielding $4x^2 = -6$, which after multiplying by 4 on both sides becomes $16x^2 = -24$. Choice B is incorrect and may result from solving for x^2 rather than $16x^2$. Choice C is incorrect and may result from calculation errors.

QUESTION 4.

Choice B is correct. Taking the sum of $4x + 9y = 12$ and $5x + 3y = 12$ yields $9x + 12y = 24$. Dividing both sides of the equation by 3 yields $3x + 4y = 8$.

Choices A, C, and D are incorrect and may result from calculation errors while adding or subtracting the equations, or from calculation errors while attempting to solve for x and y individually.

QUESTION 5.

Choice C is correct. In the equation $\frac{a-2}{2} = \frac{3a}{a+8}$, cross-multiplying yields $(a-2)(a+8) = 6a$. Expanding the left-hand side of the equation yields $a^2 + 6a - 16 = 6a$ and after subtracting $6a$ from either side one can see that $a^2 - 16 = 0$, or $a^2 = 16$.

Choices A and B are incorrect and may result from solving for a instead of a^2 . Choice D is incorrect and may result from calculation errors.

QUESTION 6.

Choice D is correct. If the carpets were stained much deeper than expected, it would take a longer time to get the stains out with the same number of machines and laborers. Therefore, h , the number of hours, would be the variable that would change the most with deeply stained carpets. The only expression that includes h is CLh .

Choices A, B, and C are incorrect because they do not include h , which is the only variable that gets affected by extended time.

QUESTION 7.

Choice B is correct. A line that is perpendicular to a line with the equation $y = -Kx + t$ will have an opposite reciprocal slope. Therefore, the equation of this line in slope-intercept form would be $y = \frac{1}{K}x + b$. If the line goes through the point $(4, 3)$, substituting 4 for x and 3 for y yields $3 = \frac{1}{K}4 + b$. Subtracting $\frac{4}{K}$ from both sides reveals that $b = 3 - \frac{4}{K}$.

Choice A is incorrect and may result from incorrectly substituting 3 for x and 4 for y . Choice C is incorrect and may result from giving the line a parallel, or the same, slope and substituting 3 for x and 4 for y . Choice D is incorrect and may result from giving the line a parallel, or the same, slope.

QUESTION 8.

Choice C is correct. Since the point $(1, y)$ is the only solution to the system of linear equations, one can substitute 1 for x in the equation $2x + y = 15$, which yields $2(1) + y = 15$, or simply $y = 13$. Substituting 1 for x and 13 for y in the other equation, $kx - 4y = 100$, yields $k(1) - 4(13) = 100$ or $k - 52 = 100$, which simplifies to $k = 152$.

Alternately, one can multiply the first equation, $2x + y = 15$, by 4 on both sides, which yields $8x + 4y = 60$. Adding this new equation to $kx - 4y = 100$ yields $(k + 8)x = 160$. Substituting 1 for x yields $k + 8 = 160$, or simply $k = 152$.

Choices A, B, and D are incorrect and may result from basic substitution and/or calculation errors. For example, choice D is incorrect and results from adding 8 to 160, rather than subtracting 8.

QUESTION 9.

Choice B is correct. Since the quadratic function $y = -(x - 2)^2 + 4$ is in vertex form, the form given by $y = a(x - h)^2 + k$ where (h, k) is the coordinate of the vertex, one can see that the vertex of the quadratic function in question is $(2, 4)$. Substituting the points $(2, 4)$ and $(0, 0)$ into the distance formula, $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ yields $D = \sqrt{(2 - 0)^2 + (4 - 0)^2}$, which simplifies to $D = \sqrt{4 + 16} = \sqrt{20}$. Therefore, after simplifying the radical, $D = 2\sqrt{5}$.

Choices A, C, and D are incorrect and may result from a misunderstanding of the vertex form of a quadratic function or an incorrect application of the distance formula.

QUESTION 10.

Choice D is correct. If $g(2)$ were equivalent to 0, $(2, 0)$ would be an x -intercept of the function $g(x)$ and $x - 2$ would be a factor of $g(x)$. However, $g(2)$ does not equal 0, but instead, $g(2) = 1$. Looking at it another way, one can see that $g(2) = 0 + 1$. Therefore, if the function $g(x)$ were divided by the factor $x - 2$, there would be a remainder of 1.

Choices A, B, and C are incorrect because the question does not state that $g(2) = 0$, $g(1) = 0$, or $g(-2) = 0$, the conditions that would make $x - 2$, $x - 1$, and $x + 2$ factors of the function $g(x)$, respectively.

QUESTION 11.

Choice C is correct. Setting the equation $y = x^2 - 12x + 20$ equivalent to $y = -x^2 + 12x - 34$ yields $x^2 - 12x + 20 = -x^2 + 12x - 34$. Moving all terms in the equation to the left hand side by adding $x^2 - 12x + 34$ to both sides yields $2x^2 - 24x + 54 = 0$. Factoring out a 2 yields $2(x^2 - 12x + 27) = 0$, and factoring the expression $x^2 - 12x + 27$ yields $2(x - 9)(x - 3) = 0$. This makes the two solutions to the equation, 9 and 3. Substituting 3 for x in the equation $y = x^2 - 12x + 20$ yields $y = (3)^2 - 12(3) + 20$, or $y = -7$. Substituting 9 for x in the same equation yields $y = (9)^2 - 12(9) + 20$, or $y = -7$. Since the y -values of each point are the same, one can calculate the straight line distance between 9 and 3. The straight line distance between 9 and 3 is $9 - 3 = 6$.

Choices A and D are incorrect and may result from calculating the x -value of the points of intersection not the distance between them. Choice B is incorrect and may result from a calculation error.

QUESTION 12.

Choice B is correct. Dividing the expression $2x^2 - 7x + M$ by the binomial $2x + 5$ yields the following:

$$\begin{array}{r}
 \overline{)2x^2-7x+M} \\
 \underline{-(2x^2+5x)} \\
 -12x+M \\
 \underline{-(-12x-30)} \\
 M+30
 \end{array}$$

Therefore, the remainder is $\frac{M+30}{2x+5}$. If the remainder is given in the form $\frac{4M}{2x+5}$, it follows that $M+30=4M$. Subtracting M from both sides yields $30=3M$, or $M=10$.

Choices A, C, and D are incorrect and may result from calculation errors in performing polynomial long division or synthetic division.

QUESTION 13.

Choice C is correct. $\angle DAE$ and $\angle BAE$ are complementary angles whose sum is 90° . If $\angle BAE$ was equivalent to x , it follows that $\angle DAE$ is equivalent to $4x$. Then, solving the equation $x+4x=90$ yields $x=18$. Therefore, $\angle DAE$ is equivalent to $4(18)=72^\circ$. Due to the symmetry of a rectangle, $\angle ADE$ is equivalent to $\angle DAE$ making $\triangle AED$ isosceles. Subtracting $2(72)$ from 180 yields the measure of $\angle AED$ which is 36° . Since $\angle DAE$ and $\angle BEC$ are vertical angles, $\angle BEC$ also measures 36° . Therefore, $\angle AED+\angle BEC$ is equivalent to $36^\circ+36^\circ$, or 72° .

Choices A, B, and D are incorrect and may result from errors in understanding complementary angles and/or neglecting to account for the sum of two angles.

QUESTION 14.

Choice A is correct. If $|a-b|=2a$ then a must be non-negative since absolute values can only produce non-negative outcomes. Since $a+b=0$, then b must be equivalent to $-a$ in order to make both statements true. If $b=-a$, then the equation $a^2=b^2$ would be equivalent to $a^2=(-a)^2$, which is true. In the equation $a-b<0$, if $b=-a$ then $a-(-a)<0$, which is *not* true. Finally, in the equation $ab<0$, if $b=-a$ then $a(-a)<0$, which is true. However, if $a=0$ the equation would not be true and the question never states that a cannot be the same as b , nor that a cannot be equal to 0.

Choice B is incorrect because if a is equivalent to 0, ab is *not* less than 0. Choices C and D are incorrect because if $b = -a$ then $a - (-a)$ is *not* less than 0 and if a is equivalent to 0, ab is *not* less than 0.

QUESTION 15.

Choice A is correct. If one were to apply the quadratic formula, $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$,

to the equation $0 = 3x^2 + 2x - 4$, where $a = 3$, $b = 2$, and $c = -4$, the result would

be $\frac{-(2) \pm \sqrt{(2)^2 - 4(3)(-4)}}{2(3)}$. Simplifying yields $\frac{-2 \pm \sqrt{52}}{6}$ which can be rewritten as $\frac{-2 \pm 2\sqrt{13}}{6}$, or $\frac{-1 \pm \sqrt{13}}{3}$.

Choices B, C, and D are incorrect because they do not have roots with x -values

equivalent to $\frac{-1 + \sqrt{13}}{3}$ and $\frac{-1 - \sqrt{13}}{3}$.

QUESTION 16.

The correct answer is 1.5 or $\frac{3}{2}$. Subtracting 2 from both sides of the equation

$2 + \frac{3}{7}(x - \frac{1}{3}) = \frac{5}{2}$ yields $\frac{3}{7}(x - \frac{1}{3}) = \frac{1}{2}$. Multiplying each side by $\frac{7}{3}$ yields $x - \frac{1}{3} = \frac{7}{6}$,

and adding $\frac{1}{3}$ to both sides gives $x = \frac{9}{6}$. After simplifying, $x = \frac{3}{2}$.

QUESTION 17.

The correct answer is 4. Multiplying the binomial $x^2 + 1$ by the binomial $x^2 - 1$ in the equation $255 = (x^2 + 1)(x^2 - 1)$ yields $255 = x^4 - 1$. Adding 1 to both sides of the equation gives $256 = x^4$ and the 4th root of 256 is equivalent to ± 4 . Since x must be greater than 0, the answer is 4.

QUESTION 18.

The correct answer is 48. If Team A scored 30 points less than four times the number of points that Team B scored, using a for Team A's score and b for Team B's score yields $a = 4b - 30$. If Team C scored 61 points more than half of the number of points that

Team B scored, using c for Team C's score and b for Team B's score yields $c = \frac{1}{2}b + 61$.

If Team A and Team C shared in the victory then $a = c$. Therefore, $4b - 30 = \frac{1}{2}b + 61$.

Subtracting $\frac{1}{2}b$ and adding 30 to both sides of the equation yields $\frac{7}{2}b = 91$. Multiplying

both sides by $\frac{2}{7}$ yields $b = \frac{182}{7}$, or $b = 26$. Substituting 26 for b in either equation,

$a = 4b - 30$ for example, yields $a = 4(26) - 30 = 74$. Therefore, Team *A* and Team *C* scored $74 - 26 = 48$ more points than Team *B*.

QUESTION 19.

The correct answer is 144. Given that \overline{AB} intersects \overline{CD} , the angle below the angle that measures $3y^\circ$ also measures $3y^\circ$ because they are vertical angles. Therefore, $y^\circ + 3y^\circ + y^\circ = 180^\circ$ because the angles form a straight line. Combining like terms yields $5y^\circ = 180^\circ$ and dividing by 5 gives $y^\circ = 36^\circ$. Since on both sides of the triangle the exterior angles on the top measure y° and the exterior angles on the bottom measure x° , we know that the two horizontal lines in the diagram are parallel. Therefore, using the rule that the interior angles on the same side of a transversal are supplementary, it follows that $x^\circ + y^\circ = 180^\circ$. Substituting 36 for y yields $x^\circ + 36^\circ = 180^\circ$ and after subtracting 36° from both sides, $x^\circ = 144^\circ$.

QUESTION 20.

The correct answer is .416, .417, or $\frac{5}{12}$. If the height of the bridge is 2 feet above the

level of the water on one side and 12 feet above the level of the water on the other side, the actual height increase is 10 feet from one side of the river to the next. Looking at the distance straight across the river as one leg of a right triangle measuring x feet, the increase in the height of the river bank from one side to the other as the other leg which measures 10 feet, and the bridge's length of 26 feet as the hypotenuse, the Pythagorean Theorem, $a^2 + b^2 = c^2$, states that $x^2 + (10)^2 = (26)^2$. Simplifying yields the equation $x^2 + (10)^2 = (26)^2$ which is equivalent to $x^2 + 100 = 676$. Subtracting 100 from both sides yields $x^2 = 576$, or $x = 24$ feet. Alternatively, one could recognize the special right triangle side length relationship 5-12-13 which, when doubled, would yield 10-24-26. The tangent of the angle that the bridge makes with the surface of the water would be opposite over adjacent, which is the height change of the bank over the distance straight

across the river, or $\frac{10}{24} = \frac{5}{12}$.

Section 4: Math Test - Calculator

QUESTION 1.

Choice A is correct. Distributing the negative sign to the second half of the expression $(12x^2 + 5x + 1) - (10x^2 - 5x - 1)$ yields $12x^2 + 5x + 1 - 10x^2 + 5x + 1$. Combining like terms yields $2x^2 + 10x + 2$.

Choice B is incorrect and may result from neglecting to distribute the negative sign to the -1 at the end of the expression. Choice C is incorrect and may result from neglecting to distribute the negative sign to the $-5x$ near the end of the expression. Choice D is incorrect and may result from neglecting to distribute the negative sign to both the $-5x$ and the -1 at the end of the expression.

QUESTION 2.

Choice A is correct. In order to calculate the slope of the line that represents the points

in the table, one can use the points $(-3, 5)$ and $(0, 7)$, as well as the formula for finding

slope, $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting 7 for y_2 , 5 for y_1 , 0 for x_2 , and -3 for x_1 yields

$$m = \frac{(7) - (5)}{(0) - (-3)} = \frac{2}{3}. \text{ Being that } m = \frac{2}{3} \text{ and the } y\text{-intercept, } b, \text{ is } 7, \text{ as given by the point}$$

$(0, 7)$, the equation of the line that represents the data in the table in the form $y = mx + b$

$$\text{is } y = \frac{2}{3}x + 7.$$

Choices B and D are incorrect because their y -intercepts would indicate that the point $(0, 5)$ should be in the table, which it is not. Choice C is incorrect because the slope of the line, 2, does not match the change in y in relation to the change in x that is present in the table.

QUESTION 3.

Choice C is correct. In order to calculate the total number of actuarial students from 2008 through 2012, one must count every male and female from 2008 through 2012. This yields the sum $(10 + 2) + (10 + 5) + (8 + 7) + (4 + 8) + (2 + 8)$, which is equivalent to 64. The number of female students in 2011 was 8 and the number of female students in 2012 was also 8, which makes the total number of female students from 2011 and 2012 equivalent to 16. Therefore, the probability of randomly selecting a female actuarial student from 2011 or 2012 from all of the actuarial students from 2008 to 2012 is $\frac{16}{64}$, or $\frac{1}{4}$.

Choice A is incorrect and may result from calculating the probability of selecting a male from 2011 and 2012 instead of a female. Choice B is incorrect and may result from calculating the probability of selecting a female from only 2011 or from only 2012, but not from either/or. Choice D is incorrect and may result from calculating the probability of selecting any actuarial student from 2011 or 2012, not females only.

QUESTION 4.

Choice B is correct. If there are 1670 students in Lakesedge High School and approximately 22% of the students are sophomores, there are approximately $1670(.22) \approx 367$ sophomores. If approximately 40% of the sophomores take Contemporary American Issues, then approximately $367(.40) \approx 147$ students take the course. Therefore, approximately 150 sophomores take Contemporary American Issues.

Choices A, C, and D are incorrect and may result from percentage calculation errors.

QUESTION 5.

Choice D is correct. In 1994 the computer wholesale company had \$200,000 in sales. Over the next 5 years, the annual sales increased and decreased but generally rose to \$800,000 in sales in 1999. The increase in sales over the change in years is equivalent to

$$\frac{\$800,000 - \$200,000}{1999 - 1994} = \$120,000 \text{ per year. This approximately represents a } \$100,000 \text{ per}$$

year increase in sales, on average, from 1994 to 1999.

Choice A is incorrect because the sales do not steadily increase. The sales increase and decrease year after year. Choice B is incorrect because the sales did not increase then decrease from 1994 to 1999. The sales increased and decreased year after year. Choice C is incorrect and may result from misinterpreting the scale of the y -axis of the graph.

QUESTION 6.

Choice A is correct. Substituting 5 for a in the equation $\frac{7}{2}a = \frac{5}{b}$ yields $\frac{7}{2}(5) = \frac{5}{b}$, or $\frac{35}{2} = \frac{5}{b}$. Cross-multiplying yields $35b = 10$ and after dividing both sides of the equation by 35, the equation yields $b = \frac{10}{35} = \frac{2}{7}$.

Choices B, C, and D are incorrect and may result from calculation errors while solving for b .

QUESTION 7.

Choice D is correct. If Madeline can drink 13 bottles of water in 5 minutes, she can drink 13 bottles of water in $5(60) = 300$ seconds. If Madeline can drink 13 bottles of water in 300 seconds, then she can drink 3 bottles of water in x seconds. One can solve the proportion $\frac{13}{300} = \frac{3}{x}$ in order to find x , the number of seconds it takes Madeline to drink 3 bottles of water. Cross-multiplying yields $13x = 900$ and dividing both sides by 13 yields $x \approx 69$ seconds.

Choice A is incorrect and may result from calculating the approximate number of minutes it takes Madeline to drink 3 bottles of water instead of the approximate number of seconds. Choice B is incorrect and may result from a calculation error. Choice C is incorrect and may result from solving for approximately how long it takes Madeline to drink 1 bottle of water instead of 3 bottles of water.

QUESTION 8.

Choice D is correct. If the current enrollment for the training seminar for construction foremen is 42 and 6 years have passed since the seminar's inception, the point $(6, 42)$ would be a solution to the linear model that represents the enrollment in the seminar. Further, if enrollment has increased by 18 over 6 years, the slope of the linear model that represents the current enrollment would be $\frac{18}{6} = 3$ foremen per year. Substituting 3 for

m in the linear form $y = mx + b$ and substituting the point $(6, 42)$ for x and y yields $(42) = (3)(6) + b$, or $42 = 18 + b$. Subtracting 18 from both sides of the equation gives $b = 24$, which leads to the linear model $y = 3x + 24$.

Choices A and B are incorrect because a slope of 18 implies that the seminar's enrollment grew by 18 foremen per year, when in fact it grew by 18 foremen over the course of 6 years. Choice C is incorrect because the y -intercept of 42 is actually the current enrollment, not the initial enrollment that the y -intercept should represent.

QUESTION 9.

Choice B is correct. If Hernando were walking downhill his walking rate in miles per hour would be faster than his walking rate while walking uphill. At 3:00, Hernando recorded that he was walking at a rate of 5 miles per hour. At 3:30, Hernando reported that he was walking at a rate of 7 miles per hour. At some point in time between 3:00 and 3:30, Hernando switched from moving at a rate of 5 miles per hour to a rate of 7 miles per hour. Therefore, this implies that between 3:00 and 3:30, Hernando switched from walking uphill to walking downhill.

Choices A and C are incorrect because the walking rate does not change from 2:30 to 3:00, nor does it change from 3:30 to 4:00, which implies that during these times Hernando was walking uphill or downhill, but did not switch from one to the other. Choice D is incorrect because from 4:00 to 4:30 Hernando's walking rate drops, which would imply switching from walking downhill to walking uphill, not the opposite.

QUESTION 10.

Choice D is correct. Isolating the x -coordinate of the vertex, h , in the vertex form of a quadratic equation, $y = a(x - h)^2 + k$, first involves subtracting k from either side of the equation which yields $y - k = a(x - h)^2$. Dividing both sides of the equation by a

yields $\frac{y - k}{a} = (x - h)^2$ and taking the square root of both sides of the equation yields

$\sqrt{\frac{y - k}{a}} = x - h$. Adding h to both sides and subtracting $\sqrt{\frac{y - k}{a}}$ from both sides gives h

in terms of y , a , x , and k , $h = x - \sqrt{\frac{y - k}{a}}$.

Choices A, B, and C are incorrect and may result from errors in correctly applying the order of operations in order to isolate the variable h .

QUESTION 11.

Choice C is correct. An Empress tree grows at a rate of 15 feet per year and reaches maturity after 3.33 years. Therefore, the height of a mature Empress tree is $15(3.33) \approx 50$ feet. The Quaking Aspen tree grows at a rate of 5 feet per year and reaches maturity after 10 years. Therefore, the height of a mature Quaking Aspen is $5(10) = 50$ feet. At maturity, the Empress tree and the Quaking Aspen are approximately the same height.

Choices A, B, and D are incorrect because none of these pairs of trees are the same height when they have reached maturity.

QUESTION 12.

Choice C is correct. The Lombardy Poplar tree grows at a rate of 10 feet per year and reaches maturity after 6 years. Its height at maturity is $10(6) = 60$ feet, representing the tallest tree at maturity in the table. The Cleveland Pear tree grows at a rate of 4 feet per year and reaches maturity after 7.5 years, making its height at maturity $4(7.5) = 30$ feet, representing the shortest tree at maturity in the table. Multiplying the height of the shortest tree at maturity by the growth factor $(1 + r)$ and setting the expression equal to the height of the tallest tree at maturity will allow one to solve for r , the percentage increase in the height of the shortest tree compared to the height of the tallest tree. Therefore, $30(1 + r) = 60$. Dividing both sides of the equation by 30 yields $1 + r = 2$ and subtracting 1 from both sides makes $r = 1$, or 100%. Therefore, the height of the tallest tree at maturity in the table, the Lombardy Poplar tree, is 100% taller than the height of the shortest tree in the table, the Cleveland Pear tree.

Choice A is incorrect because 50% is how much shorter the shortest tree is at maturity than the highest tree at maturity. Choice B is incorrect and may result from a calculation error. Choice D is incorrect and may result from calculating what percent the tallest tree at maturity is compared to the height of the shortest tree at maturity rather than what percent *larger* the tallest tree at maturity is than the shortest tree at maturity.

QUESTION 13.

Choice D is correct. If the boy approaches the token dispensing machine once every 20 minutes for a total of m minutes, taking m and dividing it by 20 yields $\frac{m}{20}$, the total number of times the boy uses the token dispensing machine. If every time the boy uses the machine he uses a ten-dollar bill and the machine dispenses 4 tokens for every dollar it receives, then multiplying 10 by 4 yields $10(4)$, the number of tokens the boy receives every time he uses the token machine. If the boy visits the machine $\frac{m}{20}$ times and receives $10(4)$ tokens every time he uses the machine, then multiplying the two expressions together yields t , the total number of tokens the machine dispenses to the boy in m minutes. Therefore, $t = \frac{10(4)m}{20}$.

Choices A, B, and C are incorrect because they do not equal the correct number of total tokens, t , dispensed by the machine over the course of m minutes.

QUESTION 14.

Choice B is correct. By definition, the median is the middle number in a list of ordered numbers. If there is an even number of numbers in the list, the median is the average of the middle two numbers. In this case, placing the students' times in order from least to greatest yields: 6, 8, 8, 9, 12, 12, 13, and 14. The two middle times are 9 seconds and 12

seconds. The average of 9 and 12 is $\frac{9+12}{2} = 10.5$ seconds.

Choices A and D are incorrect and may result from selecting one of the 2 middle numbers when all of times are in order, rather than taking the average of the two middle numbers. Choice C is incorrect and may result from a calculation error.

QUESTION 15.

Choice D is correct. The student's experiment is an example of poor experimental design. The student places rubber bands of one type in a colder environment and rubber bands of another type in a warmer environment. In the end the results are clear that the rubber bands from Company A that were placed in the freezer for 15 minutes are less elastic before breaking than the rubber bands from Company B that were placed on the warming tray for 15 minutes. The issue is that the initial experiment as to whether or not temperature affects the elasticity before breaking of rubber bands is not clearly answered. The rubber bands from Company A that were in the freezer for 15 minutes definitely snapped at a shorter stretch distance. However, the student does not know whether or not the rubber bands snapped at a shorter stretch distance because they were colder in temperature, or because they were made by a different company. The fact of the matter is that according to this student's experimental design, it is possible that temperature has no effect on elasticity before breaking. Company A may just make a less elastic rubber band. Therefore, temperature is confounded with rubber band manufacturer and the student cannot make a legitimate inference about temperature and elasticity of rubber bands.

Choices A, B, and C are incorrect because none of the statements can be proven because of a poor experimental design due to confounding variables.

QUESTION 16.

Choice C is correct. If a single liter of Osmium is equivalent to 50 pounds, then 582 pounds of Osmium would be equivalent to $\frac{582}{50} = 11.64$ liters of Osmium. If there are 3.88 liters in a gallon, then 11.64 liters of Osmium would be equivalent to $\frac{11.64}{3.88} = 3$ gallons of Osmium.

Choices A, B, and D are incorrect and may result from calculation errors and/or errors in correctly applying unit conversions.

QUESTION 17.

Choice A is correct. Using the exponential model for the stock's growth, $y = 10(2)^x$, yields a price of $y = 10(2)^3 = \$80$ after 3 years have passed and a price of $y = 10(2)^4 = \$160$ after 4 years have passed. Therefore, the analyst who predicts exponential growth for the stock predicts that the stock will rise by $\$160 - \$80 = \$80$ from the third year to the fourth year. Looking at the linear model for the stock's growth, $y = 10 + 62x$, one can see that the slope, or change in price per year, is 62. Therefore,

the analyst who predicts linear growth for the stock predicts that the stock will rise by \$62 from the third year to the fourth year. Therefore, since $\$80 - \$62 = \$18$, the analyst who predicts exponential growth believes that the stock will grow by \$18 more from the third to fourth year than the analyst who predicts linear growth.

Choices B, C, and D are incorrect and may result from substitution and calculation errors while using the linear and exponential growth models.

QUESTION 18.

Choice B is correct. Building a table for the value of the stock, y , predicted by both the linear model and the exponential model at x , the times of 0, 1, 2, 3, 4, and 5 years after the stock's opening trading date yields the following:

$x =$	0	1	2	3	4	5
$y = 10 + 62x$	10	72	134	196	258	320
$y = 10(2)^x$	10	20	40	80	160	320

Three years after the stock's opening date, the linear model predicts the stock's price to be \$196 whereas the exponential model predicts the stock's price to be \$80. This is a difference of $\$196 - \$80 = \$116$, which is the largest advantage the linear model ever has over the exponential model.

Choices A, C, and D are incorrect because the difference between the linear model's prediction for the stock's price and the exponential model's prediction for the stock's price is not as high as year 3 in any of these years.

QUESTION 19.

Choice C is correct. Looking at the graph of $G(x)$ in the xy -plane, one can see that the function has 3 x -intercepts, or roots, one of which is at 0 and the other two of which have positive x -values. Therefore, one of the factors of the function $G(x)$ will be x and the other two factors will be in the form $(x - a)$ and $(x - b)$, where a and b represent the positive values of the two x -intercepts. Factoring the x out of the right-hand side of the function $y = x^3 - 6x^2 + 8x$ yields $y = x(x^2 - 6x + 8)$ and further factoring the expression $x^2 - 6x + 8$ yields $y = x(x - 2)(x - 4)$. Therefore, the function $y = x^3 - 6x^2 + 8x$ has two positive roots and one root at zero, the characteristics present in the graph of $G(x)$.

Choice A is incorrect because it is a polynomial of degree two and only has two roots, whereas the graph of $G(x)$ has three distinct roots. Choice B is incorrect because even though it is a cubic function, it only has one root at $x = 3$. Choice D is incorrect because in its factored form, $y = x(x + 2)(x + 4)$, it is clear there is a root at 0, but there are also two negative roots which are not present in the graph of $G(x)$.

QUESTION 20.

Choice B is correct. Suppose that the four numbers are a , b , c , and d . Then, $a + b + c + d = 84$. Further, if a is equivalent to $b + c + d$, then via substitution $(b + c + d) + b + c + d = 84$. Combining like terms yields $2b + 2c + 2d = 84$ and dividing both sides of the equation by 2 yields $b + c + d = 42$. Since the average of the other three numbers, b , c , and d , is equivalent to $\frac{b + c + d}{3}$, dividing both sides of the equation $b + c + d = 42$ by 3 yields $\frac{b + c + d}{3} = \frac{42}{3} = 14$.

Choices A, C, and D are incorrect and may be the result of not correctly applying the average formula or misinterpreting the target of the question. For example, choice D is incorrect because 42 is the sum of the other three numbers, not the average of the other three numbers.

QUESTION 21.

Choice A is correct. Making c the total number of candies that Mrs. Darcy had and t the number of trick-or-treaters that came to the house, if Mrs. Darcy had enough pieces of candy to give each trick-or-treater 2 pieces with 24 pieces left over, then $c = 2t + 24$. Further, if Mrs. Darcy only had enough money to give half of the trick-or-treaters 5 pieces of candy, then $c = 5(\frac{1}{2}t)$. Setting the two equations equal to each other yields $2t + 24 = 5(\frac{1}{2}t)$. Subtracting $2t$ from both sides of the equation yields $24 = \frac{1}{2}t$ and after multiplying both sides by 2, t is equivalent to 48 trick-or-treaters.

Choices B, C, and D are incorrect and may result from calculation errors when solving for the number of trick-or-treaters or errors in creating the appropriate equations to represent Mrs. Darcy's total candy count.

QUESTION 22.

Choice C is correct. Since $\angle acb$ and $\angle cab$ are complementary angles, the sum of $7x + 4$ and $4x - 2$ must be equivalent to 90. Combining like terms in the equation $7x + 4 + 4x - 2 = 90$ yields $11x + 2 = 90$. Subtracting 2 from both sides of the equation yields $11x = 88$ and then dividing by 11 yields $x = 8$. Substituting 8 for x in the expression $7x + 4$ yields $7(8) + 4 = 60$ and substituting 8 for x in the expression $4x - 2$ yields $4(8) - 2 = 30$. Being that $\triangle abc$ is a 30-60-90 right triangle, the ratio of \overline{ab} to \overline{bc} is equivalent to $\sqrt{3}$ to 1. Therefore, the tangent of $\angle acb$ is equivalent to $\frac{\sqrt{3}}{1}$, or just $\sqrt{3}$.

Choice A is incorrect because $\frac{1}{2}$ is the cosine of $\angle acb$. Choice B is incorrect because $\frac{1}{\sqrt{3}}$ is the tangent of $\angle cab$, not $\angle acb$. Choice D is incorrect because 2 is the cosecant of angle $\angle acb$.

QUESTION 23.

Choice B is correct. A cylindrical container with a height of 6 inches and a diameter of 3 inches has a radius of 1.5 inches. Substituting 6 for h and 1.5 for r into the formula for the volume of a cylinder, $V = \pi r^2 h$, yields $V = \pi(1.5)^2(6) = 13.5\pi$ cubic inches. The other cylindrical container with a diameter that is three times the diameter of the first cylindrical container will have a radius that is three times the original radius which would be $3 \times 1.5 = 4.5$ inches. A cylindrical equation with a radius of 4.5 inches would have a volume of $V = \pi(4.5)^2 h$ cubic inches. Setting $\pi(4.5)^2 h$ equal to 13.5π yields $\pi(4.5)^2 h = 13.5\pi$. Dividing both sides by π yields $(4.5)^2 h = 13.5$ and squaring 4.5 yields $20.25h = 13.5$. Then, dividing both sides by 20.25 gives $h = 0.66\ldots$ or $\frac{2}{3}$.

Choice A is incorrect because a container with a diameter of 9 and a height of $\frac{1}{3}$ would not have enough volume to hold all of the salt. Choices C and D are incorrect because containers with diameters of 9 and heights of $\frac{4}{3}$ inches and 2 inches, respectively, would hold more salt than 13.5π cubic inches.

QUESTION 24.

Choice A is correct. Substituting 10 for x in the equation $H(x) = 2.1x + 48$ yields $H(10) = 2.1(10) + 48$, which makes $H(10)$ equivalent to 69 inches. If a residual is defined as an observed data point minus a predicted data point, a residual of -3 would be equivalent to $Observed - 69$. If $Observed - 69 = -3$, adding 69 to both sides of the equation yields $Observed = 66$ inches. Therefore, the actual height of the person, or the observed height, is equivalent to 66 inches.

Choice B is incorrect because if the person's actual height were 69 inches, there would be a residual of 0. Choice C is incorrect and may result from accidentally flipping observed and expected in the defined equation for a residual. Choice D is incorrect and may result from a calculation error.

QUESTION 25.

Choice B is correct. A cube with a volume of 8 cubic inches has sides of length 2 because $\sqrt[3]{8} = 2$. A cube with a volume of 27 cubic inches has sides of length 3 because $\sqrt[3]{27} = 3$. If each side length is increased from 2 to 3, multiplying 2 by $(1+r)$ and setting the expression equal to 3 will reveal r , the percent increase in decimal form. Dividing both sides of $2(1+r) = 3$ by 2 yields $1+r = 1.5$ and after subtracting 1 from both sides $r = .5$, or 50%.

Choices A and C are incorrect and may result from calculation errors while solving for the percent increase in side length. Choice D is incorrect because 150% represents the percent that the side length of the cube with a volume of 27 is of the side length of the cube with a volume of 8, not how much *larger* the side length is comparatively.

QUESTION 26.

Choice C is correct. If at the end of each month an account increased by 10% more than \$100, then the account would increase by $\$100(1.10) = \110 each month. Increasing by \$110 each month represents linear growth, not exponential growth.

Choices A, B, and D are incorrect because all three answers describe an account that increases by a fixed percent each month, thus representing exponential growth.

QUESTION 27.

Choice C is correct. The slope of each line, h , is equivalent to m in the equation

$m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting h for m and the points $(5, 24)$ and $(15, h^2)$ into the equation

$m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $h = \frac{(h^2) - (24)}{(15) - (5)}$. Simplifying gives $h = \frac{h^2 - 24}{10}$ and multiplying

both sides by 10 yields $10h = h^2 - 24$. Subtracting $10h$ from both sides yields $0 = h^2 - 10h - 24$ and factoring the right-hand side gives $0 = (h - 12)(h + 2)$, which reveals the roots of 12 and -2 . Therefore, the sum of the roots is $12 + (-2) = 10$.

Choices A, B, and D are incorrect and may result from miscalculating the signs of one or both of the roots.

QUESTION 28.

Choice A is correct. Substituting $3c$ for a in the equation $a = 2b + 3$ yields $3c = 2b + 3$

and dividing each side of the equation by 3 yields $c = \frac{2}{3}b + 1$. Then, substituting $\frac{2}{3}b + 1$

for c in the equation $4c = 5d + 6$ yields $4(\frac{2}{3}b + 1) = 5d + 6$. Distributing the 4 on the left-

hand side yields $\frac{8}{3}b + 4 = 5d + 6$ and subtracting 6 from both sides gives

$\frac{8}{3}b - 2 = 5d$. Dividing both sides of the equation by 5 reveals that $d = \frac{8}{15}b - \frac{2}{5}$, or

$d = \frac{8b - 6}{15}$.

Choices B, C, and D are incorrect and may result from substitution and/or calculation errors while attempting to solve for d .

QUESTION 29.

Choice D is correct. The decay of a radioactive isotope can be represented by an

exponential decay model of the form $y = I(r)^{\frac{t}{a}}$, where y represents the mass of an isotope after t years have passed, with an initial mass of I , a decay factor of r , and a time of a years that it takes the isotope to complete one cycle of the decay factor. Substituting

202 for y , 20 for t , $\frac{1}{2}$ for r , and 40 for a yields $202 = I(\frac{1}{2})^{\frac{20}{40}}$. Raising $\frac{1}{2}$

to the power of $\frac{1}{2}$, or taking the square root of $\frac{1}{2}$, on the left hand side of the equation yields $202 = I\sqrt{\frac{1}{2}}$. Since $\sqrt{\frac{1}{2}}$ can be rewritten as $\frac{\sqrt{2}}{2}$, the equation $202 = I\sqrt{\frac{1}{2}}$ can be rewritten as $202 = \frac{\sqrt{2}I}{2}$. Multiplying both sides of the equation by $\sqrt{2}$ yields $I = 202\sqrt{2}$.

Choices A, B, and C are incorrect and may result from an error in setting up the appropriate exponential decay equation involving I . For example, choice A is incorrect because I and 202 were incorrectly swapped when their substitution took place.

QUESTION 30.

Choice D is correct. In a group of 250 men and women, if there are 50 more women than men, one can use x for men and $x + 50$ for women to develop the equation $x + x + 50 = 250$ which simplifies to $2x + 50 = 250$. Subtracting 50 from both sides of the equation yields $2x = 200$ and dividing by 2 makes $x = 100$. Therefore, there are 100 men and 150 women. Similarly, if there are 100 fewer doctors than lawyers, one can use x for lawyers and $x - 100$ for doctors to develop the equation $x + x - 100 = 250$ which simplifies to $2x - 100 = 250$. Adding 100 to both sides of the equation yields $2x = 350$ and dividing by 2 makes $x = 175$. Therefore, there are 175 lawyers and 75 doctors. If there are 30 male doctors, the remaining 45 doctors must be female. If there are a total of 150 women and 45 of them are doctors, the remaining 105 women are lawyers. If a woman is to be selected at random, the probability of selecting a lawyer is $\frac{105}{150}$, or $\frac{7}{10}$.

Choice A is incorrect because $\frac{3}{10}$ is the probability of selecting a doctor if a woman is to be selected at random. Choice B is incorrect because $\frac{2}{5}$ is the probability of selecting a man if a lawyer is selected at random. Choice C is incorrect because $\frac{3}{5}$ is the probability of selecting a woman if a lawyer is selected at random.

QUESTION 31.

The correct answer is 7. Adding $-x^2 + 22$ to $2x^2 + 7x - 52$ makes $g(x)$ equivalent to $x^2 + 7x - 30$. Factoring the right-hand side of the function $g(x) = x^2 + 7x - 30$ yields $g(x) = (x + 10)(x - 3)$. This form shows that the roots of the function $g(x)$ are -10 and 3 . Therefore, the absolute value of the sum the roots is equivalent to $|-10 + 3| = 7$.

QUESTION 32.

The correct answer is 5, 10, or 15. Jefferson could have the following sets of bills in his wallet to sum to a total of \$30:

1-\$10 bill,	1-\$5 bill,	and 15-\$1 bills.
1-\$10 bill,	2-\$5 bills,	and 10-\$1 bills.
1-\$10 bill,	3-\$5 bills,	and 5-\$1 bills.
2-\$10 bills,	1-\$5 bill,	and 5-\$1 bills.

Any other configuration of \$10, \$5, and \$1 bills that summed to \$30 would not have at least one of each bill. Therefore, the only possible number of \$1 bills Jefferson could have in his wallet would be 5, 10, or 15 one-dollar bills.

QUESTION 33.

The correct answer is 1.75 or $\frac{7}{4}$. If the area of circle O is 16π , setting 16π equal to πr^2 yields $\pi r^2 = 16\pi$. Dividing both sides by π yields $r^2 = 16$ and taking the square root of both sides of the equation reveals that the radius is 4. Given that the length of an arc is equivalent to the radius of the circle multiplied by the measure of the arc's central angle in radians, one can say that $7 = 4(\theta)$, where θ is the measure of the central angle that defines the arc in radians. Dividing both sides of the equation by 4 yields $\theta = \frac{7}{4}$, or 1.75 radians.

QUESTION 34.

The correct answer is 8. Solving the inequality $y \geq \frac{13}{2}x + 20$ as an equality,

$y = \frac{13}{2}x + 20$, for x , yields $y - 20 = \frac{13}{2}x$ and after multiplying both sides of the equation

by $\frac{2}{13}$ the equation reveals x as $x = \frac{2}{13}(y - 20)$. Distributing $\frac{2}{13}$ and combining like

terms yields $x = \frac{2y - 40}{13}$. Substituting $\frac{2y - 40}{13}$ for x in the inequality $x > -2$ yields

$\frac{2y - 40}{13} > -2$. Multiplying both sides of the inequality by 13 yields $2y - 40 > -26$ and

adding 40 to both sides gives $2y > 14$. Finally, dividing both sides by 2 yields $y > 7$. Therefore, the least integer value of y that satisfies the system of inequalities is 8.

QUESTION 35.

The correct answer is 86. If the sum of 8 different integers is 124 and at least three of them are greater than 10, the greatest possible value for one of the integers can be found by minimizing the other 7 integers. Since 5 of the integers are at most 10, the least possible values for these 5 integers would be 1, 2, 3, 4, and 5. Further, since the other two integers must be greater than 10, the least possible values for these two integers would be 11 and 12. Using x to represent the value of the largest possible integer in the set of 8 numbers yields the equation $1 + 2 + 3 + 4 + 5 + 11 + 12 + x = 124$. Simplifying yields $38 + x = 124$, or $x = 86$.

QUESTION 36.

The correct answers are 64 or 128. If the function has only one root at the point $(-4, 0)$, the only factor of the function is $x + 4$. In order to create the function, the only factor $x + 4$ must be squared to create $(x + 4)^2 = x^2 + 8x + 16$. Therefore, if $x^2 + 8x + 16$ is equivalent to the function $x^2 + abx + bc$, one can see that ab is equivalent to 8 and bc is equivalent to 16. The following set of values for a , b , and c satisfy both conditions:

- | | | | |
|----|---------|---------|----------|
| 1. | $a = 1$ | $b = 8$ | $c = 2$ |
| 2. | $a = 2$ | $b = 4$ | $c = 4$ |
| 3. | $a = 4$ | $b = 2$ | $c = 8$ |
| 4. | $a = 8$ | $b = 1$ | $c = 16$ |

Since the question states that $b < a < c$, then cases 3 and 4 are the only two combinations of a , b , and c that work. Therefore, $(4)(2)(8) = 64$ or $(8)(1)(16) = 128$.

QUESTION 37.

The correct answer is 76.5. If one newton of force is equivalent to approximately 0.225 pounds of force, then dividing 200 pounds by 0.225 pounds would yield the man's weight as approximately equivalent to 888.89 newtons. Substituting 888.89 for w and 9.8 (the gravitational acceleration on Earth) for g in the equation $w = mg$ yields $(888.89) = m(9.8)$. Dividing both sides of the equation by 9.8 reveals the man's mass, $m \approx 90.7$ kilograms. Substituting 90.7 for m and 3.75 (the gravitational acceleration on Mars) for g in the equation $w = mg$ yields $w = (90.7)(3.75)$, or $w = 340.125$ newtons. Multiplying 340.125 by 0.225 reveals the man's weight on Mars, $340.125 \times 0.225 \approx 76.5$ pounds.

Alternatively, since the man's mass of approximately 90.7 kilograms never changes, then the man's weight in pounds is directly proportional to the gravitational acceleration of the planet on which his weight is being calculated. So, weight in pounds on Earth divided

by $9.8 \frac{m}{s^2}$ is equivalent to weight in pounds on Mars divided by $3.75 \frac{m}{s^2}$. Cross-multiplying in the proportion $\frac{200}{9.8} = \frac{x}{3.75}$ yields $200(3.75) = 9.8x$. Dividing both sides by 9.8 yields $x = \frac{200(3.75)}{9.8} \approx 76.5$ pounds.

QUESTION 38.

The correct answer is 13. Since the scale on the mysterious planet reads 1,000 pounds, or 5 times his current weight on Earth of 200 pounds, then the gravitational acceleration on the planet would have to be 5 times the gravitational acceleration on Earth due to the fact that the man's mass, $m \approx 90.7$ kilograms as calculated in the answer explanation for Question 37, never changes. Therefore, the gravitational acceleration on the mysterious planet would be $5 \times 9.8 = 49 \frac{m}{s^2}$. Dividing 49 by 3.75 yields approximately 13.067. Therefore, the gravitational acceleration on the mysterious planet is approximately 13 times the gravitational acceleration of $3.75 \frac{m}{s^2}$ on Mars.