DIAGNOSTIC SAT DETAILED ANSWER KEY

Section 1: Reading

1. **C** **Specific Purpose**

Let's translate this question into a "stand-alone" question: "How is Smith's work presented in the first paragraph?" The passage states (line 3) that *Karl Smith has a good rule of thumb for* ***categorizing*** *epidemics*, then goes on to describe various types of epidemics in an effort to help visualize the types of spread. In other words, he is proposing a model for *conceptualizing phenomena*. (Note that the word *phenomena* refers simply to common occurrences. It has a neutral tone, not a positive one.)

2. **A** **Inference**

The passage states in lines 67–72 that *Nevin's paper was almost completely ignored* because *Nevin was an economist, not a criminologist, and his paper was published in* Environmental Research, *not a journal with a big readership in the criminology community.* In other words, Nevin's paper was ignored because it *was not presented by authorities with the proper credentials.*

3. **C** **Textual Evidence**

As the explanation to question 2 indicates, the evidence for this answer is lines 67–72, which includes the statement in (C).

4. **B** **Inference from Data**

According to the graph, the percent increase in violent crimes per 10,000 capita increased by 400% from 1963–1993. Notice that the graph only gives crime data for 1963–2013.

5. **D** **Inference from Data**

Nevin's hypothesis is phrased in the form of a question in lines 27–28: *Maybe reducing lead exposure had an effect on violent crime too?* Therefore, the portion of the graph that would *least* support his hypothesis is the portion that shows the *least* correlation between lead exposure and crime. The biggest gap in the two graphs (and hence the portion that provides the least support for his thesis) corresponds to the set of violent crime statistics from 2003 to 2013.

6. **C** **Specific Purpose**

The *sales of vinyl LPs* are mentioned to describe a statistic that also happens to correlate with preschool blood lead levels, thereby making the point that *a single correlation between two curves isn't all that impressive, econometrically speaking . . . No matter how good the fit, if you only have a single correlation it might just be coincidence.* Hence, it is a statistic that may be more coincidental than explanatory.

7. **D** **Interpretation**

The sentence in lines 21–24 indicates that *lead exposure in small children [had been linked] with a whole raft of complications later in life, including lower IQ, hyperactivity, behavioral problems, and learning disabilities.* These *complications* are *psychological problems* for those exposed to lead at a young age.

8. **A** **Interpretation**

When the passage states that the drivers *were unwittingly creating a crime wave two decades later* (lines 63–64), it indicates that they were *inadvertent abettors.*

9. **B** **Word in Context**

The phrase *even better* (line 49) refers to the finding mentioned in the previous sentence that *the similarity of the curves was as good as it seemed*, suggesting that the data showed an even stronger correlation than Nevin had hoped.

10. **D** **Specific Purpose**

The final paragraph discusses the fact that the *gasoline lead hypothesis* explains many additional phenomena, such as the difference between the murder rates in large cities (where there are lots of cars) and small cities (where there are fewer cars and therefore less lead exhaust exposure). These implications further support the hypothesis.

11. **B** **Cross-Textual Inference**

The author of Passage 1 indicates that Hemingway was a legendary figure whose work *seemed . . . to have been carved from the living stone of life* (lines 25–26) and therefore had a great impact on the author and his friends. Passage 2, however, suggests that Hemingway's works don't have the impact they once did, saying that they *now seem unable to evoke the same sense of a tottering world that in the 1920s established Ernest Hemingway's reputation* (lines 48–50) and *no longer seem to penetrate deeply the surface of existence* (lines 57–58). Therefore, the two passages disagree most strongly on the *incisiveness* (deep analytical quality) of Hemingway's work.

12. **C** **Textual Evidence**

As the answer to the previous question indicates, the best evidence for this answer is found in lines 24–26 and lines 56–58.

13. **C** **Cross-Textual Interpretation**

The author of Passage 1 regards Hemingway as a *legend* (line 16) whose *impact upon us was tremendous* (lines 18–19), but the author of Passage 2 calls Hemingway a *dupe of his culture rather than its moral-aesthetic conscience* (lines 66–67).

14. **D** **Cross-Textual Inference**

The author of Passage 1 indicates that, although Hemingway's work had a strong formative impact on him, it ultimately could not capture the true horrors of war that he and his friends were later to encounter:

The Hemingway time was a good time to be young. We had much then that the war later forced out of us, something far greater than Hemingway's strong formative influence (lines 33–36).

Likewise, the author of Passage 2 indicates that Hemingway's work did not fully capture the horrors of war: *We have had more war than Hemingway ever dreamed of* (lines 53–54) . . . *yet Hemingway's great novels no longer seem to penetrate deeply the surface of existence* (lines 56–58).

15. **A** **Word in Context, Purpose**

In saying that *the words he put down seemed to us to have been carved from the living stone of life* (lines 24–26), the author of Passage 1 means that Hemingway's words represent living truths that have the weight and permanence of stone carvings. In other words, his words represent the *salient* (prominent and important) *experience* of life.

16. **D** **Interpretation**

In saying that *we began unconsciously to translate our own sensations into their terms and to impose on everything we did and felt the particular emotions they aroused in us* (lines 28–32) the author is saying that he and his friends *identified* with Hemingway's language.

17. **B** **Inference**

According to Passage 1, the *lessons that [Hemingway] had to teach* (line 43) included the example he set as a war correspondent *writing a play in the Hotel Florida in Madrid while thirty fascist shells crashed through the roof* (lines 10–12) and as a soldier *defending his post single-handedly against fierce German attacks* (lines 13–15), both of which exemplify *confidence in the face of danger.*

18. **D** **Specific Purpose**

The phrase *a tottering world* (line 49) is used to describe the Europe of the 1920s that Ernest Hemingway depicts in his novels. The author compares this world to one whose *social structure is . . . shaken* (lines 51–52) and which had *more war than Hemingway ever dreamed of* (line 54). In other words, a world filled with *societal upheaval*.

19. **C** **Cross-Textual Inference**

The author of Passage 1 clearly views Hemingway as a personal and literary hero. Hence, a withering accusation such as the one in Passage 2 that *Hemingway, in effect, became a dupe of his culture rather than its moral-aesthetic conscience* (lines 66–67) would almost certainly be met with *vehement disagreement.*

Tip: Questions about how the author of one passage might *most likely* respond to some statement in another passage require us to focus on the *thesis and tone* of that author. Before attempting to answer such questions, remind yourself of the central theses of the passages.

20. **B** **Textual Evidence**

The best evidence for this answer comes from lines 28–32, where the author of Passage 1 says that *we began to unconsciously translate our own sensations into their terms and to impose on everything we did and felt the particular emotions they aroused in us*. In other words, Hemingway was in fact a kind of *moral-aesthetic conscience* for the author of Passage 1 and his friends.

21. **B** **Interpretation**

Passage 2 states that Hemingway's novels *yielded to the functionalist, technological aesthetic of the culture instead of resisting in the manner of Frank Lloyd Wright* (lines 63–66). In other words, Frank Lloyd Wright was more *iconoclastic* (culturally rebellious) than Hemingway.

22. **C** **Specific Purpose**

The first paragraph establishes the idea that *atoms, the building blocks of everything we know and love . . . don't appear to be models of stability*, a fact that represents a *scientific conundrum* (riddle), because instability is not a quality that we expect of *building blocks.*

23. **D** **Word in Context**

By asking *[w]hy are some atoms, like sodium, so hyperactive while others, like helium, are so aloof?* the author is drawing a direct contrast between chemical reactivity and relative *nonreactivity.*

24. **D** **Inference**

This question, about why protons stick together in atomic nuclei, is the guiding question for the passage as a whole. The next paragraph analyzes this question in more detail, explaining why this well-known fact is actually so puzzling. The remainder of the passages discusses attempts to resolve this puzzle, which remains at the heart of quantum physics.

25. **A** **Textual Evidence**

The evidence that this question represents a *central conundrum* is found in lines 1–5, where the author makes the uncontroversial claim that *a sound structure requires stable materials*, but then makes the paradoxical claim that *atoms, the building blocks of everything we know and love . . . don't appear to be models of stability.*

26. **A** **Specific Purpose**

The two sentences in lines 13–19 (*We are told . . . electrons. We are also told . . . closer*) indicate that we, the educated public, have been taught two seemingly contradictory facts about atoms. In other words, these are *predominant conceptions.*

27. **C** **Inference from Data**

In the graph, the equilibrium point is indicated by a dashed vertical line labeled *Equilibrium*. If we notice where this line intersects the two curves, we can see that the corresponding electrostatic force is precisely opposite to the corresponding strong nuclear force. That is, the equilibrium point is where the two forces "cancel out" and have a sum of 0.

28. **C** **Inference from Data**

Tip: When a question asks about a graph or table, it helps to circle the words or phrases in the question that correspond to the words or phrases in the graph or table. In this case, circle the key phrases *electrostatic repulsion* and *separated by 1.5 femtometers* in both the question and the graph.

Now, if we go to the graph and find the vertical line that corresponds to a *separation of 1.5 femtometers*, we can see that it intersects the curve for *electrostatic force* at the horizontal line representing 10^2, or 100, Newtons.

29. **C** **Interpretation**

In the fourth paragraph, we are told that Hideki Yukawa *proposed that the nuclear force was conveyed by a then-undiscovered heavy subatomic particle he called the pi meson (or "pion"), which (unlike the photon) decays very quickly and therefore conveys a powerful force only over a very short distance* (lines 44–49). However, his theory *was dealt a mortal blow by a series of experiments . . . that demonstrated that pions carry force only over distances greater than the distance between bound protons* (lines 50–55). In other words, pions are *ineffective in the range required by atomic theory*, so they cannot be the carriers of the strong nuclear force.

30. **B** **General Structure**

The first paragraph of this passage introduces the *scientific conundrum* of how protons adhere in atomic nuclei. The second paragraph analyzes this strange situation. The third paragraph describes a force, the strong nuclear force, that could solve the conundrum. The fourth paragraph describes a particular theory, now refuted, about what might convey this strong nuclear force. The fifth and sixth paragraphs indicate that the problem has yet to be satisfactorily resolved. Thus, the passage as a whole is *a description of a technical puzzle and the attempts to solve it.*

31. **A** **Literary Devices**

A **rhetorical question** is a question intended to convey a point of view, rather than suggest a point of inquiry. Although the first and second paragraphs include five questions, they are all inquisitive, not rhetorical.

The passage includes **illustrative metaphors** in lines 15–16 (*a cloud of speedy electrons*) and lines 55–56 (*a plumber's wrench trying to do a tweezer's job*), **technical specifications** in lines 29–40 (*First, it can't have . . . each other*), and **appeals to common intuition** in lines 1–2 (*a sound structure . . . materials*) and lines 13–16 (*We are . . . electrons*).

32. **B** **Word in Context**

The hope that *QCD ties up atomic behavior with a tidy little bow* is the hope that the QCD theory *resolves* the problem in a tidy way.

33. **C** **General Purpose**

The passage as a whole develops the thesis that *the wise legislator does not begin by laying down laws good in themselves, but by investigating the fitness of the people, for which they are destined, to receive them* (lines 3–6). In other words, the passage is concerned with *examining the social conditions that foster effective legal systems.*

34. **C** **Word in Context**

In saying that *the architect sounds the site to see if it will bear the weight*, the author means that the architect *probes* the proposed location for a building to make sure that it is safe to build upon.

35. **A** **Specific Purpose**

The analogy of the architect in the first paragraph illustrates the thesis of the passage that *the wise legislator does not begin by laying down laws good in themselves, but by investigating the fitness of the people, for which they are destined, to receive them* (lines 3–6). That is, that a *nation's civil code depends on the nature of its people.* Choice (B) is incorrect because the analogy is not about the *foundational principles* of laws, but rather the *fitness of the people* for whom they are intended.

36. **A** **Inference**

The author states that as a nation grows older, its citizens *become incorrigible* (unable to be improved). *Once customs have become established and prejudices inveterate*

(deep-seated), *it is dangerous and useless to attempt their reformation* (lines 19–21). That is, the people become stubbornly resistant to political change.

37. **B** **Textual Evidence**

As the explanation to the previous question indicates, the relevant evidence is found in lines 20–21.

38. **B** **Interpretation**

When the author says that *[m]ost peoples, like most men, are docile only in youth* (lines 17–18), he is saying that societies (the *peoples*) as well as individuals (*men*) become less manageable as they age.

39. **B** **Specific Purpose**

The author refers to *Sparta at the time of Lycurgus* (line 35) as an example of a *state, set on fire by civil wars, [which] is born again* (lines 31–32). That is, a *society rejuvenated by conflict*. Choice (A) may seem tempting, because the beginning of the paragraph mentions the fact that *periods of violence* (lines 28–29) can make people *forget the past*, but the paragraph explains that this forgetting has the effect of renewal, not paralysis.

40. **B** **Interpretation**

Although the word *constitution* can be used to mean *the documented rules by which a nation defines its governmental institutions* (as in the *Constitution of the United States of America*), the phrase *the constitution of the state,* as it is used in this passage, clearly refers to the *composition* of the state, that is, the people who constitute the nation.

41. **A** **Interpretation**

In saying that *[o]ne people is amenable to discipline from the beginning; another, not even after ten centuries* (lines 51–53), the author means that some nations are *ready to be governed by the rule of law* as soon as they are founded, but others require much more time.

42. **D** **Inference**

The passage states that *Peter the Great . . . lacked true genius [because he] did not see that [his nation] was not ripe for civilization: he wanted to civilize it when it needed only hardening* (lines 55–61). In other words, he did not give his nation the *hardening* it needed: his flaw was his *irresolution* (hesitancy due to a lack of conviction) *in exerting control*.

43. **C** **General Purpose**

The first sentence of the passage establishes its central purpose: *to understand the views of Aristotle*, and asserts that to do this *it is necessary to apprehend his imaginative background* (lines 1–3). In other words, the purpose of this passage is to *describe the conceptions that inform a particular mindset.*

44. **B** **Interpretation**

When the author states that *Animals have lost their importance in our imaginative pictures of the world* (lines 29–30), he is reinforcing his point that modern students *are accustomed to automobiles and airplanes; they do not, even in the dimmest recesses of their subconscious imagination, think that an automobile contains some sort of horse inside, or that an airplane flies because its wings are those of a bird possessing magical powers* (lines 23–29). In other words, *animistic beliefs no longer inform our physical theories.*

45. **D** **Interpretation**

When the author states that *[e]very philosopher, in addition to the formal system that he offers to the world, has another much simpler system of which he may be quite unaware* (lines 3–6), the *simpler system* refers to the *imaginative background* (line 3) that informs a scientist's formal theories. However, if a scientist is aware of this simpler system, *he probably realizes that it won't do* (line 7). Therefore, this system is a *relatively unrefined way of thinking.*

46. **A** **Inference**

In lines 61–65, the author states that *It was natural that a philosopher who could no longer regard the heavenly bodies themselves as divine should think of them as moved by the will of a Divine Being who had a Hellenic love of order and geometric simplicity.* In other words, the astronomical theories of some ancient Greek philosophers were closely associated with their religious ideas.

47. **D** **Textual Evidence**

As the explanation to the previous question indicates, the evidence for this answer is in lines 61–65.

48. **D** **Word in Context**

When the author states that, to the Greek, *it seemed more natural to assimilate apparently lifeless motions to those of animals* (lines 46–47), he means that the ancient Greeks found it easy to *liken* the motion of machines to the motion of animals.

49. **D** **Inference**

The passage states that *To the ancient Greek, attempting to give a scientific account of motion, the purely mechanical view hardly suggested itself, except in the case of a few men of genius such as Democritus and Archimedes.* In other words, most Greeks were not inclined toward the mechanical view, except for the men of genius, who had more accurate *metaphors for the laws of motion, and therefore were "willing to disregard conventional wisdom."*

50. **C** **Inference**

As it is discussed in the passage, the *apparent gulf between animals and machines* (lines 44–45) is the ever-shrinking gap between the animistic and the mechanistic view of animal physiology. To the modern scientist, each piece of evidence that demonstrates how *the body of an animal is a very elaborate machine, with an enormously complex physical and chemical structure* (lines 41–43) serves to bridge this gulf. One example of such evidence might be *the mechanical laws that describe bumblebee flight.*

51. **B** **Inference**

The first paragraph discusses the fact that *the views of Aristotle* (line 1) are *due to his imaginative preconceptions, or to what Santayana calls "animal faith"* (lines 17–18), which the author goes on to explain include *animistic tendencies*, that is, tendencies toward seeing living spirits in all physical phenomena.

52. **D** **Textual Evidence**

Lines 45–47 also reinforce the author's point that Aristotle, like other ancient Greeks, was inclined toward an animistic view of the world: *To the Greek, it seemed more natural to assimilate apparently lifeless motions to those of animals*.

Section 2: Writing and Language

1. **B** **Subject-Verb Agreement**

The subject of this verb is *demand*, which is singular. Therefore, *are* must be changed to *is*.

2. **C** **Diction**

This question asks you to choose the word that best fits the semantic context of the sentence, that is, the word that helps the sentence to convey a logical idea in the context of the paragraph.

This previous sentence states that *an important challenge facing the healthcare industry is how to address this shortfall without sacrificing quality of care.* Among our options, the only one that suggests a *possible solution* to this problem is *to incentivize more medical school graduates to choose primary care.*

Although it may seem that *interest* is a reasonable choice, notice that its use would violate idiom in this sentence: the correct idiom is not *interest someone to do something*, but rather *interest someone in doing something.*

3. **C** **Logical Comparisons**

This portion of the sentence is part of a parallel construction in the form *A instead of B*. In such constructions, the words or phrases in *A* and *B* must have the same grammatical form and describe logically comparable (or contrastable) things. Since in this case *A* is *primary care* (a noun phrase indicating a medical specialty), the most logical choice for *B* is *the more lucrative specialties* (a noun phrase indicating medical specialties). The original phrasing is incorrect because *their choosing* does not indicate a medical specialty, (B) is incorrect because *to choose* does not indicate a medical specialty, and choice (D) is incorrect because it is redundant.

4. **A** **Parallelism**

Words or phrases in a list should have the same grammatical form. In the original phrasing, the three items in the list are all present tense verbs: *talk . . . prescribe . . . perform*.

5. **B** **Diction**

Because a *"team-based" model* is not a location, the use of the pronoun *where* is incorrect. Likewise, choice (D) *when* is incorrect because a *"team-based" model* is not a time. Choice (C) is incorrect because it produces a comma splice. The correct answer is (B) *whereby*, which means *by which*.

6. **C** **Diction**

The adverb *still* means *even now* or *nevertheless*, neither of which fit the logical context of this sentence. Only choice (C) *while*, meaning *at the same time*, fits logically. Choice (B) *while at the same time* is redundant, and choice (D) *although* implies a contrast, which is illogical.

7. **A** **Coordination of Ideas, Cross-References**

The subject of the inserted sentence is *these professionals*. The pronoun *these* requires an antecedent, which is best provided if the sentence is placed after sentence 1, which specifies *medical professionals like physician assistants (PAs) and nurse practitioners (NPs).*

8. **D** **Data Analysis**

The descending line in the graph shows clearly that the percentage of PAs in primary care has declined from 51% in 2000 (over one-half) to 31% in 2010 (under one-third).

9. **A** **Logical Comparisons, Pronoun-Antecedent Agreement**

This sentence is correct as written. The pronoun *they* agrees in number and kind with its antecedent *students*, and the comparison is logical. Choice (D) is redundant.

10. **D** **Idiom, Pronoun-Antecedent Agreement**

Using the phrase *being that* to mean *because* is colloquial and nonstandard for written American English, therefore choices (A) and (C) are incorrect. Choice (B) is incorrect because *when* should only be used to refer to a time.

11. **D** **Pronoun-Antecedent Agreement, Cross-References**

The definite pronoun *they* must refer to some plural noun, but the only possible plural antecedent in this sentence is *programs*, which would be illogical. Choice (D) clarifies the reference.

12. **C** **Punctuation**

The four choices differ only in their punctuation. Any reference to a city-and-country or city-and-state must separate the two with commas: e.g. *London, England* or *Providence, Rhode Island*. Therefore the original punctuation in (A) is incorrect. Choice (B) is incorrect because it produces a sentence fragment. Choice (D) is incorrect because it misuses the semicolon: the two phrases on either side of the semicolon should be independent clauses.

13. **B** **Logic, Dangling Participles**

Since *engineering* is a class of profession and not a *position*, the original phrasing is illogical. Choice (C) is incorrect because it is a dangling participial phrase: the past participle *considered* does not share a subject with the main clause. Choice (D) is incorrect because the phrase *in reputation* is not idiomatic.

14. **D** **Dangling Participles**

The sentence begins with the participial phrase *suffering ridicule and isolation.* Any participial phrase must have the same subject as the main clause. In the original phrasing, the subject of the main clause is *Montessori's medical studies,* but this cannot be the subject of *suffering ridicule and isolation.* Therefore, choices (A) and (C) are both incorrect. Choices (B) and (D) both correct this problem by changing the subject of the main clause to *Montessori*, but (B) is incorrect because the phrase *by becoming* is illogical.

15. **A** **Parallelism**

This sentence contains the parallel construction *A rather than B*. The original phrasing provides parallel phrasing: *respect and stimulation* shares the same grammatical form and semantic category as *the regimentation*. Choice (D) provides a parallel phrasing but illogically implies that the students *were receiving* institutions.

16. **B** **Diction, Agreement**

The original phrasing is incorrect because *they're* is a contraction of *they are*, which is illogical in this context. Choice (C) is incorrect because *childrens'* is not a word at all. *Children* is the plural form of *child*, and the possessive form of *children* is *children's*. Choice (D) is incorrect because *their* disagrees in number with the antecedent *each*.

17. **C** **Diction**

This sentence discusses how word of Montessori's success with her school began to *spread* of its own merit and accord. Choices (A) and (D) are incorrect because both *distribute* and *exhibit* imply intentional action. Choice (B) is illogical: *word* of someone's success cannot *increase*.

18. **D** **Logical Cohesiveness**

To understand which sentence most effectively introduces this paragraph, we must first understand what the paragraph is about. As a whole, the paragraph discusses how *Montessori schools were regarded as a remedy to the educational programs associated with rapid urban population growth in Europe . . .* but then *came to be seen as a threat to the power of the state.* Choice (D) encapsulates this idea the best.

19. **C** **Logical Transitions**

Choice (C) provides the most logical transition between ideas in the paragraph: the shift from a positive view of Montessori's work to a negative view requires a contrasting transition like *however.*

20. **D** **Redundancy**

The original phrasing is redundant: being *subversive* is the same as *undermining power.* The most concise correct phrasing is that in (D).

21. **B** **Subject-Verb Agreement**

In the original phrasing, the subject *response* (singular) disagrees with the verb *were* (plural) *divided.* Choice (B) provides the most effective correction.

22. **A** **Logical Cohesiveness**

The remarkable thing about this paragraph is its introduction of dissenting views on Montessori's work from within the field of education, rather than merely from political opponents. Any additional discussion in this paragraph should elaborate on the nature of that dissent in the educational community. Only choice (A) extends the discussion in a relevant way.

23. **D** **Redundancy**

This sentence is asserting a claim that directly contrasts the point of view presented in the previous paragraph. Choice (D) *In fact,* introduces just such an assertion. Choice (A) *First* is incorrect because this claim is not part of an enumerated list. Choice (B) *So* is incorrect, because this sentence is not asserting a logical consequence of the previous claim. Choice (C) *While* is incorrect because it produces a sentence fragment.

24. **C** **Diction, Idiom**

The original phrasing is incorrect because the phrase *complies [to]* is not idiomatic. The same is true of (B) *overlaps [to]* and (D) *concurs [to].* Choice (C) *corresponds [to],* however, is idiomatic and logical.

25. **A** **Coordination of Ideas**

This phrase is correct as written. It is expressing a condition, and so the use of the conjunction *if* is correct.

26. **D** **Dangling Participles**

The participle *pondering* and the main clause must share the same subject, or else the participle "dangles." Who was *pondering*? Plato. Therefore *Plato* must be the subject of the main clause. Choice (C) is incorrect, however, because there is no need for the past participle form *had argued*.

27. **C** **Parallelism**

The sentence contains the parallel construction *A yet B*. The phrasing *inaccessible . . . yet apprehensible* provides a parallel form, since both *inaccessible* and *apprehensible* are adjectives.

28. **B** **Modifier Usage**

The phrase between the commas is an interrupting modifier. Any sentence should remain grammatically complete even when any interrupting modifier is removed. Notice that if we did this with the original sentence, it would read *as effective . . . than sensory experience*, which is clearly unidiomatic. (The correct comparative idiom is *as effective as*.) The only choice that corrects this problem is (B).

29. **C** **Logical Cohesiveness**

The information the author is proposing does not fit with the discussion about the philosophy of Platonic idealism.

30. **D** **Modifier Form**

In the original phrasing, the conjunction *and* is incorrect because it does not conjoin comparable words or phrases; therefore, choices (A) and (C) are incorrect. In choice (B) the prepositional phrase *in not having to believe* is illogical. Choice (D) is correct because the prepositional phrase *without having to believe* logically modifies the verb *understand*.

31. **A** **Possessives**

This sentence is correct as written. Choice (B) is incorrect because the pronoun *they* has no clear antecedent. Choice (C) misuses the possessive *brain's*, and choice (D) yields the subject-verb disagreement *brain make*.

32. **C** **Verb Mood**

This clause is part of a counterfactual hypothesis. As we discuss in Chapter 4, Lesson 30, a present counterfactual hypothesis takes the form of the present subjunctive mood, which is usually the same form as the simple past tense: *existed*.

33. **B** **Pronoun Consistency**

Since the previous sentence refers to *our brains*, pronoun consistency requires that this sentence continue to use the first-person plural pronoun *we*.

34. **B** **Coordination of Clauses**

The interrupting modifier (*perhaps while showering or driving*) must be "bracketed" on either end by commas, em dashes, or parentheses. Since it clearly ends with an em dash, it must start with an em dash as well.

35. **A** **Pronoun Form**

This sentence is correct as written. Choice (B) uses the wrong pronoun form *what* and incorrectly implies that Archimedes is shouting in the present. Choice (C) uses the wrong pronoun form *that* and misplaces the modifying clause *it is said*. Choice (D) misuses the past perfect form *had shouted*.

36. **B** **Diction**

The sentence discusses the relationship between the *feeling* of the Eureka effect and *a fundamentally different way of thinking*. In the context of the discussion, the only choice that indicates a logical relationship is (B): this feeling *indicates* a different way of thinking.

37. **D** **Coordination of Clauses**

The original phrasing is incorrect because it includes a comma splice. Choice (B) is incorrect because the prepositional phrase *by which* is illogical. In choice (C), the use of the pronoun *where* is incorrect because an experiment is not a place.

38. **C** **Subject-Verb Agreement, Redundancy**

The verb *requires* (singular) disagrees with the subject *tasks* (plural), therefore choices (A) and (D) are incorrect. Choice (B) is redundant.

39. **C** **Subject-Verb Agreement**

The modifying phrase *as soon as solving it* is vague and awkward. Choice (C) clarifies the modifier by indicating that the *subjects* are solving the task.

40. **D** **Awkwardness, Logical Transitions**

The underlined phrase is a sentence modifier, that is, a phrase that modifies the statement in the main clause *experimenters found*. Choices (A), (B), and (C) are needlessly awkward and wordy, but choice (D) provides a concise and clear modifier.

41. **B** **Verb Tense**

This clause is describing a general fact (*the theory that . . .*), not an event. To express general facts, we use the simple present tense: *corresponds*.

42. **B** **Data Analysis**

According to the graph, the line indicating the Insight condition separates from the line representing the Non-insight condition approximately 0.3 seconds prior to the button being pushed, and remains elevated until about 0.7 seconds after the button is pushed, for a duration of approximately 1 second.

43. **D** **Pronoun-Antecedent Agreement, Subject-Verb Agreement**

The verb *is* agrees with the subject *interpreting* (both are singular), but the pronoun *this* disagrees with its antecedent *data* (*this* is singular, but *data* is plural).

44. **B** **Coordinating Clauses**

The correct choice should combine the two questions into a single sentence. Choice (A) misstates the second question. Choice (C) inappropriately uses the subjunctive mood. Choice (D) misuses the parallel construction *both A and B*.

Section 3: Math (No Calculator)

1. **B** **Algebra (solving equations) EASY**

$6x + 9 = 30$

To solve in one step, just divide both sides by 3: $2x + 3 = 10$

Most students waste time solving for x, which will work, but takes longer: $6x + 9 = 30$

Subtract 9: $6x = 21$

Divide by 6: $x = 3.5$

Evaluate $2x + 3$ by substituting $x = 3.5$: $2x + 3 = 2(3.5) + 3 = 7 + 3 = 10$

2. **D** **Advanced Mathematics (nonlinear systems) EASY**

The solutions to the system correspond to the points of intersection of the two graphs. The figure shows four such intersection points.

3. **B** **Algebra (algebraic expressions) EASY**

Let a = # of adult tickets sold, and c = # of child tickets sold. If 300 tickets were sold altogether: $c + a = 300$

The revenue for a adult tickets sold at \$5 each is $\$5a$, and the revenue for c child tickets sold at \$3 each is $\$3c$. Since the total revenue is \$1,400: $5a + 3c = 1{,}400$

4. **A** **Advanced Mathematics (polynomials) EASY**

$2(x-4)^2 - 5x$

Factor: $2[(x-4)(x-4)] - 5x$

FOIL: $2[x^2 - 4x - 4x + 16] - 5x$

Simplify: $2[x^2 - 8x + 16] - 5x$

Distribute: $2x^2 - 16x + 32 - 5x$

Combine like terms: $2x^2 - 21x + 32$

5. **C** **Special Topics (three-dimensional geometry) MEDIUM**

On the drawing, we should first mark the areas of the three faces. The front and back faces both have an area of $3a$. The left and right faces both have an area of $3b$. The top and bottom faces both have an area of ab. We should now try to find integer values for a and b so that these areas match those given in the choices.

(A) 15, 18, and 30 — This is possible if $a = 5$ and $b = 6$.

(B) 18, 24, and 48 — This is possible if $a = 6$ and $b = 8$.

(C) 12, 15, and 24 — This cannot work for any integer values of a and b.

(D) 15, 24, and 40 — This is possible if $a = 5$ and $b = 8$.

6. **D** **Algebra (linear equations) MEDIUM**

$C(n) = an + b$

Since this expression is linear in n (the input variable, which represents the number of necklaces produced), the constant a represents the slope of this line, which in turn represents the "unit rate of increase," in other words, the increase in total cost for each individual necklace produced.

The constant b represents the "y-intercept" of this line, which in this case means the costs when $n = 0$ (that is, the fixed costs before any necklaces are produced).

7. **A** **Algebra (lines) MEDIUM**

To find the slope of line l, we can find two points on l and then use the slope formula.

$f(x) = 2x^2 - 4x + 1$

Plug in -1 for x: $f(-1) = 2(-1)^2 - 4(-1) + 1$

Simplify: $f(-1) = 2(1) + 4 + 1 = 2 + 4 + 1 = 7$

Therefore line l intersects the function at $(-1, 7)$.

Plug in 2 for x: $f(2) = 2(2)^2 - 4(2) + 1$

Simplify: $f(2) = 2(4) - (8) + 1 = 8 - 8 + 1 = 1$

Therefore line l intersects the function at (2, 1). Now we find the slope of the line containing these two points.

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7-1}{-1-2} = \frac{6}{-3} = -2$$

8. **B** **Advanced Mathematics (parabolas) MEDIUM**

The general equation of a parabola in the xy-plane is $y = a(x - h)^2 + k$, in which (h, k) is the vertex. Now let's express each choice in precisely this form.

(A) $y = (x-3)^2 + 2$ $y = 1(x-3)^2 + 2$ $a = 1, h = 3, k = 2$

(B) $y = 2(x-3)^2$ $y = 2(x-3)^2 + 0$ $a = 2, h = 3, k = 0$

(C) $y = 2x^2 - 3$ $y = 2(x-0)^2 - 3$ $a = 2, h = 0, k = -3$

(D) $y = 3x^2 + 2$ $y = 3(x-0)^2 + 2$ $a = 3, h = 0, k = 2$

If this vertex is on the x-axis, then $k = 0$. The only equation in which $k = 0$ is (B).