DIAGNOSTIC TEST 1: MULTIPLE-CHOICE ANSWER KEY

Let's take a look at how you did on Diagnostic Test 1. Follow the two-step process in the scorecard below and read the explanations for any questions you got wrong, or you struggled with but got correct. Once you finish working through the scorecard and the explanations, go to the next chapter to make your study plan.

STEP 1» Check your answers and mark any correct answers with a ✔ in the appropriate column.

Reading and Writing Comprehension—Module 1							
Q #	**Ans.**	**✔**	**Chap. # Section**	**Q #**	**Ans.**	**✔**	**Chap. # Section**
1	D		**7,** Vocabulary	15	C		**16,** Pronouns
2	B		**7,** Vocabulary	16	C		**13,** Who or What Are You Talking About?
3	B		**7,** Purpose (Sentence Function)	17	D		**12,** The Perfect Form
4	A		**7,** Purpose (Sentence Function)	18	A		**14,** The Strongest Link
5	D		**7,** Dual Texts	19	A		**16,** Pronouns
6	A		**8,** Retrieval	20	B		**15,** Don't Go Where You're Not Wanted-If You are Punctuation
7	A		**8,** Retrieval	21	B		**14,** Picking Sides with Transitions
8	A		**8,** Main Idea	22	C		**17,** A Smooth Transition
9	A		**8,** Claims	23	D		**17,** A Smooth Transition
10	B		**8,** Charts	24	D		**17,** A Smooth Transition
11	A		**8,** Charts	25	C		**17,** A Smooth Transition
12	B		**8,** Charts	26	D		**17,** Ready, Set...Synthesize
13	D		**8,** Charts	27	C		**17,** Ready, Set...Synthesize
14	A		**8,** Conclusions				

Reading and Writing Comprehension—Module 2: Easier							
Q #	Ans.	✔	Chap. # Section	Q #	Ans.	✔	Chap. # Section
1	D		7, Vocabulary	15	A		**8,** Conclusions
2	A		7, Vocabulary	16	A		**8,** Conclusions
3	C		7, Vocabulary	17	D		**12,** The Perfect Form
4	A		7, Vocabulary	18	B		**16,** Pronouns and Apostrophes
5	B		7, Vocabulary	19	D		**16,** Pronouns
6	B		7, Vocabulary	20	D		**14,** The Strongest Link
7	A		7, Vocabulary	21	A		**12,** Answer in the Form of a Question
8	A		7, Vocabulary	22	D		**16,** Verbs
9	C		**8,** Retrieval	23	C		**12,** The Perfect Form
10	D		**8,** Claims	24	D		**17,** A Smooth Transition
11	D		**8,** Claims	25	C		**17,** A Smooth Transition
12	C		**8,** Claims	26	A		**17,** A Smooth Transition
13	C		**8,** Conclusions	27	A		**17,** Ready, Set...Synthesize
14	B		**8,** Conclusions				

Reading and Writing Comprehension—Module 2: Harder							
Q #	Ans.	✔	Chap. # Section	Q #	Ans.	✔	Chap. # Section
1	C		7, Vocabulary	15	C		**8,** Conclusions
2	B		7, Vocabulary	16	A		**8,** Conclusions
3	C		7, Vocabulary	17	C		**16,** Verbs
4	D		7, Vocabulary	18	B		**13,** Who or What Are You Talking About?
5	A		7, Vocabulary	19	A		**16,** Verbs
6	C		7, Vocabulary	20	A		**13,** Who or What Are You Talking About?
7	A		7, Vocabulary	21	D		**14,** Picking Sides with Transitions
8	D		7, Vocabulary	22	D		**14,** The Strongest Link
9	A		**8,** Retrieval	23	A		**17,** A Smooth Transition
10	B		**8,** Claims	24	C		**17,** A Smooth Transition
11	B		**8,** Claims	25	D		**17,** A Smooth Transition
12	A		**8,** Claims	26	D		**17,** Ready, Set...Synthesize
13	A		**8,** Claims	27	B		**17,** Ready, Set...Synthesize
14	C		**8,** Conclusions				

Math—Module 1							
Q #	**Ans.**	**✔**	**Chap. # Section**	**Q #**	**Ans.**	**✔**	**Chap. # Section**
1	B		**24,** What is a Frequency Table?	12	A		**22,** Plug In the Answers (PITA)
2	C		**23,** Equations of a Parabola	13	D		**23,** Function Fundamentals
3	C		**21,** Write Your Own Equations	14	A		**23,** Solving Systems of Equations
4	B		**25,** Triangles	15	25		**22,** Meaning In Context
5	D		**22,** Meaning In Context	16	D		**21,** Growth and Decay
6	$\frac{12}{20}$ or 0.6		**24,** Probability	17	C		**25,** Volume
7	D		**24,** What is Margin of Error?	18	C		**23,** Points of Intersection
8	–4		**21,** Solving Quadratic Equations	19	$\frac{40}{41}$		**25,** Triangles
9	A		**21,** Growth and Decay	20	–2.5		**23,** Equations of a Parabola
10	B		**22,** Plug In the Answers (PITA)	21	10		**23,** Parallel and Perpendicular Lines
11	A		**22,** Plug In the Answers (PITA)	22	2.4		**23,** Points of Intersection

Math—Module 2: Easier							
Q #	**Ans.**	**✔**	**Chap. # Section**	**Q #**	**Ans.**	**✔**	**Chap. # Section**
1	C		**24,** What is a Median?	12	B		**23,** Function Fundamentals
2	32		**21,** Fundamentals of Digital SAT Algebra	13	118		**25,** Lines and Angles
3	B		**25,** Rectangles and Squares	14	A		**23,** Equations of a Line
4	C		**21,** Fundamentals of Digital SAT Algebra	15	D		**24,** Rates
5	A		**21,** Fundamentals of Digital SAT Algebra	16	B		**21,** Write Your Own Equations
6	B		**21,** Solving Rational Equations	17	B		**23,** Function Fundamentals
7	140		**24,** Percentages	18	C		**23,** Equations of a Parabola
8	A		**24,** Rates	19	D		**23,** Function Fundamentals
9	44		**21,** Solving for Expressions	20	A		**23,** Function Fundamentals
10	D		**23,** Function Fundamentals	21	D		**21,** Fundamentals of Digital SAT Algebra
11	D		**23,** Function Fundamentals	22	A		**25,** Triangles

Math—Module 2: Harder							
Q #	**Ans.**	**✔**	**Chap. # Section**	**Q #**	**Ans.**	**✔**	**Chap. # Section**
1	A		**21,** Fundamentals of Digital SAT Algebra	12	A		**21,** Fundamentals of Digital SAT Algebra
2	A		**24,** Percentages	13	D		**23,** Equations of a Parabola
3	–120		**21,** Solving for Expressions	14	C		**23,** Graphing Functions
4	B		**21,** Solving for Expressions	15	D		**21,** Solving Quadratic Equations
5	C		**22,** Meaning In Context	16	A		**23,** Equations of a Line
6	D		**24,** Ratios and Proportions	17	12		**21,** Solving Systems of Equations
7	B		**22,** Plugging In Your Own Numbers	18	C		**25,** Triangles
8	B		**21,** Solving Rational Equations	19	B		**23,** Function Fundamentals
9	25		**23,** Equation of a Circle	20	105		**24,** Averages
10	C		**22,** Plug In the Answers (PITA)	21	B		**22,** Plugging In Your Own Numbers
11	A		**23,** Points of Intersection	22	D		**25,** Triangles

PRACTICE TEST 1—READING AND WRITING EXPLANATIONS

Module 1

1. **D** This is a Vocabulary question, as it's asking for a *logical and precise word or phrase* for the blank. Read the text and highlight what can help fill in the blank. The text states that *the risk of loss of human life in the event of an eruption is minimal,* so the area surrounding Calabozos must not be very inhabited. A good word for the annotation box based on this information would be "isolated."

   - (A) and (B) are wrong because *hazardous* and *active* don't match "isolated."
   - (C) is wrong because *mountainous* is a **Could Be True trap**: mountainous regions are often isolated, but the text does not support that the area surrounding Calabozos has any other mountains besides the volcano itself.
   - (D) is correct because *remote* matches "isolated."

2. **B** This is a Vocabulary question, as it's asking for a *logical and precise word or phrase* for the blank. Read the text and highlight what can help fill in the blank. The text states that H.D. *wrote in a variety of forms and genres,* yet her contemporaries *focused only on her important contributions to the Imagist movement.* Therefore, a good phrase for the annotation box based on this information would be that the contemporaries' view was "narrow."

   - (A) is wrong because *expansive* is the **Opposite** of "narrow."
   - (B) is correct because *limited* matches "narrow."
   - (C) and (D) are wrong because *imaginative* and *complicated* don't match "narrow."

3. **B** This is a Purpose question, as it's asking for the *function* of a sentence. Read the text and highlight what can help understand the function of the second sentence. In the second sentence, *Previous studies...have been unsuccessful because these studies relied on human subjects.* In the third sentence, it states that *A recent study by physiologists Yuta Senzai and Massimo Scanziani has avoided this issue by studying dreaming mice instead.* Therefore, the second sentence must be describing an issue that the scientists in the third sentence avoided. Write "explain issue with previous studies" in the annotation box.

   - (A) is wrong because it is the **Opposite** of what the text supports: *previous studies* ran into a *problem,* but the study by *Yuta Senzai and Massimo Scanziani has avoided this issue.*
   - (B) is correct because it's consistent with the relationship between the second and third sentences.

- (C) is wrong because it is **Half-Right:** the sentence mentions the studies before Senzai and Scanziani's but does not *present the findings* of those studies.
- (D) is wrong because the text does not discuss anyone interpreting Senzai and Scanziani's study.

4. **A** This is a Purpose question, as it's asking for the *function* of a sentence. Read the text and highlight what can help understand the function of the third sentence. In the third sentence, it states that *electroreception is not limited to fish.* Write "explain it's not just fish" in the annotation box.

- (A) is correct because it's consistent with the highlighting and annotation.
- (B) is wrong because it's **Half-Right:** the fourth sentence explains how monotremes use electroreception, but the earlier sentences do not explain how fish use electroreception, just that they have it.
- (C) is wrong because it is **Right Answer, Wrong Question:** the fourth and possibly the fifth sentence give more *examples* of animals with electroreception, not the third sentence, which is what the question asks about.
- (D) is wrong because the text does not explain *how electroreception evolved* in any of the animals discussed.

5. **D** This is a Dual Texts question, as it asks how the scientists in Text 2 would *most likely respond* to those in Text 1. Read Text 1 and highlight the claim made by Premack and Woodruff regarding a theory of mind: after seeing videos of human actors struggling with various problems, *the chimpanzees were able to select photographs that showed the best tool to solve each actor's problem.* Read Text 2 and highlight Povinelli, Nelson, and Boysen's response to the same idea: *it may be the case that chimpanzees are following learned behaviors in a known environment, rather than applying a theory of mind in a novel situation.* Write in the annotation box for the highlighting in Text 2 that "Text 2 offers an alternate explanation."

- (A) and (C) are wrong because neither text discusses any other *nonhuman primates* besides chimpanzees.
- (B) is wrong because it is **Recycled Language:** it's the human subjects in Text 1 that are described as *struggling* with a problem and Text 2 never suggests that the chimpanzees could solve problems by struggling through the problems on their own.
- (D) is correct because it would address the scientists in Text 2's main objection to the claim in Text 1: by placing the chimpanzees *in novel environments* that they *would have been unlikely to encounter* previously, Premack and Woodruff could better determine whether the chimpanzees have a theory of mind rather than are just *following learned behaviors in a known environment.*

6. **A** This is a Retrieval question, as it says *According to the text.* Read the text and highlight what is said about Dorian. The text mentions that *his cheeks flushed for a moment with pleasure* and *A look of joy came into his eyes* upon seeing his picture. He knows that *Hallward was speaking to him, but* he was *not catching the meaning of his words.* Lastly, *The sense of his own beauty came on him like a revelation.* The correct answer should be consistent with as many of these ideas as possible.

   - (A) is correct because it exactly describes what is occurring in the text. Dorian cannot focus on what Hallward is saying because of the beauty of his own picture.
   - (B) is wrong because it is **Extreme Language:** Dorian can't focus on what Hallward is saying, but the text never goes so far as to state that Dorian thinks it's *unimportant.*
   - (C) is wrong because it is the **Opposite** of the text: not only does Dorian *recognize his own image,* but he is also immensely pleased by it.
   - (D) is wrong because nothing about how easily Dorian gets embarrassed is mentioned in the text.

7. **A** This is a Retrieval question, as it says *Based on the text.* Read the text and highlight what is said about the children. The text states that the old forester wondered *What would become of them* (the children)*—living in so sequestered a spot that few even knew of its existence—totally shut out from the world, and left to their own resources?* The correct answer should be as consistent with this description of the children as possible.

   - (A) is correct because *isolated from people other than the old forester* is consistent with *totally shut out from the world.*
   - (B) is wrong because it is **Extreme Language:** while the forester is worried about what would happen to the children if left alone, the text does not indicate that the children would be *completely unable* to take care of themselves.
   - (C) is wrong because it is the **Opposite** of the forester's feelings towards the children: he feels responsible for them, not *resentful* of them.
   - (D) is wrong because it is **Recycled Language:** the answer misuses the word *responsibility* from the text and never indicates that the children help the forester with his tasks.

8. **A** This is a Main Idea question, as it asks for the *main idea* of the text. Read the text and highlight the main phrases or lines that all of the other sentences seem to support. The citation states that the author is addressing an unknown person. The opening two lines state that the author will never *hold a place* in this person's (*thine*) heart until the author renounces *all sense, all shame, all grace.* The author also states at the end of the poem that this individual will make an *offer with corrupting art / The rotten borough of the human heart.* The main idea would be that author's feelings towards this individual in this poem are negative, and the correct answer should be consistent with this.

   - (A) is correct because it is consistent with the main idea and *disapproval towards the unknown person* is expressed several times in the poem.
   - (B) and (D) are wrong because the poem never states what the unknown person feels towards the author, just what the author feels towards the unknown person. Choice (D) is also **Recycled Language** and warps the meaning of the opening line of the text.
   - (C) is wrong because it is **Recycled Language:** the author is not referring to a literal seat. Rather, the seat is a metaphor for the place the speaker may hold in the unknown person's heart.

9. **A** This is a Claims question, as it asks for what answer would support Soni and his team's claim. Read the text and highlight the claim made by Soni's team, which is that *administering ketone esters can reduce inflammation and immune system weakening caused by sepsis.*

   - (A) is correct because it shows *ketone esters* to be more effective at reducing inflammation and reducing damage to organs (which the text states are connected to immune system response) than at least one other treatment, *standard antibiotics.*
   - (B) is wrong because it does not address the items mentioned in the claim, referencing *blood ketone levels* and *energy* rather than *inflammation* and the *immune system* or *organ damage.*
   - (C) is wrong because the text does not mention *medication intended to reduce fever* or how such medication would affect the performance of *ketone esters.*
   - (D) is wrong because it is **Half-Right:** patients treated with *ketone esters* should have *reduced inflammation*, but they should have *less* organ damage, not *greater* organ damage, than those treated with other treatments, such as standard antibiotics.

10. **B** This is a Charts question as it asks about *data from the table* that will complete an example. Read the table first and note the title and terms on the table. Then, read the text and look for a claim and example that mentions those same terms. The fourth sentence states that *horses with only one handler were less reluctant to interact with the novel object than were horses with multiple handlers.* The example states that *45% of horses with only one handler had no reluctance when interacting with a novel object,* so a good completion of this example would compare that statistic to a statistic regarding *multiple handlers* while remaining consistent with the claim in the fourth sentence.

    - (A) and (D) are wrong because they don't mention *multiple handlers,* which are needed to be consistent with the text's claim.
    - (B) is correct because it shows that horses with *multiple handlers* only had *no reluctance* towards interacting with the novel object 25% of the time, whereas horses with only one handler showed no reluctance 45% of the time, making them less reluctant overall as the claim states.
    - (C) is wrong because the claim and the first half of the example address no reluctance rather than strong reluctance. It's best to compare two items from the same row or same column to complete comparisons, depending on what the problem is looking for.

11. **A** This is a Charts question as it asks about *data from the table* that will illustrate a claim. Read the table first and note the title and variables. Then, read the text and look for a claim that mentions those same terms. The fourth sentence states that *starting with the 1989 election, the party which won the largest number of seats failed to win more than half of the total seats.* The final sentence claims that *This trend was eventually broken by the Bharatiya Janata Party.* The correct answer should offer evidence from the table that supports the Bharatiya Janata Party breaking the trend described in the fourth sentence.

    - (A) is correct because it is consistent with the table for those years and shows the Bharatiya Janata Party holding both the largest number of seats *and* a majority of the total seats.
    - (B), (C), and (D) are wrong because none of them mention the Bharatiya Janata Party winning a majority, or *more than half of the total seats,* as stated in the text.

12. **B** This is a Charts question as it asks about *data from the table* that will support a hypothesis. Read the table first and note the title and terms. Then, read the text and look for a hypothesis that mentions those same terms. The last sentence states that *A group of researchers...hypothesized that those who take vitamin B12 would experience improvements in fibrosis and insulin resistance when compared to a control group over the same time period.* The correct answer should use data from the table to support this idea.

- (A) is wrong because it only talks about the control group and not the Vitamin B12 group.
- (B) is correct because it references both groups and is consistent with the relationship between those groups stated by the claim in the text.
- (C) and (D) are wrong because neither mentions the terms *fibrosis* and *insulin resistance* that were referenced by the claim.

13. **D** This is a Charts question as it asks about *data from the table* that will complete a statement. Read the table first and note the title and terms. Then, read the text and look for a statement that mentions those same terms. The last sentence states that *The localized nature of weather patterns during this event can be seen by comparing Newark, NJ, and New York, NY, with* _____. The correct answer should complete this statement regarding localized weather patterns by showing a difference in mean levels of carbon monoxide in Newark and New York when compared to a more distant city.

- (A), (B), and (C) are wrong because the mean levels of carbon monoxide shown for Washington, D.C., and Philadelphia, PA, on the dates in each answer are similar or identical to the levels in New York, NY, on those dates. Farther cities from Newark showing similar levels to neighboring cities to Newark would not show the *localized nature of weather patterns during* the smog event.
- (D) is correct because Washington, D.C., shows zero carbon monoxide recorded on those dates, while Newark and New York show positive carbon monoxide level.

14. **A** This is a Conclusions question as it asks for an answer that *logically completes the text.* Read the text and highlight the main ideas. The text states that *neurons change how they respond to stimuli based on previous experience* and that *electrical engineers seek to replicate similar processes in their development of computer memory.* Lastly, *electrical engineer Mohammad Samizadeh Nikoo has demonstrated that vanadium dioxide (VO_2) has a similar memory property to that of neurons.* The correct answer should be consistent with these ideas and establish a logical link between them.

- (A) is correct because it establishes a link between VO_2 from the last sentence and the computer memory that electrical engineers are trying to work on from the second sentence.

- (B) and (C) are wrong because both are **Recycled Language.** For (B), it's never stated that neurons use VO_2 in any way, just that they have a similar memory property. Choice (C) takes the words *neurons, VO_2,* and *stimuli from sensory organs* and combines them in a way not supported by the text.
- (D) is wrong because it uses **Extreme and Recycled Language:** it is VO_2, not neurons, that may be helpful for computer memory. Furthermore, the text supports this is only a possibility, whereas the answer states that the engineers *can now use* it.

15. **C** In this Rules question, pronouns are changing in the answer choices, so it's testing consistency with pronouns. Find and highlight the word the pronoun refers back to, *books*, which is plural, so a plural pronoun is needed. Write an annotation saying "plural." Eliminate any answer that isn't consistent with *books.*

- (A) is wrong because *some* doesn't refer back to a specific thing.
- (B) and (D) are wrong because they are singular.
- (C) is correct because *they* is plural and is consistent with *books.*

16. **C** In this Rules question, commas and the word *that* are changing in the answers, which suggests that the question is testing the construction of describing phrases. The first part of the sentence says *In 1988, the group worked together to form Action Deaf Youth,* which is an independent clause followed by a comma. Eliminate any answer that isn't consistent with the first part of the sentence.

- (A) is wrong because a phrase starting with "that" is Specifying and never follows a comma.
- (B) and (D) are wrong because they both create a run-on sentence.
- (C) is correct because it creates a Specifying phrase with *that* and no punctuation.

17. **D** In this Rules question, verb forms are changing in the answer choices, so it's testing sentence structure. If the main verb is in the wrong form, the sentence won't be complete. The subject of the sentence is *Her experience*, but there is no main verb, so one is needed. Eliminate any answer that does not produce a complete sentence.

- (A) is wrong because a "to" verb can't be the main verb in a sentence.
- (B) is wrong because it lacks a main verb and thus creates an incomplete sentence.
- (C) is wrong because an *-ing* verb can't be the main verb in a sentence.
- (D) is correct because *inspired* is in the right form to be the main verb and make a complete sentence.

18. **A** In this Rules question, punctuation is changing in the answer choices, so look for independent clauses. The first part of the sentence says *American artist Simone Leigh creates art in various mediums, including sculptures, video, and performance*, which is an independent clause. The second part says *discussing the themes and images in her artwork, Leigh has emphasized that Black women are her primary audience...*, which is also an independent clause. Eliminate any answer that can't correctly connect two independent clauses.

- (A) is correct because a period is appropriately used after an independent clause.
- (B) is wrong because it creates a run-on sentence.
- (C) and (D) are wrong because neither a comma by itself nor a coordinating conjunction by itself can connect two independent clauses.

19. **A** In this Rules question, pronouns are changing in the answer choices, so it's testing consistency with pronouns. Find and highlight the word the pronoun refers back to, *wet-folding*, which is singular, so a singular pronoun is needed. Write an annotation saying "singular." Eliminate any answer that isn't consistent with *wet-folding*.

- (A) is correct because *it* is singular and is consistent with *wet-folding*.
- (B) and (D) are wrong because they are plural.
- (C) is wrong because *one* doesn't refer back to a specific thing.

20. **B** In this Rules question, punctuation is changing in the answer choices. Look for independent clauses. The first part of the sentence says *His 2004 installation The Glassy Surface of a Lake.* The verb (*uses*) comes right after this. A single punctuation mark can't separate a subject and a verb, so eliminate answers with punctuation.

- (A), (C), and (D) are wrong because a single punctuation mark can't come between a subject and a verb.
- (B) is correct because no punctuation should be used here.

21. **B** In this Rules question, punctuation with a transition is changing in the answer choices. The first part of the sentence says *Not all of the styles survived beyond that time.* There is an option to add *however* to this independent clause, and since it is contrasting with the previous idea, eliminate options that don't include *however* in the first part or are incorrectly punctuated.

- (A) is wrong because it doesn't put *however* with the first independent clause.
- (B) is correct because *however* is part of the first independent clause.
- (C) and (D) are wrong because a comma can't be used to connect two independent clauses.

22. **C** This is a transition question, so follow the basic approach. Highlight ideas that relate to each other. The previous sentence says *Calede first compared measurements of the beaver's ankle*, and the next sentence says *Calede dated the species to approximately 30 million years ago.* These ideas are different steps Calede took, so a same-direction transition is needed. Make an annotation that says "agree." Eliminate any answer that doesn't match.

- (A) is wrong because *for example* introduces an example not stated in the text.
- (B) is wrong because *in conclusion* introduces a conclusion not present in the text.
- (C) is correct because *next* introduces another step in a sequence.
- (D) is wrong because *in fact* is used to give more detail, which is not present.

23. **D** This is a transition question, so follow the basic approach. Highlight ideas that relate to each other. The previous part of the paragraph says *Male and female American citizens had starkly different roles during World War II* and lists the roles of men, and the sentence in question says *women were responsible for maintaining the home and supporting the men.* These ideas disagree, so an opposite-direction transition is needed. Make an annotation that says "disagree." Eliminate any answer that doesn't match.

- (A) and (C) are wrong because they are same-direction transitions.
- (B) is wrong because *instead* introduces an alternative, but the paragraph discusses the different roles of men and women, not alternative roles for men.
- (D) is correct because *meanwhile* shows that women had different roles during the same time period.

24. **D** This is a transition question, so follow the basic approach. Highlight ideas that relate to each other. The first sentence says *some patients with damaged ear structures are not able to use traditional cochlear implants*, and the next sentence tells what *researchers are working* on as a result of this problem. These ideas agree, so a same-direction transition is needed. Make an annotation that says "agree." Eliminate any answer that doesn't match.

- (A) is wrong because there is no first step in the paragraph.
- (B) is wrong because the last sentence is not an addition to the previous sentence.
- (C) is wrong because *finally* is used to indicate the last step or a conclusion.
- (D) is correct because *hence* suggests that the last sentence is an effect of the previous sentence.

25. **C** This is a transition question, so follow the basic approach. Highlight ideas that relate to each other. The previous sentence says *Her materials are often perishable and biological and are not traditionally used for artwork*, and the next sentence says *Yi spends almost as much time transforming these substances into completely new materials as she does creating the actual art pieces.* These ideas agree, so a same-direction transition is needed. Make an annotation that says "agree." Eliminate any answer that doesn't match.

- (A) and (B) are wrong because they are opposite-direction transitions.
- (C) is correct because *in fact* adds detail to the previous sentence.
- (D) is wrong because the last sentence is not a conclusion.

26. **D** This is a Rhetorical Synthesis question, so follow the basic approach. Highlight the goal(s) stated in the question: *emphasize a difference between the two numeral systems.* Eliminate any answer that doesn't fulfill this purpose.

- (A) is wrong because it states a similarity between the two numeral systems.
- (B) is wrong because it doesn't mention both *numeral systems.*
- (C) is wrong because it doesn't mention a *difference* between the systems.
- (D) is correct because it states differences between the two numeral systems and uses the contrast word *while.*

27. **C** This is a Rhetorical Synthesis question, so follow the basic approach. Highlight the goal(s) stated in the question: *present the Newen Antug study and its conclusions.* Eliminate any answer that doesn't fulfill this purpose.

- (A), (B), and (D) are wrong because they do not include a *conclusion*—what the researchers found.
- (C) is correct because *canoes were used as coffins* is a conclusion.

27. **A** This is a Rhetorical Synthesis question, so follow the basic approach. Highlight the goal(s) stated in the question: *make a generalization about the kind of study conducted by Eberhard, Wilcove, and Dobson*. Eliminate any answer that doesn't *make a generalization*.

- (A) is correct because it provides a *generalization about the kind of study* conducted by the scientists: analyzing *population trends to find out the impact of legal protections*.
- (B), (C), and (D) are wrong because they don't provide a *generalization* or a broader way of explaining the type of study.

Module 2—Harder

1. **C** This is a Vocabulary question, as it's asking for a *logical and precise word or phrase* for the blank. Read the text and highlight what can help fill in the blank. The text states that *all things, living or not, have the inclination to exist and enhance themselves*. A good word or phrase for the annotation box based on this information would be "exist" or "hold on."

- (A), (B), and (D) are wrong because *deteriorate, perish,* and *disappear* are the **Opposite** of "exist" or "hold on."
- (C) is correct because *persevere* matches with "exist" or "hold on."

2. **B** This is a Vocabulary question, as it's asking for a *logical and precise word or phrase* for the blank. Read the text and highlight what can help fill in the blank. The text states that the birds' behavior in the study made it *more difficult for the researchers to obtain data*. A good word for the annotation box based on this information would be "hindered."

- (A) and (C) are wrong because *aided* and *clarified* are the **Opposite** of "hindered."
- (B) is correct because *impeded* matches "hindered."
- (D) is wrong because *exposed* doesn't match "hindered."

3. **C** This is a Vocabulary question, as it's asking for a *logical and precise word or phrase* for the blank. Read the text and highlight what can help fill in the blank. The text states that the objects that M.C. Escher creates *first appear normal but on closer inspection are, in fact, impossible*. A good phrase for the annotation box based on this information would be "confusing objects."

- (A), (B), and (D) are wrong because *geometry, beauty,* and *color* don't match "confusing objects."
- (C) is correct because *paradox* best matches "confusing objects."

4. **D** This is a Vocabulary question, as it's asking for a *logical and precise word or phrase* for the blank. Read the text and highlight what can help fill in the blank. The text states that *When microdroplets of water hit a solid surface, an electric charge* produces *hydroxyl radicals that in turn combine with remaining oxygen to form hydrogen peroxide.* This information describes a chain of events started by water, so a good phrase for the annotation box would be "likely to trigger something."

   - (A), (B), and (C) are wrong because *viable, contaminated,* and *common* don't match "likely to trigger something."
   - (D) is correct because *reactive* matches "likely to trigger something."

5. **A** This is a Vocabulary question, as it's asking for a *logical and precise word or phrase* for the blank. Read the text and highlight what can help fill in the blank. The text states that *The Beat Generation* had a *central message of nonconformity,* meaning that they would reject *the traditional values of the 1950s.* A good word for the annotation box based on this information would be "rejection of."

   - (A) is correct because *dissension from* matches "rejection of."
   - (B), (C), and (D) are wrong because *gratitude, adherence,* and *deference* all imply a positive attitude toward or at least an acknowledgment of traditional values, which is the **Opposite** of "rejection of."

6. **C** This is a Vocabulary question, as it's asking for a *logical and precise word or phrase* for the blank. Read the text and highlight what can help fill in the blank. In regard to *recycling used car tires,* the text states *potentially reusing them would be beneficial* and that *walls made of used tires and dirt* are *structurally robust,* or strong. A good word for the annotation box based on this information would be that the author considers the possibility of recycling used car tires as building materials to be "promising."

   - (A) and (B) are wrong because both *derivative* and *ludicrous* are negative words that are the **Opposite** tone of "promising."
   - (C) is correct because *auspicious* matches with "promising."
   - (D) is wrong because *innovative* is a **Could Be True trap** answer: the text doesn't actually say reusing tires as the text describes would be a new idea or has not been done before.

7. **A** This is a Vocabulary question, as it's asking for a *logical and precise word or phrase* for the blank. Read the text and highlight what can help fill in the blank. The text states that *cryptographers have yet to demonstrably decipher any portion of the text,* so a good word for the annotation box to describe *the meaning and purpose of the Voynich manuscript* would be "mysterious."

   - (A) is correct because *enigmatic* matches "mysterious."
   - (B) and (D) are wrong because *venerable* and *coherent* don't match "mysterious."

- (C) is wrong because it is a **Could Be True trap** answer. While *multifarious,* or complex, things can be *mysterious*, the words are not synonyms: mysterious things can be simple, and complex things can be quite well known and understood.

8. **D** This is a Vocabulary question, as it's asking for a *logical and precise word or phrase* for the blank. Read the text and highlight what can help fill in the blank. The text describes Whitsett's *groundbreaking development* and states that astronautics *owes much to him.* A good word for the annotation box based off this information would be "innovative."

- (A) and (B) are wrong because *dubious* (doubtful) and *futile* (hopeless) are the **Opposite** tone of "innovative."

- (C) is wrong because *galvanizing,* which means "stimulating," doesn't match "innovative."

- (D) is correct because *avant-garde* means "pioneering," which matches "innovative."

9. **A** This is a Retrieval question, as it says *Based on the text.* Read the text and highlight what is said about Mr. Lorry in his interaction with Miss Manette. Mr. Lorry states that he is *a man of business* and *not much else* before telling Miss Manette he wants to tell her a story. After her repetition of the word *story,* the text states that *He seemed willfully to mistake the word she had repeated* and acts as if she had repeated the word *customers* instead of *story.* The correct answer should be as consistent with these two descriptions of Mr. Lorry as possible.

- (A) is correct because it is consistent with the description of Mr. Lorry before and after Miss Manette's reply.

- (B) and (C) are wrong because they are **Half-Right:** In (B), Mr. Lorry does not misunderstand Miss Manette's interjection; he intentionally focuses on a different word. Similarly, in (C), it's never stated that he *cannot keep the details of the story accurate.*

- (D) is wrong because the text never indicates that Miss Manette is *rude*, nor does it state that Mr. Lorry is *unthinking* in his actions.

10. **B** This is a Claims question, as it asks what finding would support a claim. Read the text and highlight the claim made, which is that *Abel claims that his use of Barbeau's text shows how anthropological texts can be used to portray Indigenous people differently based on the author.*

- (A), (C), and (D) are wrong because they do not contain *different* portrayals of Indigenous peoples.

- (B) is correct because it focuses on one anthropologist, Marius Barbeau, choosing to portray the chiefs' feud *over constructing the largest pole as unreasonable,* while the *other anthropologists* offer a reason as to why *larger totem poles* may have been culturally important to a tribe.

11. **B** This is a Claims question, as it asks for an illustration of a claim. Read the text and highlight the claim made, which is that *While adult adoption remains a way for individuals to improve their economic status, the practice has its detractors as well, with some researchers arguing that it can lead to issues with the adoptee developing a firm sense of identity in his or her new environment.* The correct answer should be consistent with this claim and support both the positive and negative viewpoints towards adult adoption.

- (A) and (D) are wrong because they are **Half-Right:** both express positive opinions toward adult adoptees but fail to account for the negative opinions towards adult adoption stated in the second half of the text.
- (B) is correct because it is consistent with both the positive and negative outcomes of adult adoption discussed in the claim.
- (C) is wrong because the distinction made in the text is between positive and negative outcomes of adult adoption, not the status of adult adoption in different East Asian countries.

12. **A** This is a Claims question, as it asks for support for a hypothesis. Read the text and highlight the hypothesis, which states that *tau protein, the mutation of which is known to cause Alzheimer's disease, is key to controlling glutamate receptors.* It's also important to note the last sentence, which clarifies that *Tau protein does not directly affect glutamate receptors but does inhibit NSF.* The correct answer should be consistent with these two sentences.

- (A) is correct because if *an excess of NSF has been shown to lead to abnormal glutamate receptor behavior,* and *tau protein...does inhibit NSF,* this would support the link made between tau proteins and glutamate receptors made in the hypothesis.
- (B) and (D) are wrong because even if true, they either disregard or do not mention *tau protein* and *glutamate receptors,* the main components of the hypothesis.
- (C) is wrong because the hypothesis is not about *what causes mutations of tau protein*, but how tau protein controls glutamate receptors.

13. **A** This is a Claims question, as it asks for support for an argument. Read the text and highlight Garber's argument, which states that *tulip mania is explainable by fundamental economic concepts such as supply and demand.* The correct answer will be as consistent as possible with this claim.

- (A) is correct because it discusses supply and demand, which is consistent with Garber's claim.
- (B) and (C) are wrong because even though they focus on the price of tulip bulbs, they don't discuss supply and demand.
- (D) is wrong because Garber's argument does not mention any connection between tulip bulbs and the *supply of gold coins in the Dutch republic.*

14. **A** This is a Conclusions question as it asks for an answer that *logically completes the text.* Read the text and highlight the main ideas. The focus of the text is on *the use of ants to control pests.* The third sentence identifies *several positive effects*, but the last sentence mentions that *ants also have negative effects.* Therefore, a logical conclusion to the text should expand upon the negative effects introduced in the final sentence.

- (A) is correct because it references *unintended environmental consequences,* which relate back to the negative effects described in the first half of the last sentence when ants are *used to control pests.*
- (B) and (D) are wrong because they do not focus on *negative effects* that ants may have as pest control.
- (C) is wrong because it is the **Opposite** of what the last sentence states: there are indeed *ramifications*, or negative effects, to using ants as pest control.

15. **C** This is a Conclusions question as it asks for an answer that *logically completes the text.* Read the text and highlight the main ideas. The focus of the text is on *a receptor* related to *odor.* The first sentence states that *eliminating that receptor...results in the inability to smell that odor.* The second sentence states that *mosquitoes modified to lack the receptor for smelling blood would be unable to find humans,* but the third sentence says they *were still able to find humans.* Therefore, a logical conclusion to the text should make some claim about how mosquitoes may be different from other animals.

- (A) is wrong because no comparison between *mosquitoes without damage* and *those with damage* is made in the text.
- (B) and (D) are wrong because they are the **Opposite** of what is stated in the text: in both cases, mosquitoes with damage to their odor receptors were still able to find humans, so there is no evidence they could not detect certain odors or would be prevented from feeding.
- (C) is correct because it indicates that mosquitoes may not *have the same correlation between receptors and the ability to sense certain odors* that other animals do.

16. **A** This is a Conclusions question as it asks for an answer that *logically completes the text.* Read the text and highlight the main ideas. The focus of the text is on *NAFTA* and its relation to *manufacturing jobs.* During the interval from 1994 to 2020, the second sentence states that *the number of manufacturing jobs in the United States and Canada declined, but the total number of manufacturing jobs in the countries covered by NAFTA increased.* Therefore, a logical conclusion would explain how this might be possible.

- (A) is correct because if an increase in *the number of manufacturing jobs in Mexico*, which is also covered by NAFTA, was greater than the *combined decreases in the United States and Canada*, this would explain the seemingly contradictory data in the second sentence.

- (B), (C), and (D) are wrong because none of them offers a reason as to how the number of manufacturing jobs in the United States and Canada declined, but the total number of manufacturing jobs in all three countries increased.

17. **C** In this Rules question, verbs are changing in the answer choices, so it's testing consistency with verbs. Find and highlight the subject, *cloud*, which is singular, so a singular verb is needed. Write an annotation saying "singular." Eliminate any answer that is not singular.

- (A), (B), and (D) are wrong because they are plural.
- (C) is correct because it's singular.

18. **B** In this Rules question, punctuation is changing in the answer choices. The words *behavioral neuroscientist* are a title for *Damien Fair*, so no punctuation should be used. Eliminate answers that use punctuation.

- (A), (C), and (D) are wrong because a comma isn't used before or after a title.
- (B) is correct because titles before names have no punctuation

19. **A** In this Rules question, verbs are changing in the answer choices, so it's testing consistency with verbs. Find and highlight the subject, *map*, which is singular, so a singular verb is needed. Write an annotation saying "singular." Eliminate any answer that is not singular.

- (A) is correct because it's singular.
- (B), (C), and (D) are wrong because they are plural.

20. **A** In this Rules question, punctuation is changing in the answer choices. The words *common insecticide* are a title for *sulfoxaflor*, so no punctuation should be used. Eliminate answers that use punctuation.

- (A) is correct because titles before names have no punctuation.
- (B), (C), and (D) are wrong because a comma isn't used before or after a title.

21. **D** In this Rules question, punctuation with a transition is changing in the answer choices. Look for independent clauses. The first part of the sentence says *Wichman's work to preserve the culture of Kaua'i wasn't finished.* There is an option to add *though* to this independent clause, and since it's contrasting with the previous idea, the transition should be added. Eliminate options that don't have *though* in the first part.

- (A) and (C) are wrong because they create a run-on sentence.
- (B) is wrong because it puts *Though* with the second independent clause.
- (D) is correct because *though* is part of the first independent clause.

22. **D** In this Rules question, punctuation is changing in the answer choices, so look for independent clauses. The first part of the sentence says *Researchers studying bacteria have solved a 50-year mystery of how bacteria are able to move using appendages that are made of a single protein*, which is an independent clause. The second part of the sentence says *the subunits of the protein can exist in 11 different shapes...*, which is also an independent clause. Eliminate any answer that can't correctly connect two independent clauses.

- (A) and (C) are wrong because two independent clauses can't be linked with a comma by itself or with no punctuation at all.
- (B) is wrong because *while* is used for a contrast or for simultaneous events, which isn't the case here.
- (D) is correct because a colon can connect two independent clauses and is appropriately used when the second part explains the first.

23. **A** This is a transition question, so follow the basic approach. Highlight ideas that relate to each other. The first part of the sentence says *Fault tree analysis was originally used...in high-risk fields...but other fields are experimenting* with using it, and the second part of the sentence says *fault tree analysis is also being used in low-risk fields*. These ideas agree, so a same-direction transition is needed. Make an annotation that says "agree." Eliminate any answer that doesn't match.

- (A) is correct because *increasingly* supports the change from fault tree analysis's original use to where it is begun to be used.
- (B) is wrong because it is an opposite-direction transition.
- (C) is wrong because the second sentence isn't a conclusion.
- (D) is wrong because the second sentence isn't an additional point.

24. **C** This is a transition question, so follow the basic approach. Highlight ideas that relate to each other. The first part of the sentence says *she had primarily worked on canvas*, and the second part of the sentence says *but she quickly found her works evolving to include the three-dimensional space around her*. These ideas disagree, so an opposite-direction transition is needed. Make an annotation that says "disagree." Eliminate any answer that doesn't match.

- (A) is wrong because *instead* implies that the contrast is between the first and second sentence, but the contrast is between the two parts of the sentence.
- (B) and (D) are wrong because they are same-direction transitions.
- (C) is correct because *previously* is opposite-direction and supports the shift described in the sentence.

25. **D** This is a transition question, so follow the basic approach. Highlight ideas that relate to each other. The previous sentence says *Some scientists believe that the fish are carried to these locations in the beaks or talons of birds*, and this sentence describes what *new research suggests* as a different way the fish travel. These ideas disagree, so an opposite-direction transition is needed. Make an annotation that says "disagree." Eliminate any answer that doesn't match.

- (A), (B), and (C) are wrong because they are same-direction transitions.
- (D) is correct because *alternatively* is an opposite-direction transition.

26. **D** This is a Rhetorical Synthesis question, so follow the basic approach. Highlight the goal(s) stated in the question: *emphasize the aim of the research study.* Eliminate any answer that doesn't fulfill this purpose.

- (A), (B), and (C) are wrong because they don't mention the *aim of the research study*—what researchers wanted to accomplish.
- (D) is correct because it mentions the *aim of the research study* by stating what researchers *wanted to know.*

27. **B** This is a Rhetorical Synthesis question, so follow the basic approach. Highlight the goal(s) stated in the question: *emphasize the affiliation and purpose of Pääbo's and Skov's work.* Eliminate any answer that doesn't fulfill this purpose.

- (A), (C), and (D) are wrong because they don't mention the *affiliation*—the group or institution the scientists are associated with.
- (B) is correct because it states the *affiliation* (*Max Planck Institute for Evolutionary Anthropology*) and *purpose* (*provide insight into human evolution*).

PRACTICE TEST 1—MATH EXPLANATIONS

Module 1

1. **B** The question asks for the frequency table that correctly represents a list of numbers. A frequency table has two columns: the left-hand column contains the values, and the right-hand column contains the number of times each value occurs, or its frequency. Work in bite-sized pieces and eliminate answer choices that do not match the data. The number 2 occurs twice in the list, so its frequency is 2. Eliminate (A) because it shows a frequency of 4 for the number 2. Eliminate (D) because it does not include the number 2 at all. Next, the number 9 occurs three times in the list, so its frequency is 3. Eliminate (C) because it shows the number 3 occurring 9 times instead of the number 9 occurring 3 times. Choice (B) shows the correct frequency for each value. The correct answer is (B).

2. **C** The question asks for an equivalent form of an expression. When given a quadratic in standard form, which is $ax^2 + bx + c$, one approach is to factor it. Find two numbers that multiply to 56 and add to –1. These are –8 and 7, so the factored form of the quadratic is $(x - 8)(x + 7)$, which is (C). When a quadratic is more difficult to factor than this one was, another approach is to use a graphing calculator. Enter the expression given in the question, then enter the expressions from the answer choices one at a time and stop when one of the answers produces the same graph. Using either method, the correct answer is (C).

3. **C** The question asks for an equation that represents a specific situation. Translate the information in bite-sized pieces and eliminate after each piece. One piece of information says that the carpenter *hammers 10 nails per minute*, and another piece says that the carpenter *hammers nails for x minutes*. Multiplying the rate of 10 nails per minute by the number of minutes gives the number of nails: $\left(\frac{10 \text{ nails}}{1 \cancel{\text{ minute}}}\right)\left(x \cancel{\text{ minutes}}\right) = 10x$ nails. Eliminate (A) and (B) because they multiply the number of minutes by $\frac{1}{10}$ instead of by 10. Compare the remaining answer choices. The difference between (C) and (D) is the number on the right side of the equation. Since the carpenter *uses a combined total of 200 nails and screws*, the equation must equal 200. Eliminate (D) because it equals 3,420. The correct answer is (C).

4. **B** The question asks for the value of the measure of an angle on a figure. Use the Geometry Basic Approach. Start by drawing a triangle on the scratch paper. Then label the figure with the given information. Label angle D as 73°, angle E as 35°, and angle F without a number. Since the measures of the angles in a triangle have a sum of 180°, set up the equation $73° + 35° + F = 180°$, which becomes $108° + F = 180°$. Subtract 108° from both sides of the equation to get $F = 72°$. The correct answer is (B).

5. **D** The question asks about a graph representing a certain situation. In a linear graph that represents an amount over time, the y-intercept represents the initial amount. In this case, it represents the amount of plastic remaining to be recycled when $x = 0$. After 0 shifts, no plastic has been recycled yet, so the y-intercept represents the initial amount of plastic to be recycled. The answer is (D).

6. $\frac{12}{20}$ **or 0.6**

The question asks for a probability based on data in a table. Probability is defined as $\frac{\#\ of\ outcomes\ that\ fit\ requirements}{total\ \#\ of\ outcomes}$. Read the table carefully to find the numbers to make the probability. There are 200 total textbooks, so that is the *total # of outcomes*. Of these 200 textbooks, 120 are new textbooks, so that is the *# of outcomes that fit requirements*. Therefore, the probability that a textbook chosen at random is a new textbook is $\frac{120}{200}$. This cannot be entered into the fill-in box, which only accepts 5 characters when the answer is positive. All equivalent answers that fit will be accepted, so reduce the fraction or convert it to a decimal. The correct answer is $\frac{12}{20}$, 0.6, or another equivalent form.

7. **D** The question asks for a reasonable number based on survey results and a margin of error. Work in bite-sized pieces and eliminate after each piece. A margin of error expresses the amount of random sampling error in a survey's results. Start by applying the percent of respondents who did not support the existing registration system to the entire population of undergraduate students. Take 75% of the entire undergraduate student population to get $\frac{75}{100}(60{,}000) = 45{,}000$ students. Eliminate (A) and (B) because they are not close to this value and do not represent a reasonable number of students who did not support the existing registration system. The margin of error is 4%, meaning that results within a range of 4% above and 4% below the estimate are reasonable. A 4% margin of error will not change the result by very much, and (D) is the only answer choice close to 45,000.

To check, calculate the lower limit of the range based on the margin of error, since 43,800 is less than 45,000. To find the lower limit, subtract 4% from 75% to get 71%, then find 71% of the total population to get a lower limit of $\frac{71}{100}(60{,}000) = 42{,}600$. The value in (C) is less than the lower limit, so it is not a reasonable number. Choice (D) contains a value between 42,600 and 45,000, so it is reasonable. The correct answer is (D).

8. **–4** The question asks for a solution to an equation. To begin solving for a, multiply both sides of the equation by a to get $32 = a(a - 4)$. Next, distribute on the right side of the equation to get $32 = a^2 - 4a$. Subtract 32 from both sides of the equation to get $0 = a^2 - 4a - 32$. Now that the equation is a quadratic in standard form, which is $ax^2 + bx + c$, factor it to find the solutions. Find two numbers that multiply to –32 and add to –4. These are 4 and –8, so the factored form of the quadratic is $0 = (a + 4)(a - 8)$. Now set each factor equal to 0 to get two equations: $a + 4 = 0$ and $a - 8 = 0$. Subtract 4 from both sides of the first equation to get $a = -4$. Add 8 to both sides of the second equation to get $a = 8$. Therefore, the negative solution to the given equation is –4. It is also possible to enter the equation into a graphing calculator—using x as the variable—then scroll and zoom as needed to find the x-intercept with a negative value. Using either method, the correct answer is –4.

9. **A** The question asks for a description of a function that models a specific situation. Compare the answer choices. Two choices say the function is increasing, and two say it is decreasing. Since the balloon is rising, its distance above sea level is increasing over time. Eliminate (C) and (D) because they describe a decreasing function. The difference between (A) and (B) is whether the function is linear or exponential. Since the distance above sea level changes by a constant amount during each unit of time, the relationship between the balloon's distance above sea level and time is linear. Eliminate (B) because it describes an exponential function. The correct answer is (A).

10. **B** The question asks for the x-intercept of a function. An x-intercept is a point where $y = 0$. In function notation, $f(x) = y$. The number inside the parentheses is the x-value that goes into the function, or the input, and the value that comes out of the function is the y-value, or the output. Together, they represent points on the graph of the function. The answers are points that could be the x-intercept, so plug in the answers. Start with (A), and plug $x = -1$ and $y = 0$ into the function, keeping in mind that $f(x) = y$. The equation becomes $0 = (22)^{-1} - 1$. Add 1 to both sides of the equation to get $1 = (22)^{-1}$. Either use a calculator or know how to work with a negative exponent. A negative exponent means to raise the value to the positive exponent and take the reciprocal, so

$(22)^{-1}$ becomes $\frac{1}{22^1}$. The equation then becomes $1 = \frac{1}{22^1}$. This is not true, so eliminate (A). Next, try (B) and plug $x = 0$ and $y = 0$ into the function to get $0 = (22)^0 - 1$. Add 1 to both sides of the equation to get $1 = (22)^0$. Any number raised to the power of 0 is 1, so the equation becomes $1 = 1$. This is true, so stop here. The correct answer is (B).

11. **A** The question asks for the length of a side of a geometric figure. Use the Geometry Basic Approach. Start by redrawing the figure on the scratch paper, then label it with information from the question. Since the question asks for a specific value and the answers contain numbers in increasing order, plug in the answers. Write the answers on the scratch paper, label them as "side $\overline{AB}$," and start with a middle number. Try (B) and make $\overline{AB} = 16$. The question states that *the length of* $\overline{AB}$ *is one-third the length of* $\overline{AD}$. Given this, if $\overline{AB} = 16$, $\overline{AD} = 3(16) = 48$. The perimeter of a geometric shape is the sum of the lengths of the sides, so the perimeter of this figure is $16 + 48 + 16 + 48 = 128$. This does not match the perimeter of 64 given in the question, so eliminate (B). The result was too big, and a longer side length will make the perimeter even bigger, so eliminate (C) and (D), as well. The correct answer is (A).

12. **A** The question asks for a value based on a geometric figure. Use the Geometry Basic Approach. Start by drawing a triangle on the scratch paper, then label the figure with the given information. The question gives the area of the triangle, so write out the formula for the area of a triangle, $A = \frac{1}{2}bh$, and plug in the given area to get $18 = \frac{1}{2}bh$. Since the question asks for a specific value and the answers contain numbers in increasing order, plug in the answers. Write the answers on the scratch paper, label them as "m," and start with a middle number. Try (B), 9. If $m = 9$, the base of the triangle is $9 + 5 = 14$, and the height of the triangle is 9. Plug these numbers into the area formula to get $18 = \frac{1}{2}(14)(9)$. Simplify the right side of the equation to get $18 = 63$. This is not true, so eliminate (B). The result was too big, and a larger value of m will make the area even bigger, so eliminate (C) and (D), as well. The correct answer is (A).

13. **D** The question asks for the equation that represents the relationship between two variables. When given a table of values and asked for the correct equation, plug values from the table into the answer choices to see which one works. According to the table, $s = 2$ when $c = 80$. Choice (A) becomes $80 = (1 + 3)^2$, or $80 = 4^2$, then $80 = 16$. This is not true, so eliminate (A). Choice (B) becomes $80 = (1 + 5)^2$, or $80 = 6^2$, then $80 = 36$; eliminate (B). Choice (C) becomes $80 = 3(1 + 5)^2$, or $80 = 3(6)^2$, then $80 = 3(36)$, then $80 = 108$; eliminate (C). Choice (D) becomes $80 = 5(1 + 3)^2$, or $80 = 5(4)^2$, then $80 = 5(16)$, then $80 = 80$. This is true, so keep (D). The correct answer is (D).

14. **A** The question asks for the number of points of intersection in a system of equations. One method is to use a graphing calculator. Enter both equations into the calculator, then scroll and zoom to see where, if at all, they intersect. The lines appear to be parallel and do not intersect. To solve algebraically, substitute $12x$ for y in the second equation to get $24x + 7 = 2(12x)$. Simplify the right side of the equation to get $24x + 7 = 24x$. Subtract $24x$ from both sides of the equation to get $7 = 0$. This is not true, so the system of equations has no solution. This means the lines are parallel and do not intersect. Using either method, the correct answer is (A).

15. **25** The question asks for a value given a specific situation. Translate the information in bite-sized pieces. The question states that the *equation $15a + 10b = 100$ represents the situation when a of the A tiles and b of the B tiles are drawn for a total of 100 points.* Since the sum of $15a$ and $10b$ is the number of points, and a and b are numbers of tiles, 15 and 10 must be the point values of one A tile and one B tile, respectively. To find the number of points earned by drawing 1 of each type of tile, plug in 1 for a and 1 for b to get $15(1) + 10(1) = 15 + 10 = 25$. The correct answer is 25.

16. **D** The question asks for an equation that represents a specific situation. The value of the fund is decreasing by a certain fraction over time, so this question is about exponential decay. Knowing the parts of the growth and decay formula can help with this question. That formula is *final amount* = (*original amount*)$(1 \pm \textit{rate})^{\textit{number of changes}}$. In this case, d is the final amount, and the question states that the original amount was \$10,000. Eliminate (A) and (B) because they do not have 10,000 as the original amount in front of the parentheses. Since this situation involves a decrease, the original amount must be multiplied by (1 – *rate*), and the rate here is $\frac{1}{4}$, so the value in parentheses should be $1-\frac{1}{4}$ or $\frac{3}{4}$. Eliminate (C), which does not have this rate. The only remaining answer is (D), and it matches the growth formula. Without this formula, it is still possible to answer this question. Plug in a value of y to see how the fund amount decreases over time. After 1 year, the fund will have $\frac{1}{4}$ less than the initial \$10,000. The value of the account will then

be $\$10{,}000 - \frac{1}{4}(\$10{,}000) = \$10{,}000 - \$2{,}500 = \$7{,}500$. After another year, the fund will have $\frac{1}{4}$ less than \$7,500, so the value will be $\$7{,}500 - \frac{1}{4}(\$7{,}500) = \$7{,}500 - \$1{,}875 = \$5{,}625$. Plug $y = 2$ into the answer choices to see which gives a value of 5,625 for d. Only (D) works. Using either method, the correct answer is (D).

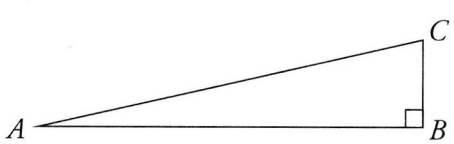
17. **C** The question asks for the measurement of part of a geometric figure. Use the Geometry Basic Approach. Start by drawing a cylinder on the scratch paper, then label the figure with the given information. Look up the formula for the volume of a cylinder on the online reference sheet and write it down: $V = \pi r^2 h$. Plug in the values given in the question for the volume and the height to get $144\pi = \pi r^2(4)$. Divide both sides of the equation by 4π to get $36 = r^2$. Take the square root of both sides of the equation to get $6 = r$. Be careful, and read the final question, which asks for the diameter, not the radius. The diameter of a circle is twice the radius, so $d = 2(6)$, or $d = 12$. The correct answer is (C).

18. **C** The question asks for the value of the x-coordinate of the solution to a system of equations. The quickest method is to enter both equations into a graphing calculator, then scroll and zoom as needed to find the point of intersection. The point is (6, –10), so the x-coordinate, or a, is 6. To solve the system for the x-coordinate algebraically, find a way to make the y-coordinates disappear when stacking and adding the equations. Compare the y-terms: the larger coefficient, 10, is 5 times the smaller one, 2. Multiply the entire first equation by –5 to get the same coefficient with opposite signs on the y terms. The first equation becomes $-5(4x + 2y) = -5(4)$ and then $-20x - 10y = -20$. Now stack and add the two equations.

$$\begin{array}{rl} -20x - 10y = & -20 \\ +\ \underline{19x + 10y = } & \underline{\ \ 14} \\ -x \qquad = & -6 \end{array}$$

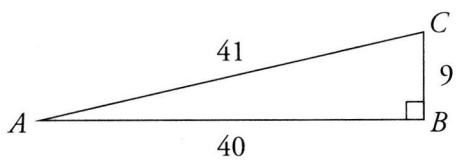
Divide both sides of the resulting equation by –1 to get $x = 6$. Using either method, the correct answer is (C).

19. $\frac{40}{41}$ The question asks for the value of a trigonometric function. Use the Geometry Basic Approach. Begin by drawing a triangle and labeling the vertices. The largest angle in a right triangle is the 90° angle, and the largest angle is opposite the longest side, so label angle B as a right angle. The drawing should look something like this:



Next, write out SOHCAHTOA to remember the trig functions. The SOH part defines the sine as $\frac{\text{opposite}}{\text{hypotenuse}}$, and the question states that $\sin(A) = \frac{9}{41}$, so label the side opposite angle A, which is $\overline{BC}$, as 9 and the hypotenuse, which is $\overline{AC}$, as 41. To find the length of the third side, use Pythagorean Theorem: $a^2 + b^2 = c^2$. Plug in the known values to get $9^2 + b^2 = 41^2$. Square the numbers to get $81 + b^2 = 1{,}681$, then subtract 81 from both sides of the equation to get $b^2 = 1{,}600$. Take the square root of both sides of the equation to get $b = 40$.

With all three side lengths labeled, the drawing looks like this:



To find $\sin(C)$, use the SOH part of SOHCAHTOA again. The side opposite angle C is 40, and the hypotenuse is 41, so $\sin(C) = \frac{40}{41}$. On fill-in questions, a fractional answer can also be entered as a decimal. When the answer is positive, there is room in the fill-in box for five characters, including the decimal point. In this case $\frac{40}{41} = .\overline{97560}$, which is too long. Either stop when there's no more room and enter .9756 or round the last digit, which in this case is also .9756. It is allowed but not required to put a 0 in front of the decimal point, which would make the answer 0.975 or 0.976, but do not shorten it more than that. The correct answer is $\frac{40}{41}$ or equivalent forms.

20. **–2.5** The question asks for the value when a quadratic function reaches its maximum. A parabola reaches its minimum or maximum value at its vertex, so find the x-coordinate of the vertex. One method is to enter the equation into a graphing calculator, then scroll and zoom as needed to find the vertex. The vertex is at (–2.5, 13.5), so the value of the x-coordinate is –2.5. To solve algebraically, find the value of h, which is the x-coordinate of the vertex (h, k). The equation is in standard form, $ax^2 + bx + c$, in which $h = -\frac{b}{2a}$. Since $a = -6$ and $b = -30$, $h = -\frac{-30}{2(-6)}$. This becomes $h = -\frac{-30}{-12}$, and then $h = -2.5$. Using either method, the correct answer is –2.5.

21. **10** The question asks for the value of a function. The question states that the graph of function f and the graph of function g are perpendicular lines, which means they have slopes that are negative reciprocals of each other. The question gives the equation of line f, so find the slope of that line. This function is in the form $y = mx + b$, in which m is the slope and b is the y-intercept, so the slope of line f is $-\frac{1}{5}$. The negative reciprocal of $-\frac{1}{5}$ is 5, so the slope of line g is 5. In function notation, the number inside the parentheses is the x-value that goes into the function, or the input, and the value that comes out of the function is the y-value, or the output. Together, they represent points on the graph of the function. Thus, if $g(0) = 0$, that means line g contains the point (0, 0). Plug this point into the $y = mx + b$ equation to get $0 = 5(0) + b$, or $0 = b$. Now plug $x = 2$, $m = 5$, and $b = 0$ into $y = mx + b$ to get $y = 5(2) + 0$, or $y = 10$. The correct answer is 10.

22. **2.4** The question asks for a value in a system of equations. Start by simplifying the second equation by multiplying both sides of the equation by 10 to get $y = -10x$. Now that both equations are equal to y, set them equal to each other to get $-10x = 5kx^2 + 2x + 3$. Add $10x$ to both sides of the equation to get $5kx^2 + 12x + 3 = 0$. The question states that the system *has exactly one solution*. To determine the number of solutions to a quadratic, use the discriminant. The discriminant is the part of the quadratic formula under the square root sign, and it can be written as $D = b^2 - 4ac$. When the discriminant is positive, the quadratic has exactly two real solutions; when the discriminant is 0, the quadratic has exactly one real solution; and when the discriminant is negative, the quadratic has no real solutions. Since this quadratic has exactly one real solution, the discriminant must equal 0. The quadratic is now in standard form, $ax^2 + bx + c = 0$, so $a = 5k$, $b = 12$, and $c = 3$. Plug these into the discriminant formula, along with $D = 0$, to get $0 = 12^2 - 4(5k)(3)$, which becomes $0 = 144 - 60k$. Add $60k$ to both sides of the equation to get $144 = 60k$, then divide both sides of the equation by 60 to get $2.4 = k$. The correct answer is 2.4.

Module 2—Easier

1. **C** The question asks for the median of a set of data. The median of a list of numbers is the middle number when the numbers are arranged in order. In lists with an even number of numbers, the median is the average of the two middle numbers. Count to see that there are 7 numbers in the list. Since there is an odd number of numbers, the median is the middle number. Since this list is already in order, cross out one number at a time from each end until only the middle number is left, like so: ~~33~~, ~~34~~, ~~38~~, 41, ~~43~~, ~~44~~, ~~47~~. The middle number is 41, so the median is 41. The correct answer is (C).

adjacent to A is 165, and the hypotenuse is 325, so $\cos(A) = \frac{165}{325}$. Since $\cos(L) = \cos(A)$, $\cos(L)$ is also $\frac{165}{325}$. To match the result with an answer choice, either use a calculator to find the decimal equivalent or reduce the fraction. Using a calculator, $\frac{165}{325} \approx 0.5077$ and $\frac{33}{65} \approx 0.5077$. To reduce the fraction, notice that both numbers are multiples of 5, and divide the numerator and denominator by 5 to get $\cos(L) = \frac{33}{65}$. Either way, the correct answer is (A).

Module 2—Harder

1. **A** The question asks for an equivalent form of an expression. Use bite-sized pieces and the Process of Elimination to tackle this question. The only term with a single a is $6a$, so it cannot be combined with any other terms and must appear in the correct answer. Eliminate (B) and (C) because they do not include $6a$. Combine the two terms with a^3 to get $3a^3 - 5a^3 = -2a^3$. Eliminate (D) because it does not include $-2a^3$. The correct answer is (A).

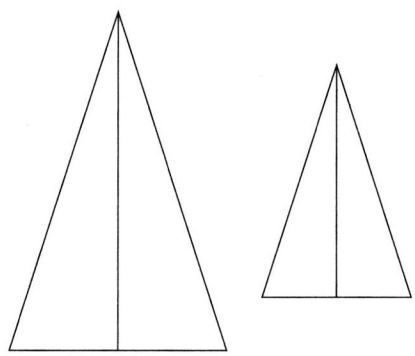
2. **A** The question asks for a percent based on the information provided. Start by ballparking: 10% of 45,000,000 is 4,500,000, so 4,950,000 is a little more than 10%. Eliminate (C) and (D) because they are much too large. Choice (A) is likely correct, but to check, plug in 11%. *Percent* means out of 100, so 11% can be represented as $\frac{11}{100}$. Multiply this by the total number of shirts to get $\frac{11}{100}(45{,}000{,}000) = 4{,}950{,}000$. This matches the number of white shirts given in the question. The correct answer is (A).

3. **–120** The question asks for the value of an expression based on an equation. When a Digital SAT question asks for the value of an expression, there is usually a straightforward way to solve for the expression without needing to completely isolate the variable. Start solving by distributing the numbers outside the parentheses on both sides of the equation. The equation becomes $3x - 24 - 16 = 8x + 80 + x$. Simplify both sides of the equation to get $3x - 40 = 9x + 80$. Subtract $3x$ from both sides of the equation to get $-40 = 6x + 80$, then subtract 80 from both sides of the equation to get $-120 = 6x$. The question asked for the value of $6x$, so stop here. The correct answer is –120.

4. **B** The question asks for the value of an expression based on an equation. When a Digital SAT question asks for the value of an expression, there is usually a straightforward way to solve for the expression without needing to completely isolate the variable. Start by subtracting $8(a - 3)$ from both sides of the equation to get $-17 = 9(a - 3) - 8(a - 3)$. Combine the terms with $(a - 3)$ to get $-17 = (9 - 8)(a - 3)$, which becomes $-17 = 1(a - 3)$, or $-17 = a - 3$. The correct answer is (B).

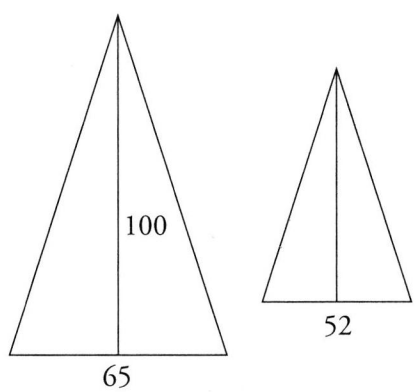
5. **C** The question asks for the meaning of a constant in context. Start by reading the final question, which asks for the meaning of the constant *b*. Then label the parts of the equation with the information given. The question states that the lab area is 30 square feet, the seating area is 80 square feet, and the total number of floor tiles is 4,200. Rewrite the equation with these labels: (lab area size)(*a*) + (seating area size)(*b*) = total tiles. Next, use Process of Elimination to get rid of answer choices that are not consistent with the labels. Since *b* is multiplied by the size of the seating area, eliminate (A) and (B) because they refer to the lab area, not the seating area. Compare the remaining answer choices. The difference is between the average number of tiles and the total number of tiles. Since *b* is multiplied by the number of square feet in the seating area, it must represent a value per square foot, not a total value. Keep (C) because it is consistent with this information, and eliminate (D) because it refers to a total number. The correct answer is (C).

6. **D** The question asks for the change in a value given a proportion. Use the Geometry Basic Approach. Start by drawing two triangles, one with a smaller base than the other. The question asks about the height, so draw a line for the height. This figure should look something like this:



Next, label the figure with the information given. Since no specific numbers are given for the base and the height, plug in. Make the height of the larger triangle 100, so the base would be 65% of 100 or just 65. If the base decreases by 13 inches, the new base would be 65 – 13 = 52 inches.

Label this information on the figure, which now looks like this:



Since the base is smaller and the proportions stay the same, the height must also be smaller. Eliminate (A) and (B) because they would both make the height larger. To find the length of the new height, set up a proportion for $\frac{\text{base}}{\text{height}}$: $\frac{65}{100} = \frac{52}{x}$. Cross-multiply to get (100)(52) = (65)(x). Simplify both sides of the equation to get 5,200 = 65x. Divide both sides of the equation by 65 to get 80 = x. Since the original height was 100, the change is 100 – 80 = 20. The new height is less than the original height, so it decreased by 20. The correct answer is (D).

7. **B** The question asks for an equation in terms of a specific variable. Since the question is about the relationship between variables and the answers contain variables, plug in. The fraction on the left side of the equation could make the numbers awkward, so start on the right side of the equation and make b = 2. The equation becomes $\frac{a}{3} = 10 - 7(2)$, then $\frac{a}{3} = 10 - 14$, and then $\frac{a}{3} = -4$. Multiply both sides of the equation by 3 to get a = –12. Now plug a = –12 and b = 2 into the answer choices and eliminate any that do not work. Choice (A) becomes $2 = \frac{-12 - 21}{30}$, then $2 = -\frac{33}{30}$. This is not true, so eliminate (A). Choice (B) becomes $2 = \frac{30 - (-12)}{21}$, then $2 = \frac{42}{21}$, and then 2 = 2. This is true, so keep (B) but check the remaining answers just in case. Choice (C) becomes $2 = 10 + \frac{-12}{3}$, then 2 = 10 + (–4), and then 2 = 6; eliminate (C). Choice (D) becomes $2 = 10 + \frac{3}{-12}$, then $2 = 10 + \left(-\frac{1}{4}\right)$, and then $2 = 9\frac{3}{4}$; eliminate (D). The correct answer is (B).

8. **B** The question asks for the value of a constant given two equivalent expressions. Start by rewriting the expressions with an equal sign between them to get $\frac{3}{y + c} = \frac{15}{5y + 30}$. Next, start to solve by cross-multiplying. The equation becomes (y + c)(15) = (3)(5y + 30). Distribute on both sides of the equation to get 15y + 15c = 15y + 90. Subtract 15y from both sides of the equation to get 15c = 90. Divide both sides of the equation by 15 to get c = 6. The correct answer is (B).

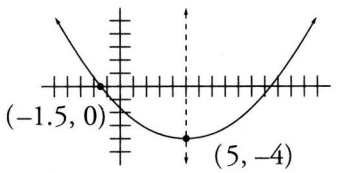
9. **25** The question asks for the value of a constant, given information about circles in the coordinate plane. The equation of a circle in standard form is $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center and r is the radius. In the equation given for circle O, r^2 = 64. Take the square root of both sides of the equation to get r = 8. The question states that *the radius of circle P is three less than the radius of circle O*, so the radius of circle P is 8 – 3 = 5. Plug r = 5 into the equation of circle P to get $(x - 7)^2 + (y + 7)^2 = 5^2$, or $(x - 7)^2 + (y + 7)^2 = 25$. Thus, c = 25. The correct answer is 25.

10. **C** The question asks for a maximum value given a specific situation. Since the question asks for a specific value and the answers contain numbers in increasing order, plug in the answers. Rewrite the answer choices on the scratch paper and label them "number of laptops." Next, pick a value to start with. Since the question asks for the maximum, start with the largest number, 146. The question states that *each laptop costs $149*, so multiply that by the number of laptops to get ($149)(146) = $21,754. The question also states that there is *a 7.5% discount on orders of at least 100 laptops.* Since 146 is more than 100, the discount applies. Take 7.5% of the cost and subtract the result from the cost to get $\$21{,}754-\left(\frac{7.5}{100}\right)(\$21{,}754)=\$20{,}122.45$. This is greater than the donation of $20,000, so eliminate (D). The result was close, so plug in the next largest value, 145, for the number of laptops. The initial cost becomes ($149)(145) = $21,605. Apply the 7.5% discount to get $\$21{,}605-\left(\frac{7.5}{100}\right)(\$21{,}605)\approx\$19{,}984.63$. This is less than the donation of $20,000, so the school can purchase 145 laptops. The correct answer is (C).

11. **A** The question asks for the value of the x-coordinate of the solution to a system of equations. The quickest method is to enter both equations into a graphing calculator, then scroll and zoom as needed to find the points of intersection. The graph shows two points of intersection: (3, 1) and (–4, 22), so the x-coordinate is either 3 or –4. Only –4 is in an answer choice, so choose (A). To solve the system for the x-coordinate algebraically, substitute $-3x + 10$ for y in the first equation to get $3x^2 - (-3x + 10) - 26 = 0$. Distribute the negative sign to get $3x^2 + 3x - 10 - 26 = 0$, then combine like terms to get $3x^2 + 3x - 36 = 0$. Factor out 3 to get $3(x^2 + x - 12) = 0$. Factor the quadratic to get $3(x + 4)(x - 3) = 0$. Set each factor equal to 0 and solve to get $x = -4$ and $x = 3$. Using either method, the correct answer is (A).

12. **A** The question asks for the number of solutions to an equation. Distribute on both sides of the equation to get $-24y - 12 = 12 - 24y$. Add $24y$ to both sides of the equation to get $-12 = 12$. This is not true, so the equation has no solutions. The correct answer is (A).

13. **D** The question asks for an x-intercept of a parabola. Sketch a graph using the given points, and label those points. The vertex of a parabola is on the axis of symmetry, so the axis of symmetry of this parabola is the line $x = 5$; add this line to the graph. The graph should look something like this:



The two x-intercepts are an equal distance from the line of symmetry. The x-coordinate of the given x-intercept is –1.5, so the distance from the line of symmetry is $5 - (-1.5) = 6.5$. The x-coordinate of the other x-intercept is thus $5 + 6.5 = 11.5$. The correct answer is (D).

14. **C** The question asks for an equation that represents a graph. To find the best equation, compare features of the graph to the answer choices. The answer choices all take the form $y = mx + b$, in which m is the slope and b is the y-intercept. All of the answer choices have the same slope, so focus on the y-intercept. The graph shown in the question has been transformed from the graph of function g. Adding or subtracting outside the parentheses shifts the graph up or down. Thus, the given graph of $g(x) - 10$ is shifted 10 units down from the graph of $g(x)$. Undo this by adding 10 to transform the given graph back to $g(x)$. The graph of $g(x) - 10$ has its y-intercept at (0, –5). Move the point up 10 units to get a y-intercept of (0, 5). Eliminate (A), (B), and (D) because the equations have the wrong y-intercept. The correct answer is (C).

15. **D** The question asks for the value of a constant in a quadratic equation. To determine when a quadratic equation has no real solutions, use the discriminant. The discriminant is the part of the quadratic formula under the square root sign and is written as $D = b^2 - 4ac$. When the discriminant is positive, the quadratic has exactly two real solutions; when the discriminant is 0, the quadratic has exactly one real solution; and when the discriminant is negative, the quadratic has no real solutions. Thus, the discriminant of this quadratic must equal a negative number. First, put the quadratic in standard form, which is $ax^2 + bx + c = 0$, by adding $5x$ to both sides of the equation to get $10x^2 + 5x + c = 0$. Now $a = 10$, $b = 5$, and $c = c$. Plug these into the discriminant formula to get $D = (5)^2 - 4(10)(c)$, or $D = 25 - 40c$. Next, plug in the values from the answer choices to see which value of c makes the discriminant negative. Start with a middle answer and try (C), 0. If $c = 0$, the discriminant becomes $D = 25 - 40(0)$, or $D = 25$. This is not negative, so eliminate (C). It might not be clear whether a larger or smaller number is needed, so pick a direction and try (D), 1. If $c = 1$, the discriminant becomes $D = (5)^2 - (4)(10)(1)$, or $D = 25 - 40$, and then $D = -15$. This is negative, so stop here. The correct answer is (D).

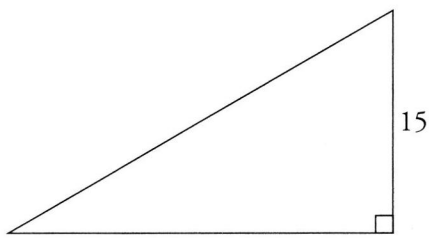
16. **A** The question asks for the value of an expression given the equation of a graph in the *xy*-plane. One method is to use a graphing calculator. Enter the equation of the line, then scroll and zoom as needed to find the intercepts. The *x*-intercept is at (5.667, 0), and the *y*-intercept is at (0, –4.25). Thus, $c = 5.667$, $k = -4.25$, and $\frac{c}{k} = \frac{5.667}{-4.25} = -1.33$. This is the same value as $-\frac{4}{3}$, which matches (A). To solve algebraically, plug the given points into the equation of the line. Plug in $x = c$ and $y = 0$ to get $3c - 4(0) = 17$, or $3c = 17$. Divide both sides of the equation by 3 to get $c = \frac{17}{3}$. Next, plug in $x = 0$ and $y = k$ to get $3(0) - 4k = 17$, or $-4k = 17$. Divide both sides of the equation by –4 to get $k = -\frac{17}{4}$. Finally, divide c by k to get $\frac{c}{k} = \frac{\frac{17}{3}}{-\frac{17}{4}}$. When dividing fractions, multiply the reciprocal of the fraction in the denominator and the fraction in the numerator. This becomes $\frac{c}{k} = \left(\frac{17}{3}\right)\left(-\frac{4}{17}\right)$, and then $\frac{c}{k} = -\frac{4}{3}$. Using either method, the correct answer is (A).

17. **12** The question asks for the value of a constant in a system of equations. When a system of linear equations has infinitely many solutions, the two equations form the same line and are equivalent to each other. Since c is a coefficient of g, look for a way to cancel the f-terms and the constants when stacking and adding the equations. First, put the two equations in the same order by subtracting $21g$ from both sides of the second equation to get $21 = 6f - 36g$, and then subtract $6f$ from both sides of the second equation to get $21 - 6f = -36g$. The f-term and constant of the second equation are both 3 times the equivalent terms in the first equation with opposite signs, so multiply the first equation by 3 to get $-21 + 6f = 3cg$. Now stack and add the equations.

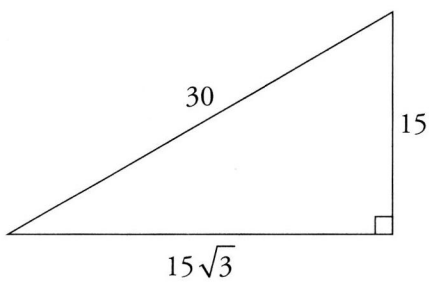
$$\begin{aligned} -21 + 6f &= 3cg \\ +\ \underline{21 - 6f} &= \underline{-36g} \\ 0 + 0 &= 3cg - 36g \end{aligned}$$

Add $36g$ to both sides of the resulting equation to get $36g = 3cg$. Divide both sides of the equation by $3g$ to get $12 = c$. The correct answer is 12.

18. **C** The question asks for the perimeter of a triangle. Use the Geometry Basic Approach. Start by drawing a triangle on the scratch paper with a right angle and one of the remaining angles twice the size of the other. Next, label the figure with the information given, and label the smallest side as 15. The drawing should look something like this:



A 30:60:90 triangle is one of the special right triangles that has a specific proportional relationship among the sides. The proportion can be found by clicking open the reference sheet, and it is x: $x\sqrt{3}$:$2x$. Since the smallest side is 15, $x = 15$. The other sides are $15\sqrt{3}$ and $2(15) = 30$. Label the figure with this information; the figure now looks like this:



The perimeter of a geometric shape is the sum of the lengths of all of the sides. Add all three side lengths to get $15 + 15\sqrt{3} + 30 = 45 + 15\sqrt{3}$. The correct answer is (C).

19. **B** The question asks for the value of an expression based on information about a function. In function notation, $f(x) = y$. The number inside the parentheses is the x-value that goes into the function, or the input, and the value that comes out of the function is the y-value, or the output. The table gives four pairs of input and output values for the function. To solve for the constants c and d, start by plugging in one of the pairs from the table. Plug $x = 2$ and $g(x) = 46$ into the function to get $46 = 2c + d$. There is no way to solve for $c + d$ using only this equation, so plug in a second pair of values. Plug $x = 4$ and $g(x) = 0$ into the function to get $0 = 4c + d$. There are now two equations with two constants, so find a way to make one of the constants disappear when stacking and adding the equations. Multiply the second equation by -1 to get $0 = -4c - d$.

The d-terms are now the same with opposite signs, so stack and add the two equations.

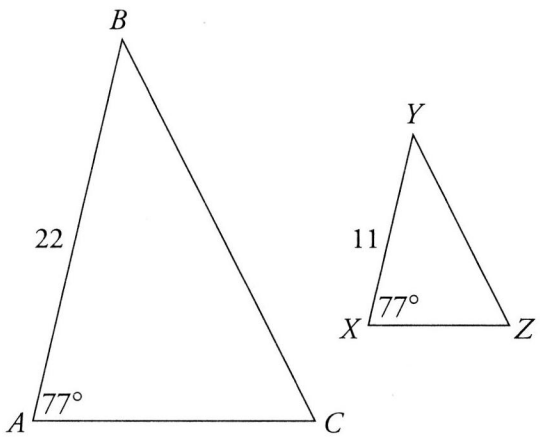
$$\begin{aligned} 46 &= 2c + d \\ + \quad 0 &= -4c - d \\ 46 &= -2c \end{aligned}$$

Divide both sides of the resulting equation by –2 to get $c = -23$. Plug $c = -23$ into the first equation to get $46 = 2(-23) + d$, or $46 = -46 + d$. Add 46 to both sides of the equation to get $92 = d$. Add the values of the two constants to get $c + d = -23 + 92 = 69$. The correct answer is (B).

20. **105** The question asks for a value given information about the mean, or average, of a data set. For averages, use the formula $T = AN$, in which T is the *Total*, A is the *Average*, and N is the *Number of things*. Start by finding the mean of the four integers given in the question. There are 4 values, so $N = 4$. Find the *Total* by adding the four integers to get $T = 114 + 109 + 106 + 111 = 440$. The average formula becomes $440 = (A)(4)$. Divide both sides of the equation by 4 to get $A = 110$. The question asks for the smallest integer that results in the full data set having an average less than that of the four integers shown, which is 110. Start with the next smallest integer, 109, for the average, and solve for the fifth integer in the data set. The average formula becomes $T = (109)(5)$, so $T = 545$. The total of the first four integers was 440, so the fifth integer is $545 - 440 = 105$. The question also states that *the mean of the entire data set is an integer* and that all of the integers are *greater than 101*, and 105 meets both of these conditions. To see whether a smaller integer meets all of the conditions given in the question, try an average of 108. The *Total* is now $T = (108)(5) = 540$, and the fifth integer is $540 - 440 = 100$. This is not greater than 101, so 100 is too small. The correct answer is 105.

21. **B** The question asks for the function that represents a certain situation. There are variables in the answer choices, and the question asks about the relationship between the number of points and the number of assignments, so plug in. Make $a = 51$ to include the 5-point assignments and at least one 3-point assignment. The first 50 completed assignments earn 5 points each, for a total of $(50)(5) = 250$ points. The additional completed assignment earns 3 points. The total number of points earned for the 51 completed assignments is $250 + 3 = 253$. This is the target value; write it down and circle it. Now plug $a = 51$ into the answer choices and eliminate any that do not match the target value. In function notation, $f(x) = y$. The number inside the parentheses is the x-value that goes into the function, or the input, and the value that comes out of the function is the y-value, or the output. Since $a = 51$, 51 is the input value, and the output value should be 253. Choice (A) becomes $g(51) = 3(51) + 5$, then $g(51) = 153 + 5$, and then $g(51) = 158$. This does not match the target value, so eliminate (A). Choice (B) becomes $g(51) = 3(51) + 100$, then $g(51) = 153 + 100$, and then $g(51) = 253$. This matches the target, so keep (B) but check the remaining answers just in case. Choice (C) becomes $g(51) = 3(51) + 250$, then $g(51) = 153 + 250$, and then $g(51) = 403$; eliminate (C). Choice (D) becomes $g(51) = 8(51) - 150$, then $408 - 150$, and then $g(51) = 258$; eliminate (D). The correct answer is (B).

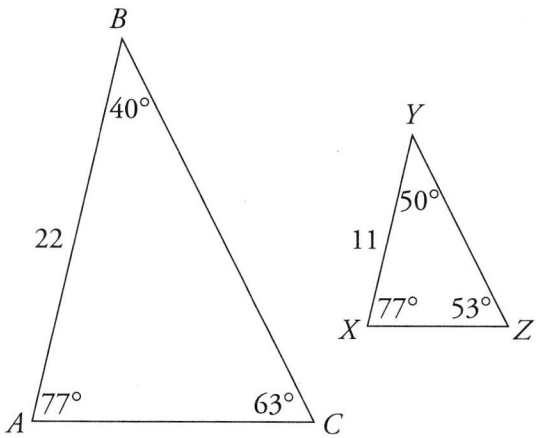
22. **D** The question asks for information that will provide proof of similar triangles. Use the Geometry Basic Approach. Triangles are similar when they have the same angle measures and proportional side lengths, so draw two triangles on the scratch paper that look similar but are different sizes. Then label the figures with information from the question: label AB as 22, XY as 11, and angles A and X as 77°. The drawing should look something like this.



Next, evaluate the Roman numeral statements. They all give information about angles, so focus on the rule that similar triangles have the same three angle measures. The question only provides enough information to know that one angle measure is the same in both triangles, so more information is necessary; eliminate (A). Angle measures alone do provide enough information if all three angles have the same measure, so eliminate (B).

Check the remaining answers one at a time to see whether one shows that all three angles have the same measure. Try (C), and label angle B as 40° and angle Y as 50°. Find the measure of the third angle in each triangle. All triangles contain 180°, so set up equations: $77° + 40° + C° = 180°$, and $77° + 50° + Z° = 180°$. Simplify the first equation to get $117° + C° = 180°$, then subtract 117° from both sides of the equation to get $C = 63°$. Simplify the second equation to get $127° + Z° = 180°$, then subtract 127° from both sides of the equation to get $Z = 53°$.

Label the figures with this information, and they now look like this:



The triangles do not have the same three angle measures, so they are not similar; eliminate (C). Try (D) and follow the same steps. Label angle B as 40° and angle Z as 63°. Angle C is again 63°. Solve for angle Y: $77° + Y° + 63° = 180°$, $140° + Y° = 180°$, and $Y° = 40°$. Label the triangles with this information to see that the triangles now have the same three angle measures. The correct answer is (D).