

PROFESSIONAL
DEVELOPMENT
MODULE

8

FACILITATOR'S
GUIDE

Connecting Science Instruction with the SAT[®] Suite of Assessments

The SAT® Suite of Assessments (SAT, PSAT/NMSQT®, PSAT™ 10, PSAT™ 8/9) is more aligned with classroom instruction than ever before. At the College Board, we know that the best way to prepare students for college and career is through excellent instruction aligned to college- and career-ready content and skills, and we have the opportunity to support excellent instruction by designing assessments that measure the skills that matter the most for college and career readiness. We are committed to partnering with teachers and school and district leaders to help students build the necessary skills that will ensure their success at their chosen college, university, or career training program.

An important feature of the SAT Suite of Assessments — based on extensive evidence and reflective of best instructional practices — is the emphasis on students applying their literacy and math knowledge and skills in a wide range of subjects. This across-the-curriculum focus means that teachers in many fields, including science, have a critical and specific role to play in helping students get ready for the assessments and, more importantly, acquire the knowledge and skills they'll need to succeed in college and career training programs.

The purpose of the *Professional Development Modules for Educators* is to build a deep understanding of the content and skills assessed on the SAT Suite of Assessments, and to support educators as they identify the natural points of alignment across the SAT Suite, classroom instruction, and curriculum. The professional development modules contain descriptions of the assessment content, sample questions, and suggestions for helping students master content and prepare for the SAT Suite. The modules are flexible; they are designed for download and presentation in various meetings and professional development sessions, for individual or group use. The presentations can be viewed in one sitting or broken into shorter chunks over time. The modules suggest interactive activities for groups and teams, but the content can be reviewed by individuals. Facilitators will bring different strengths and emphases to each presentation, and may add or delete sections or topics according to the interests in their group of participants. There is no one right way to engage in this professional development; it is our hope that individuals, schools, and districts will adapt and utilize the presentations and handouts in ways that maximize effectiveness in a variety of situations.

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What are the suggestions for module presentations?

1. Review the complete *Facilitator's Guide* with handouts and the PowerPoint presentation to get familiar with the suggested talking points, activities, and handouts in the presentation.
2. Provide a paper or electronic copy of the PowerPoint presentation to all participants for personal review and note-taking.
3. Print or email all handouts at the end of this *Facilitator's Guide* for each participant.
4. Review the suggested timing for each slide and activity, and choose activities that fit in the time frame allotted for your meeting.
5. Please follow up each presentation with an email to participants that includes a link to the online exit survey.

SUGGESTED PRESENTATION FOR TIME ALLOTTED*		
Time Allotted	Slides	Handouts
45 minutes	1–16, 23–28, 30–35	<i>Reading Test Sample Paired Passages</i> <i>Writing and Language Test Sample Passage</i> <i>Math Test Sample Questions</i> <i>Instructional Strategies (for review after the session)</i>
75 minutes	1–37	<i>Sample Paired Passages</i> <i>Reading Test Genetical Implications</i> <i>Writing and Language Test Sample Passage</i> <i>Math Test Sample Questions</i> <i>Instructional Strategies (discuss during session)</i>
90–120 minutes	All Slides	All Handouts

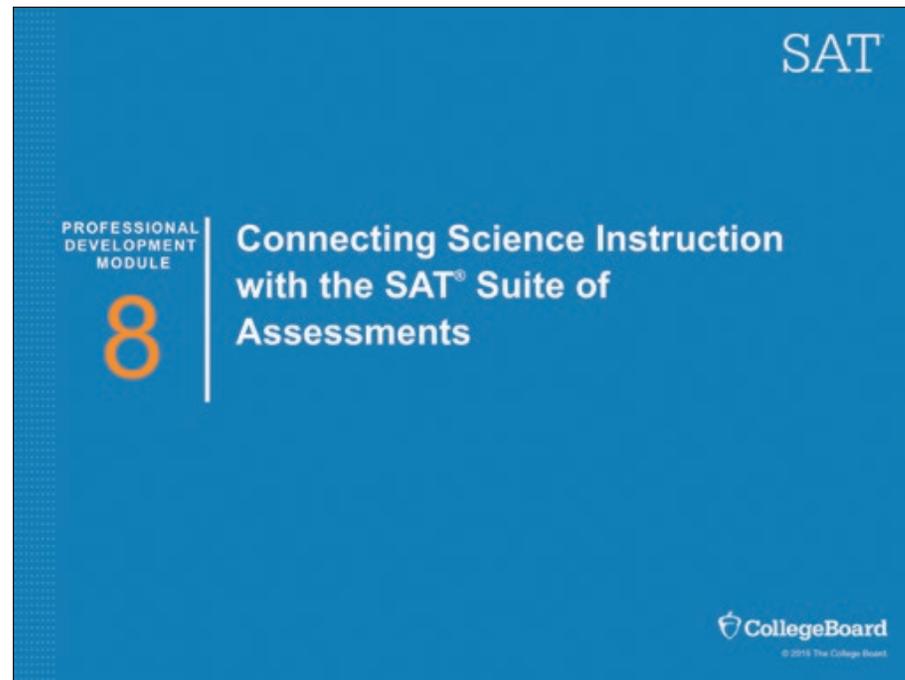
*Please note: The time allotted for each slide is estimated and based on a general audience. Different audiences may have varied levels of engagement and may spend more time discussing particular questions or strategies in the presentation.

Presentation Notes

SLIDE 1

ESTIMATED TIME (IN MINUTES): 1

Today's presentation will help science teachers recognize the important role they play in helping students prepare for the SAT® and achieve the college and career readiness benchmarks.



Presentation Notes

SLIDE 2	ESTIMATED TIME (IN MINUTES): 2
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The purpose of this professional development module is to understand how science instruction impacts SAT scores and college and career readiness. Participants will understand the Analysis in Science cross-test score by reviewing the skills associated with the scores and some sample questions that assess those skills. Finally, participants will have an opportunity to think about how these skills connect with the skills taught in their classes.

ASK: What is a science teacher's role in preparing students for the SAT?



What Is the Purpose of the Science Module?

- ▶ Understand how science instruction relates to SAT Suite scores and college and career readiness
- ▶ Explain the Analysis in Science cross-test score
- ▶ Review sample questions and passages
- ▶ Make connections with classroom instruction

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Presentation Notes

SLIDE 3	ESTIMATED TIME (IN MINUTES): 1
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Give participants a brief overview of the format of the assessments in the SAT Suite. Students will take the Reading Test and the Writing and Language Test. Together, those tests form the Evidence-Based Reading and Writing section. The other section is the Math section, which comprises the no-calculator portion and the calculator-permitted portion of the Math Test. The SAT Essay is offered only with the SAT and is optional.

The Format of the SAT Suite of Assessments

SAT

- ▶ Evidence-Based Reading and Writing section
 - ▶ Reading Test
 - ▶ Writing and Language Test
- ▶ Math section
 - ▶ No-Calculator portion
 - ▶ Calculator portion
- ▶ Optional SAT Essay

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Presentation Notes

SLIDE 4	ESTIMATED TIME (IN MINUTES): 2
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Begin with the end in mind, explaining the scores students receive when they take any of the assessments in the SAT Suite. Each box on this table represents a score students will receive when they take a PSAT-related or SAT assessment. These scores give students and educators insightful information about each student's areas of strength, and the areas in need of growth.

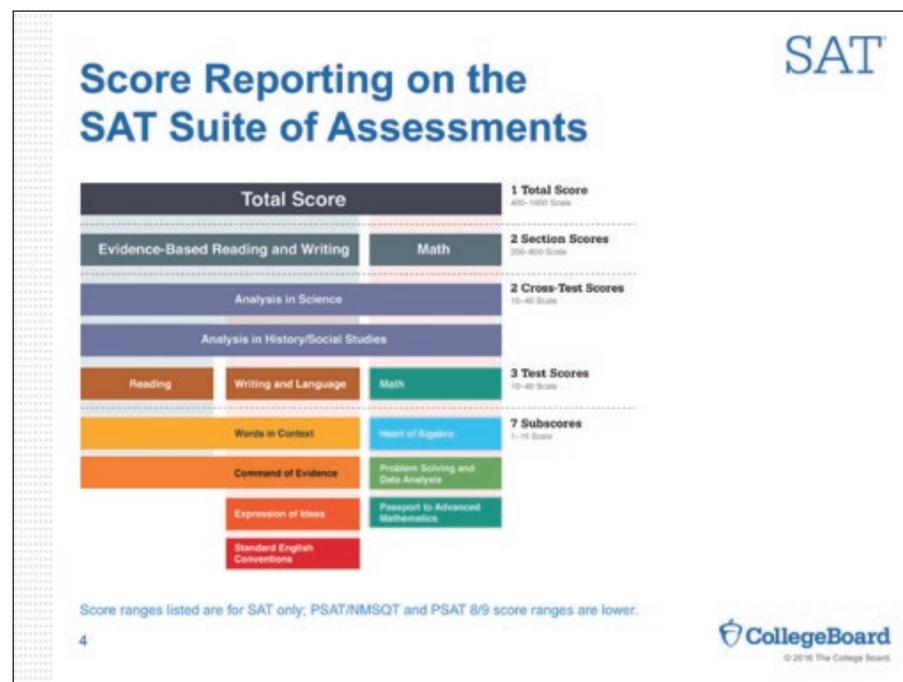
Direct participants' attention to the three test scores in the middle of the table: Reading, Writing and Language, and Math. These are the tests students will encounter on all of the assessments in the SAT Suite. In the second row, point out the section scores. The table shows that the Evidence-Based Reading and Writing section score encompasses both the Reading Test and the Writing and Language Test because they're in the same column. The Math section score is in the same column as the Math Test, demonstrating that the Math section score is derived from the two portions of the Math Test. Note that the test scores are on a different scale than the section scores.

Explain that the two section scores are added together for one total score.

In the middle of the table, note that the cross-test scores are in all three columns because they are derived from all three tests. This presentation is focused on the Analysis in Science cross-test score.

At the bottom of the table are the seven subscores. The three subscores listed below Math are derived from the Math Test. Words in Context and Command of Evidence subscores are derived from the Reading Test and the Writing and Language Test; and the Expression of Ideas and Standard English Conventions subscores are derived from the Writing and Language Test only.

The SAT Essay is optional and is not factored into any scores on this table. The essay is scored separately and students will receive scores in analysis, reading, and writing if they elect to take the SAT Essay.



All of the assessments in the SAT Suite will offer the same scores, except PSAT 8/9 will not have a score for Passport to Advanced Math, and only the SAT offers the optional essay. Content on each assessment will be offered at a level of complexity that is appropriate for the intended grade levels being assessed (eighth and ninth grades for PSAT 8/9, 10th and 11th grades for PSAT/NMSQT and PSAT 10, and 11th and 12th grades for SAT). Score ranges on the slide are accurate for the SAT. PSAT/NMSQT and PSAT 10 score ranges are slightly lower due to lower levels of complexity on the assessments (360–760 for section scores); PSAT 8/9 score ranges are the lowest (320–720 for section scores) in the SAT Suite of Assessments.

Presentation Notes

SLIDE 5

ESTIMATED TIME (IN MINUTES): 1

One hallmark of the SAT Suite is its emphasis on disciplinary literacy and numeracy. Rather than asking students to demonstrate generic reading, writing, language, and math knowledge and skills in ways that lack real-world relevance, the SAT Suite makes extensive use of texts, tasks, and scenarios similar to those students already encounter in their high school classes and to those they'll have to deal with in college and career training programs.

To help students understand how well they use their ELA and math knowledge and skills in social studies and science, the SAT Suite offers two cross-test scores: Analysis in Science and Analysis in History/Social Studies. This presentation is focused on the Analysis in Science cross-test score. Cross-test scores are derived from questions on all three of the tests students take: Reading, Writing and Language, and Math. Students will see reading passages and math problems that are focused on topics in science and social studies. Some passages on the Reading Test and the Writing and Language Test will be accompanied by informational graphics (tables, graphs, charts, etc.) and students will be asked to understand how the graphics relate to the text. Some math problems will have science or social studies contexts. All of these questions will contribute to the cross-test scores.

The optional SAT Essay does not contribute to the cross-test scores, but may relate to social studies or science. It may require students to analyze a passage in the content areas. Students will be scored on their ability to read, write, and analyze text, and must be able to support their analysis with evidence from the passage.

SAT

How Does the SAT Suite of Assessments Relate to Instruction in Science Courses?

- ▶ The SAT Suite emphasizes literacy and numeracy in a variety of subjects.
- ▶ **Cross-test scores:** Analysis in Science and Analysis in History/Social Studies scores
 - ▶ Generated from selected questions on the Reading, Writing and Language, and Math Tests.
 - ▶ The scores do not represent the level of student content knowledge in science or social studies.
- ▶ **Analysis in Science cross-test score** indicates how effectively students can apply their reading, writing, language, and quantitative analysis knowledge and skills in the science.
 - ▶ Some texts on the Reading Test and Writing and Language Test will have foundations in science.
 - ▶ Informational graphics such as tables, graphs, and maps may relate to topics in science.
 - ▶ Math problems may have science contexts.

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Presentation Notes

SLIDE 6

ESTIMATED TIME (IN MINUTES): 1

Ask participants what they want their students to be able to do (as opposed to what they should know) as students of science. Ask them to talk with a partner, and then share their answers with the group.

Share the AP[®] science practices on the slide. Explain that tasks in which students engage on the SAT Suite will relate to some of the AP science practices.

SAT

What Should Science Students Be Able to Do?

AP[®] Science Practices

- ▶ Use representations and models to communicate scientific phenomena and solve science problems.
- ▶ Use mathematics appropriately.
- ▶ Engage in scientific questioning to extend thinking or to guide investigations.
- ▶ Plan and Implement data collection strategies in relation to a particular scientific question.
- ▶ Perform data analysis and evaluation of evidence.
- ▶ Work with scientific explanations and theories.
- ▶ Connect and relate knowledge across various scales, concepts, and representations in and across domains.



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Presentation Notes

SLIDE 7

ESTIMATED TIME (IN MINUTES): 3

For clarity, this table explains exactly how many questions from each test will contribute to the Analysis in Science cross-test score.

- » Reading: 21 questions; two science passages or one passage and one pair
- » Writing and Language: 6 questions; all Expression of Ideas questions associated with a science passage (questions about sentence structure, usage, and punctuation are *not* included in the Analysis in Science score)

Math: 8 questions; based in science contexts

The number of questions from each of the science disciplines will vary with each administration of the assessments.

Analysis in Science Score: Contributions by Test



Test	Contribution to Analysis in Science Cross-Test Score
Reading	21 questions; 2 science passages
Writing and Language	6 questions; all Expression of Ideas questions associated with a science passage (questions about sentence structure, usage, and punctuation not included)
Math	8 questions; based in science contexts
<p>*The number of questions from each science discipline (biology, chemistry, physics, earth science, etc.) will vary with each administration of the assessments.</p>	

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Presentation Notes

SLIDE 8

ESTIMATED TIME (IN MINUTES): 1

The SAT Suite supports an enhanced emphasis on disciplinary literacy through careful passage selection and question development. In the Reading Test, Writing and Language Test, and SAT Essay, students are expected to engage with and analyze appropriately challenging texts spanning numerous content areas, including U.S. and world literature, history/social studies, the humanities, the sciences, and career-related topics. Moreover, while questions on the Reading Test and the Writing and Language Test do not require students to have prior knowledge of specific topics in the content areas, these questions do, where possible and beneficial, reflect differences in the ways various disciplines approach literacy. Reading questions relating to a literature selection, for example, might address theme, mood, figurative language, or characterization — concepts that are generally not relevant to the sciences. Reading questions relating to a science selection, on the other hand, might require students to delineate the experimental process described in a text, analyze research data (including data represented graphically), or determine which conclusion is best supported by a study’s findings — skills generally not required to comprehend literary texts.

The Analysis in Science score *does not* represent the level of students’ background knowledge in science. It *does* indicate the extent to which students can apply their literacy and numeracy knowledge and skills to science texts, tasks, and scenarios.

Analysis in Science on the Reading Test and Writing and Language Test

SAT

- ▶ The SAT Suite emphasizes disciplinary literacy through careful passage selection and question development.
- ▶ Questions reflect differences in the ways various disciplines approach literacy.
- ▶ Questions do not require students to have prior knowledge of specific topics in the content areas.

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Presentation Notes

SLIDE 9**ESTIMATED TIME (IN MINUTES): 1**

Direct participant's attention to the Reading Test. In this section of the presentation, participants will investigate the skills assessed in the SAT Suite that are learned in science, and then they will review some sample reading passages and questions that contribute to the Analysis in Science cross-test score.

It is important to note at the outset that the intent is not to push science teachers into becoming reading teachers. Rather, the intent is to show how fostering students' ability to handle the special challenges of reading, writing, language, and quantitative analysis in science contributes in a unique way to the literacy and numeracy work going on in schools.

SAT

Reading Test: Analysis in a
Science Context

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Presentation Notes

SLIDE 10

ESTIMATED TIME (IN MINUTES): 1

Test specifications are available at collegeboard.org and in Professional Development Modules 2–5 (www.collegereadiness.collegeboard.org/educators/k-12/professional-development-modules). The content on this and the next two slides is lifted from the test specifications and helps science teachers understand that they are already teaching these assessed skills in their science classes.

All of the questions associated with a science passage on the Reading Test will contribute to the Analysis in Science cross-test score, not just those related to the skills included on the slides.

On the next two slides, certain content domains are highlighted from the test specifications to help science teachers understand that they are already teaching these assessed skills in their classes.

Science-Related Skills Assessed on the Reading Test

SAT

► Information and Ideas

- **Reading closely** — These questions focus on the explicit and implicit meaning of text and on extrapolating beyond the information and ideas in a text.
 - **Determining explicit meanings** — The student will identify information and ideas explicitly stated in text.
 - **Determining implicit meanings** — The student will draw reasonable inferences and logical conclusions from text.
 - **Using analogical reasoning** — The student will extrapolate in a reasonable way from the information and ideas in a text or apply information and ideas in a text to a new, analogous situation.
- **Citing textual evidence** — The student will cite the textual evidence that best supports a given claim or point.

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Presentation Notes

SLIDE 11

ESTIMATED TIME (IN MINUTES): 1

Students are asked to examine and analyze the informational content of a text, and to find the explicit and implicit meanings and use analogical reasoning to apply information and ideas to a new situation. Students are also asked to analyze information presented quantitatively in such forms as graphs, tables, and charts and/or relate that information to information presented in the text. This is an important skill to practice in science. Many ELA teachers report that they do not have accompanying graphics for their literature reading assignments.

Students are assessed on their ability to cite textual evidence and to summarize, understand relationships, and interpret words and phrases in the context of the text.

ASK: Share a topic or lesson in which you are currently teaching any one or all of these skills.

Science-Related Skills Assessed on the Reading Test (continued)

SAT

- ▶ **Summarizing** — The student will identify a reasonable summary of a text or of key information and ideas in text.
- ▶ **Understanding relationships** — The student will identify explicitly stated relationships or determine implicit relationships between and among individuals, events, or ideas (e.g., cause-effect, comparison-contrast, sequence).
- ▶ **Interpreting words and phrases in context** — The student will determine the meaning of words and phrases in context.
- ▶ **Synthesis**
 - ▶ **Analyzing multiple texts** — The student will synthesize information and ideas from paired texts.
 - ▶ **Analyzing quantitative information** — The student will analyze information presented quantitatively in such forms as graphs, tables, and charts and/or relate that information to information presented in text.

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Presentation Notes

SLIDE 12

ESTIMATED TIME (IN MINUTES): 5

Handout: Reading Test Sample Paired Passages — Science (p. 50)

On each administration of an assessment in the SAT Suite, students encounter at least one set of paired passages. The paired passages may have science, literature, or other science contexts. Questions 1–11 are based on a set of passages. Passage 1 is adapted from Nicholas Carr, “Author Nicholas Carr: The Web Shatters Focus, Rewires Brains.” © 2010 by Condé Nast. Passage 2 is from Steven Pinker, “Mind Over Mass Media.” © 2010 by The New York Times Company.

Participants will need the handout to be able to answer the sample questions on the slides.

Ask participants to read the two passages and review the questions. As a group, prepare to discuss questions 4, 10, and 11. Participants can review other questions individually.



Science Sample Paired Passages

Questions 1–11 are based on a set of passages. Passage 1 is adapted from Nicholas Carr, “Author Nicholas Carr: The Web Shatters Focus, Rewires Brains.” ©2010 by Condé Nast. Passage 2 is from Steven Pinker, “Mind Over Mass Media.” ©2010 by The New York Times Company.

Passage 1:

The mental consequences of our online info-crunching are not universally bad. Certain cognitive skills are strengthened by our use of computers and the Net. These tend to involve more primitive mental functions, such as hand-eye coordination, reflex response, and the processing of visual cues....

Passage 2:

Critics of new media sometimes use science itself to press their case, citing research that shows how “experience can change the brain.” But cognitive neuroscientists roll their eyes at such talk....

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Presentation Notes

SLIDE 14

ESTIMATED TIME (IN MINUTES): 1

Ask a participant to read the question. Allow participants to discuss the question, then ask for volunteers to answer the question.

Question 10 is medium difficulty.

Answer explanation: Choice C is the best answer. In Passage 1, the author cites psychologist Patricia Greenfield's finding that "every medium develops some cognitive skills at the expense of others." In Passage 2, the author states, "If you train people to do one thing (recognize shapes, solve math puzzles, find hidden words), they get better at doing that thing, but almost nothing else." Both authors would agree that an improvement in one cognitive area, such as visual-spatial skills, would not result in improved skills in other areas. Choice A is incorrect because hand-eye coordination is not discussed in Passage 2. Choice B is incorrect because Passage 1 does not suggest that critics of electronic media tend to overreact. Choice D is incorrect because neither passage discusses whether internet users prefer reading printed texts or digital texts.



Analyzing Multiple Texts Sample Question

10. On which of the following points would the authors of both passages most likely agree?

- A) Computer-savvy children tend to demonstrate better hand-eye coordination than do their parents.
- B) Those who criticize consumers of electronic media tend to overreact in their criticism.
- C) Improved visual-spatial skills do not generalize to improved skills in other areas.
- D) Internet users are unlikely to prefer reading onscreen text to reading actual books.

The student must be able to synthesize information and ideas from paired texts.

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Presentation Notes

SLIDE 15

ESTIMATED TIME (IN MINUTES): 1

Note that this is a common question format students will see on the assessments. They'll answer a question like question #10 on the previous slide, and then they will be asked to provide the best evidence for the answer they chose in the question immediately following.

All of the questions associated with the passage contribute to the Analysis in Science cross-test score. Students are likely to encounter two passages or one passage and one pair of passages linked to the Analysis in Science cross-test score on each administration of the Reading Test.

Question 11 is medium difficulty.

Answer explanation: Choice B is the best answer. In Passage 1, the author cites Michael Merzenich's claim that when people adapt to a new cultural phenomenon, including the use of a new medium, we end up with a "different brain." The author of Passage 2 somewhat agrees with Merzenich's claim by stating, "Yes, every time we learn a fact or skill the wiring of the brain changes." Choices A, C, and D do not provide the best evidence that the author of Passage 2 would agree to some extent with Merzenich's claim. Choices A and D are incorrect because the claims are attributed to critics of new media. Choice C is incorrect because it shows that the author of Passage 2 does not completely agree with Merzenich's claim about brain plasticity.



Citing Textual Evidence Sample Question

11. Which choice provides the best evidence that the author of Passage 2 would agree to some extent with the claim attributed to Michael Merzenich in lines 43–45, Passage 1?

- A) Lines 56–58 ("Critics... brain")
- B) Lines 60–61 ("Yes... changes")
- C) Lines 62–65 ("But... experience")
- D) Lines 91–92 ("Media... consumes")

Students must understand what counts as evidence in science and be able to evaluate how – and how effectively – particular authors and speakers use (or fail to use) evidence to support their claims and points.

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Presentation Notes

SLIDE 16

ESTIMATED TIME (IN MINUTES): 1

Handout: Genetical Implications of the Structure of Deoxyribonucleic Acid (p. 54)

Ask participants to review the passage adapted from J. D. Watson and F. H. C. Crick, "Genetical Implications of the Structure of Deoxyribonucleic Acid." ©1953 by Nature Publishing Group. Ask them to answer questions 2 and 8. Participants will need the handout in order to answer the questions on the slides.

Question 2 is medium difficulty.

Answer explanation: Choice D is the best answer. The authors explain that hydrogen bonds join together pairs of nitrogenous bases, and that these bases have a specific structure that leads to the pairing: "One member of a pair must be a purine and the other a pyrimidine in order to bridge between the two chains." Given the specific chemical properties of a nitrogenous base, it would be inaccurate to call the process random. Choice A is incorrect because lines 5–6 describe how nitrogenous bases attach to sugar but not how those bases pair with one another. Choice B is incorrect because lines 9–10 do not contradict the student's claim. Choice C is incorrect because lines 25–27 describe how the two molecules' chains are linked, not what the specific pairing between nitrogenous bases is.

SAT

Analyzing Arguments Sample Question

This passage is adapted from J. D. Watson and F. H. C. Crick, "Genetical Implications of the Structure of Deoxyribonucleic Acid." ©1953 by Nature Publishing Group.

The chemical formula of deoxyribonucleic acid (DNA) is now well established. The molecule is a very long chain, the backbone of which consists of a regular alternation of sugar and phosphate groups. To each sugar is attached a nitrogenous base, which can be of four different types. Two of the possible bases — adenine and guanine — are purines, and the other two — thymine and cytosine — are pyrimidines. So far as is known, the sequence of bases along the chain is irregular. The monomer unit, consisting of phosphate, sugar and base, is known as a nucleotide....

2. A student claims that nitrogenous bases pair randomly with one another. Which of the following statements in the passage contradicts the student's claim?
- A) Lines 5–6 ("To each... types")
 - B) Lines 9–10 ("So far... irregular")
 - C) Lines 25–27 ("The bases... other")
 - D) Lines 29–31 ("One member... chains")

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Presentation Notes

SLIDE 17

ESTIMATED TIME (IN MINUTES): 1

When students encounter an informational graphic on the Reading Test, they will be asked to interpret the graph, draw a conclusion from the graph, or draw a connection between the text and graph.



Tasks Related to Informational Graphics on the Reading Test

- ▶ **Basic:** Interpret the graph.
- ▶ **More Complex:** Draw a conclusion from the graph.
- ▶ **Most Complex:** Draw a connection between the text and the graph.

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Presentation Notes

SLIDE 18

ESTIMATED TIME (IN MINUTES): 5

In this example, students are asked to draw a connection between the text and the graph.

Question 8 is medium difficulty.

Answer explanation: Choice A is the best answer. The authors state: “We believe that the bases will be present almost entirely in their most probable forms. If this is true, the conditions for forming hydrogen bonds are more restrictive, and the only pairs of bases possible are: adenine with thymine, and guanine with cytosine.” The table shows that the pairs adenine/thymine and guanine/cytosine have notably similar percentages in DNA for all organisms listed. Choice B is incorrect. Although the choice of “Yes” is correct, the explanation for that choice misrepresents the data in the table. Choices C and D are incorrect because the table does support the authors’ proposed pairing of nitrogenous bases in DNA molecules.

Analyzing Quantitative Information SAT

Sample Question

8. Do the data in the table support the authors' proposed pairing of bases in DNA?

Organism	Percentage of base in organism's DNA			
	adenine (%)	guanine (%)	cytosine (%)	thymine (%)
Maize	26.8	22.8	23.2	27.2
Octopus	33.2	17.6	17.6	31.6
Chicken	28.0	22.0	21.6	28.4
Rat	28.6	21.4	20.5	28.4
Human	29.3	20.7	20.0	30.0
Grasshopper	29.3	20.5	20.7	29.3
Sea urchin	32.8	17.7	17.3	32.1
Wheat	27.3	22.7	22.8	27.1
Yeast	31.3	18.7	17.1	32.9
<i>E. coli</i>	24.7	26.0	25.7	23.6

Adapted from Manjiv Bansal, "DNA Structure: Revisiting the Watson-Crick Double Helix." ©2003 by Current Science Association, Bangalore.

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- A) Yes, because for each given organism, the percentage of adenine is closest to the percentage of thymine, and the percentage of guanine is closest to the percentage of cytosine.
- B) Yes, because for each given organism, the percentage of adenine is closest to the percentage of guanine, and the percentage of cytosine is closest to the percentage of thymine.
- C) No, because for each given organism, the percentage of adenine is closest to the percentage of thymine, and the percentage of guanine is closest to the percentage of cytosine.
- D) No, because for each given organism, the percentage of adenine is closest to the percentage of guanine, and the percentage of cytosine is closest to the percentage of thymine.

Presentation Notes

SLIDE 19

ESTIMATED TIME (IN MINUTES): 5

Handout: Instructional Strategies (p. 67)

Several instructional strategies are shared on the slide to support student development of college readiness skills in science classes. Share the instructional strategies with the group.

Ask: In which of your lessons could you incorporate one of these instructional strategies? Are there other strategies you are using that will help students develop skills they'll use on the SAT?

For more information on instructional strategies, consult *The Redesigned SAT Teacher Implementation Guide* and SAT Professional Development Modules 2–5.

SAT

Instructional Strategies — Reading Test

- ▶ Give students opportunities to practice reading long passages of 500+ words in which text and data (e.g. tables or graphs) are paired. Give students the opportunity to read and analyze not only authentic science articles, but also articles written about science.
- ▶ Allow students to examine tables, charts, and graphs prior to reading or discussing explanations of the data. Give them an opportunity to generate hypotheses about the data and then confirm or contrast their ideas with the textual conclusions.
- ▶ Practice synthesis by asking students to read primary and secondary sources on the same science topic, identifying ambiguities, areas of agreement and disagreement among authors, and the limits of scientific thinking.

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Presentation Notes

SLIDE 20	ESTIMATED TIME (IN MINUTES): 1
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To promote close reading in your classroom, routinely ask students, as they read and strategically reread text, to consider:

- » what the text says explicitly (i.e., what’s stated);
- » what reasonable inferences and conclusions can be drawn from the text (i.e., what’s implied); and
- » what textual evidence — direct quotations, facts, figures, telling details, and the like — supports their interpretation of what the text says directly and implicitly.



Instructional Strategies — Reading Test (continued)

- ▶ Promote close reading of complex text by asking students to consider and discuss:
 - ▶ What the text says explicitly
 - ▶ What reasonable inferences and conclusions can be drawn
 - ▶ What textual evidence supports their analysis (quotations, facts, figures, etc.)

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Presentation Notes

SLIDE 21

ESTIMATED TIME (IN MINUTES): 1

On the Writing and Language Test, science passages discuss scientific topics, exploring concepts, research, and discoveries in the natural sciences, including Earth science, biology, chemistry, and physics (and their subfields).

The questions associated with the passages place students in the role of someone revising and editing the work of an unspecified writer. Students are asked to improve the development, organization, and use of language in the passages and to ensure that the passages conform to conventions of Standard Written English grammar, usage, and punctuation. When passages and/or questions are accompanied by graphics, students are asked to draw connections between the text and the graphics — for example, to correct a passage's inaccurate interpretation of data presented in a table. Answers to all questions are anchored in the context of the passages.

SAT

Writing and Language Test: Analysis in a Science Context


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Presentation Notes

SLIDE 22

ESTIMATED TIME (IN MINUTES): 1

On the Writing and Language Test, students are asked to review passages and determine if the passages can be improved in the areas of topic development, accuracy, logic, cohesion, and rhetorically effective use of language. For Analysis in Science, students are asked to review claims and counterclaims to ensure that arguments, information, and ideas are conveyed clearly and effectively. They will be asked to add, revise, or retain information and ideas that support claims in the text, and they must ensure that quantitative information is presented accurately in the passage.

Science-Related Skills Assessed on the Writing and Language Test

SAT

Expression of Ideas — These questions focus on revision of text for topic development, accuracy (consistency between text and graphic[s]), logic, cohesion, and rhetorically effective use of language.

► Development

- **Proposition** — The student will add, revise, or retain central ideas, main claims, counterclaims, topic sentences, and the like to structure text and convey arguments, information, and ideas clearly and effectively.
- **Support** — The student will add, revise, or retain information and ideas (e.g., details, facts, statistics) intended to support claims or points in text.
- **Focus** — The student will add, revise, retain, or delete information and ideas in text for the sake of relevance to topic and purpose.
- **Quantitative information** — The student will relate information presented quantitatively in such forms as graphs, charts, and tables to information presented in text.

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Presentation Notes

SLIDE 23

ESTIMATED TIME (IN MINUTES): 1

In addition, students will be asked to revise the text to improve the exactness or appropriateness of word choice.

Working with a partner or a small group, ask participants to share an example of an assignment in which students are (or could be) engaging in these skills in their science classes.

Science-Related Skills Assessed on the Writing and Language Test (continued)

SAT

- ▶ **Organization** — These questions focus on revision of text to improve the logic and cohesion of text at the sentence, paragraph, and whole-text levels.
- ▶ **Effective language use** — These questions focus on revision of text to improve the use of language to accomplish particular rhetorical purposes.
 - ▶ **Precision** — The student will revise text as needed to improve the exactness or content appropriateness of word choice.

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Presentation Notes

SLIDE 24

ESTIMATED TIME (IN MINUTES): 1

Many passages that have questions associated with the Analysis in Science cross-test score on the Writing and Language Test are accompanied by an informational graphic. Students have the opportunity to demonstrate their science skills associated with interpreting informational graphics throughout the Writing and Language Test.

At the most basic level, students have to interpret data correctly: an underlined portion might misstate data from a graph. A more complex version of this might be a misinterpretation of what the data in the graph shows — stating a percentage increase when the graph clearly just shows a change in number, or something similar.

The most complex graphics-based items on the Writing and Language Test require students to use data in the graphic to offer or improve support for a claim. A question might present four options that all accurately represent the data in the graph; only one option, however, works in the passage. For example, the sentence before the item might state a claim. The item might ask test-takers to use data from the graph to provide the best support for that claim.

Tasks Related to Informational Graphics on the Writing and Language Test

SAT

- ▶ **Basic:** Interpret data on the graphic correctly.
- ▶ **More Complex:** Correct a misinterpretation of what the data in the graph shows.
- ▶ **Most Complex:** Use data in the graphic to offer or improve support for a claim.

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Presentation Notes

SLIDE 25

ESTIMATED TIME (IN MINUTES): 5

Handout: Writing and Language Test Sample Passage (p. 58)

Ask participants to focus on questions 1 and 2. Read the question on the slide and ask for volunteers to give the answer. Unlike the Reading Test, not all questions for this passage contribute to the cross-test score. All questions are included in the handout, but only questions 1–3 and 9–11 contribute to the cross-test score. These questions are marked with (Sci) in the handout.

Point out the format of the Writing and Language Test: Question numbers are shaded and embedded in the text. Students can easily find the sentence(s) to which the question refers. Also, demonstrate that some questions do not have question stems; students just have to look to the text to figure out what correction (if any) is needed.

Question 1 is easy.

Answer explanation: Choice B is the best answer because the graph clearly indicates that, on March 5, average low temperatures are at their lowest point: 12 degrees Fahrenheit. Choice A is incorrect because the phrase “as low as” suggests that the temperature falls no lower than 20 degrees Fahrenheit, but the chart shows that in January, February, and March, the temperature frequently falls below that point. Choices C and D are incorrect because the information each provides is inconsistent with the information on the chart.

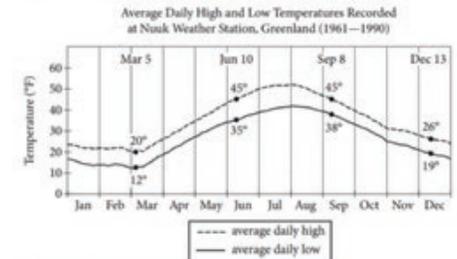
Informational Graphic — Analyzing Quantitative Information

SAT

The size of the ice sheet fluctuates seasonally: in summer, average daily high temperatures in Greenland can rise to slightly above 50 degrees Fahrenheit, partially melting the ice; in the winter, the sheet thickens as additional snow falls, and average daily low temperatures can drop **1** to as low as 20 degrees.

1. Which choice most accurately and effectively represents the information in the graph?

- A) NO CHANGE
- B) to 12 degrees Fahrenheit.
- C) to their lowest point on December 13.
- D) to 10 degrees Fahrenheit and stay there for months.



Adapted from WMO. ©2014 by World Meteorological Organization.

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Presentation Notes

SLIDE 26

ESTIMATED TIME (IN MINUTES): 1

Read the question on the slide and ask for volunteers to give the answer.

Question 9 is medium difficulty.

Answer explanation: Choice D is the best answer. The preceding sentences in the paragraph have established that a darker surface of soot-covered snow leads to more melting because this darker surface absorbs heat, whereas a whiter surface, free of soot, would deflect heat. As the passage points out, exposed land and water are also dark and cannot deflect heat the way ice and snow can. Only Choice D reflects the self-reinforcing cycle that the preceding sentences already imply.

Choices A, B, and C are incorrect because the information each provides fails to support the previous claim that the “result” of the soot “is a self-reinforcing cycle.”

Revising and Editing to Strengthen Arguments SAT

...“Soot is an extremely powerful light absorber. It settles over the ice and captures the Sun’s heat.” The result is a self-reinforcing cycle. As the ice melts, the land and water under the ice become exposed, and since land and water are darker than snow, the surface absorbs even more heat, which **9** is related to the rising temperatures.

9. Which choice best completes the description of self-reinforcing cycle?

- A) NO CHANGE
- B) raises the surface temperature.
- C) begins to cool at a certain point.
- D) leads to additional melting

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Presentation Notes

SLIDE 27

ESTIMATED TIME (IN MINUTES): 5

Ask: With a partner, share an idea for incorporating a new instructional strategy that supports the development of skills assessed in these sample questions. Ask volunteers to share with the whole group. Share the instructional strategies on the slide.

Handout: Instructional Strategies (p. 68)

Using the graphic in the Instructional Strategies handout, create three incorrect and one correct interpretation of the graph. This activity can be completed during the presentation, or can be provided as a takeaway to use in classrooms.

Instructional Strategies — Writing and Language Test

SAT

- ▶ Teach students in all classes to practice writing and language analysis skills — using effective language, clearly expressing ideas, and properly utilizing standard English conventions — to develop their analyses of social studies, science, and career-related passages.
- ▶ Familiarize students with the analysis of graphs, and charts in conjunction with text. Using the informational graphics in a textbook or periodical, provide students with inaccurate interpretations of graphics and ask them to correct the error(s). Have them explicitly describe the data they used to make each correction.
- ▶ Provide students with a science paper accompanied by an informational graphic. Ask students to use evidence (i.e., descriptive details and data from informational graphics) to add or refine central ideas, develop and strengthen claims and points, sharpen focus, and improve precision and accuracy.

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Presentation Notes

SLIDE 28	ESTIMATED TIME (IN MINUTES): 1
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Quantitative literacy is part of participation in a democracy; it is important to employers, who need students who can use mathematics outside of the classroom; and it is important not only for science, technology, engineering, and mathematics (STEM) fields but also for a wide range of college majors.

A recent study by the National Center on Education and the Economy, which analyzed the actual mathematical demands of course syllabi and assignments in two-year institutions, also supports the emphasis of the SAT on problem solving and data analysis. The study found that students pursuing two-year degree programs must be able to work with multistep problems involving ratios, proportional relationships, percentages, unit conversions, and complex measurement problems.

SAT

Math Test: Analysis in a Science Context

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Presentation Notes

SLIDE 29

ESTIMATED TIME (IN MINUTES): 1

Students will earn three subscores associated with the Math Test: Heart of Algebra, Problem Solving and Data Analysis, and Passport to Advanced Math. Students will also encounter problems in Additional Topics in Math.

The Math Test will contain two portions: one in which the student may use a calculator and another in which the student may not. The no-calculator portion allows the SAT Suite to assess fluencies valued by postsecondary instructors and includes conceptual questions for which a calculator will not be helpful. Meanwhile, the calculator portion provides insight into students' capacity to use appropriate tools strategically.

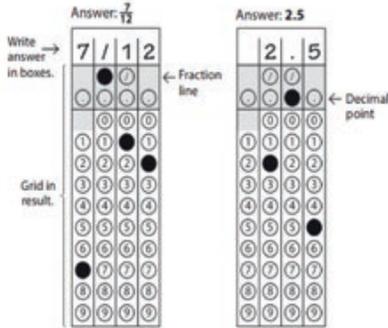
There are two types of questions on the Math Test: multiple-choice and student-produced response questions. Student-produced response questions measure the complex knowledge and skills that require students to deeply think through the solutions to problems. Set within a range of real-world contexts, these questions require students to make sense of problems and persevere in solving them; make connections between and among the different parts of a stimulus; plan a solution approach, as no scaffolding is provided to suggest a solution strategy; abstract, analyze, and refine an approach as needed; and produce and validate a response. These types of questions require the application of complex cognitive skills.

On student-produced response questions, responses are gridded in by students, often allowing for multiple correct responses and solution processes. These items allow students to freely apply their critical thinking skills when planning and implementing a solution.



Math Test Format

- ▶ Three Math subscores
 - ▶ Heart of Algebra
 - ▶ Problem Solving and Data Analysis
 - ▶ Passport to Advanced Math
- ▶ Two Portions
 - ▶ Calculator permitted
 - ▶ No-Calculator
- ▶ Two question types
 - ▶ Multiple Choice
 - ▶ Student-Produced Response





Presentation Notes

SLIDE 30

ESTIMATED TIME (IN MINUTES): 1

The Math Test emphasizes students' ability to apply math knowledge and skills to solve problems and analyze data grounded in authentic and meaningful science contexts. Questions call on students to consider scenarios, analyze data, and solve problems reflecting real-world tasks in science. Tasks are aligned with Advanced Placement® Science Practices.

- » Science Practice 2: The student can use mathematics appropriately.
- » Science Practice 4: The student can plan and implement data collection strategies in relation to a particular scientific question.
- » Science Practice 5: The student can perform data analysis and evaluation of evidence.

Prior knowledge of specific science topics is not assessed on the Math Test.

Assessing Math Skills in Science Contexts

SAT

- ▶ Emphasis on students' ability to apply math knowledge and skills to solve problems and analyze data grounded in authentic and meaningful science contexts.
- ▶ Questions call on students to consider scenarios, analyze data, and solve problems reflecting real-world tasks in sciences.
- ▶ Tasks are aligned with Advanced Placement® Science Practices.
 - ▶ Science Practice 2: The student can use mathematics appropriately.
 - ▶ Science Practice 4: The student can plan and implement data collection strategies in relation to a particular scientific question.
 - ▶ Science Practice 5: The student can perform data analysis and evaluation of evidence.
- ▶ Prior knowledge of specific science topics is not assessed on the Math Test.

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Presentation Notes

SLIDE 31

ESTIMATED TIME (IN MINUTES): 2

The Math Test requires students to exhibit mathematical practices, such as problem solving and using appropriate tools strategically. Students are asked to:

- » analyze, fluently solve, and create linear equations and inequalities;
- » demonstrate reasoning about ratios, rates, and proportional relationships;
- » interpret and synthesize data and apply core concepts and methods of statistics in science, social studies, and career-related contexts;
- » identify quantitative measures of center, the overall pattern, and any striking deviations from the overall pattern and spread in one or two different data sets, including recognizing the effects of outliers on the measures of center of a data set;
- » rewrite expressions, identify equivalent forms of expressions, and understand the purpose of different forms;
- » solve quadratic and higher-order equations in one variable and understand the graphs of quadratic and higher-order functions;
- » interpret and build functions; and
- » apply essential geometric and trigonometric concepts.

Students may encounter any of these problem types set in science contexts. Those set in science contexts will contribute to the cross-test score.

The skills listed on the slide are some that science teachers may recognize as skills students are already using in their classes.

Science-Related Skills — Math Test

SAT

► Conceptual Understanding

- Interpret the variables and constants in expressions for linear functions within the context presented.
 - The student will make connections between a context and the linear function that models the context and will identify or describe the real-life meaning of a constant term, a variable, or a feature of the given equation.
- Use the relationship between two variables to investigate key features of the graph.
 - The student will make connections between the graphical representation of a relationship and properties of the graph by selecting the graph that represents the properties described; using the graph to identify a value or set of values.
- Evaluate reports to make inferences, justify conclusions, and determine appropriateness of data collection methods.
 - The student will evaluate reports to make inferences, justify conclusions, and determine appropriateness of data collection methods. The reports may consist of tables, graphs, and text summaries.

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Presentation Notes

SLIDE 32

ESTIMATED TIME (IN MINUTES): 2

Handout: Math Test Sample Questions (p. 64)

The handout contains 5 questions from the Math Test that contribute to the Analysis in Science cross-test score. Science teachers may not want to solve the problems, but it will be valuable for them to understand how these questions relate to problems in the science disciplines. Give participants time to look at and attempt to solve the questions in the handout.

Point out that question 1 is a student-produced response question. There are no answer choices.

Question 1 is hard.

Answer explanation: The correct answer is 25. In the mesosphere, an increase of 10 kilometers in the distance above Earth results in a decrease in the temperature by k° Celsius where k is a constant. Thus, the temperature in the mesosphere is linearly dependent on the distance above Earth. Using the values provided and the slope formula, one can calculate the unit rate of change for the temperature in the mesosphere to be $\frac{-80 - (-5)}{80 - 50} = \frac{-75}{30} = \frac{-2.5}{1}$. The slope indicates that, within the mesosphere, if the distance above Earth increases by 1 kilometer, the temperature decreases by 2.5° Celsius. Therefore, if the distance above Earth increases by $(1 \times 10) = 10$ kilometers, the temperature will decrease by $(2.5 \times 10) = 25^\circ$ Celsius. Thus, the value of k is 25.

Math Test Sample Question #1 —

SAT

No Calculator

Student-Produced Response Question

Heart of Algebra

1. The mesosphere is the layer of Earth's atmosphere between 50 kilometers and 85 kilometers above Earth's surface. At a distance of 50 kilometers from Earth's surface, the temperature in the mesosphere is -5° Celsius, and at a distance of 80 kilometers from Earth's surface, the temperature in the mesosphere is -80° Celsius. For every additional 10 kilometers from Earth's surface, the temperature in the mesosphere decreases by k° Celsius, where k is a constant. What is the value of k ?

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Presentation Notes

SLIDE 33

ESTIMATED TIME (IN MINUTES): 2

Note that this question requires students to read and understand the scatterplot. Mathematical computation is not required. This is a skill that science teachers can help students understand in lessons on research and data analysis.

Question 2 is easy.

Answer explanation: Choice A is correct. According to the graph, the animal with the longest gestation period (60 days) has a life expectancy of 3 years. Choices B, C, and D are incorrect. All the animals that have a life expectancy of 4, 8, or 10 years have a gestation period that is shorter than 60 days, which is the longest gestation period.

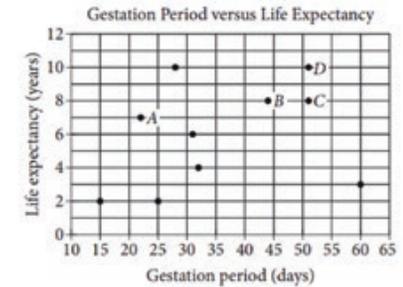
Math Test Sample Question #2 — Calculator

SAT

Problem Solving and Data Analysis

2. What is the life expectancy, in years, of the animal that has the longest gestation period?

- A) 3
- B) 4
- C) 8
- D) 10



A curator at a wildlife society created the scatterplot above to examine the relationship between the gestation period and life expectancy of 10 species of animals.

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Presentation Notes

SLIDE 34

ESTIMATED TIME (IN MINUTES): 2

This question also asks students to understand and interpret the scatterplot.

Question 3 is hard.

Answer explanation: Choice A is correct. The ratio of life expectancy to gestation period for the animal represented by point A is approximately $\frac{7 \text{ years}}{23 \text{ days}}$, or about 0.3 years/day, which is greater than the ratio for the animals represented by the other labeled points (the ratios for points B, C, and D, in units of years of life expectancy per day of gestation, are approximately $\frac{8}{44}$, $\frac{8}{51}$, and $\frac{10}{51}$ respectively, each of which is less than 0.2 years/day). Choices B, C, and D are incorrect and may be the result of errors in calculating the ratio or in reading the graph.

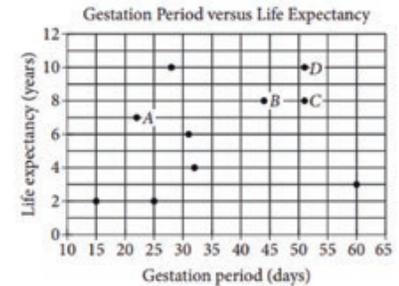
Math Test Sample Question #3 — Calculator

SAT

Problem Solving and Data Analysis

3. Of the labeled points, which represents the animal for which the ratio of life expectancy to gestation period is greatest?

- A) A
- B) B
- C) C
- D) D



A curator at a wildlife society created the scatterplot above to examine the relationship between the gestation period and life expectancy of 10 species of animals.

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Presentation Notes

SLIDE 35

ESTIMATED TIME (IN MINUTES): 2

This question is an example of a Problem Solving and Data Analysis problem in a science context. Questions like this will contribute to the Analysis in Science cross-test score.

Ask participants if they would like to solve the problem or just review the answer explanation in the handout.

Question 4 is hard.

Answer explanation: Choice B is correct. Let x represent the number of pears produced by the Type B trees. The Type A trees produce 20 percent more pears than x , which is $x + 0.20x = 1.20x$ pears. Since Type A trees produce 144 pears, the equation $1.20x = 144$ holds.

Thus $x = \frac{144}{1.20} = 120$. Therefore, the Type B trees produced 120 pears.

Choice A is incorrect because while 144 is reduced by approximately 20 percent, increasing 115 by 20 percent gives 138, not 144. Choice C is incorrect; it results from subtracting 20 from the number of pears produced by the Type A trees. Choice D is incorrect; it results from adding 20 percent of the number of pears produced by Type A trees to the number of pears produced by Type A trees.

Math Test Sample Question #4 —

Calculator

SAT

Problem Solving and Data Analysis

4. Katarina is a botanist studying the production of pears by two types of pear trees. She noticed that Type A trees produced 20 percent more pears than Type B trees did. Based on Katarina's observation, if the Type A trees produced 144 pears, how many pears did the Type B trees produce?

- A) 115
- B) 120
- C) 124
- D) 173

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Presentation Notes

SLIDE 36

ESTIMATED TIME (IN MINUTES): 1

Physics teachers will recognize this problem in Passport to Advanced Math.

Ask participants if they would like to solve the problem or just review the answer explanation in the handout.

Question 5 is hard.

Answer explanation: Choice D is correct. When the ball hits the ground, its height is 0 meters. Substituting 0 for h in $h = -4.9t^2 + 25t$ gives $0 = -4.9t^2 + 25t$, which can be rewritten as $0 = t(-4.9t + 25)$. Thus, the possible values of t are $t = 0$ and $t = \frac{25}{4.9} \approx 5.1$. The time $t = 0$ seconds corresponds to the time the ball is launched from the ground, and the time $t \approx 5.1$ seconds corresponds to the time after launch that the ball hits the ground. Of the given choices, 5.0 seconds is closest to 5.1 seconds, so the ball returns to the ground approximately 5.0 seconds after it is launched.

Choices A, B, and C are incorrect and could arise from conceptual or computation errors while solving $0 = -4.9t^2 + 25t$ for t .

Math Test Sample Question #5 —

SAT

Passport to Advanced Math

5.

$$h = -4.9t^2 + 25t$$

The equation above expresses the approximate height h , in meters, of a ball t seconds after it is launched vertically upward from the ground with an initial velocity of 25 meters per seconds. After approximately how many seconds will the ball hit the ground?

- A) 3.5
- B) 4.0
- C) 4.5
- D) 5.0

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Presentation Notes

SLIDE 37

ESTIMATED TIME (IN MINUTES): 5

Ask participants how they can support students' math instruction in science classes. Then ask them how they can help students in their discipline strengthen skills that are assessed on the Math Test. Share the suggested instructional strategies and ask if anyone would like to share additional strategies with the group.

Handout: *Instructional Strategies* (p. 67)

Instructional Strategies — Math Test

SAT

- ▶ Help students become fluent in working with numbers and data that are important in reading, writing, and communicating about texts and topics in science by regularly gathering, organizing, and analyzing relevant data.
- ▶ Give students opportunities to practice fluency of mathematical skills by asking them to work to solve problems without the use of calculators.
- ▶ Emphasize finding relationships between variables — linear, quadratic, and exponential relationships.
- ▶ Review data collection techniques and determine appropriateness of data collection methods; evaluate reports and develop conclusions based on the data.

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Presentation Notes

SLIDE 38

ESTIMATED TIME (IN MINUTES): 1

All students have access to the best SAT test practice available, regardless of educational background or ability to pay for preparation.

Together the College Board and Khan Academy® have developed comprehensive practice materials that are personalized, interactive, and engaging. Students have the opportunity not only to practice for the SAT, but also to build their college readiness skills.

It is powered by thousands of Official SAT Practice problems and four full-length practice tests, developed by the Khan Academy and reviewed and approved by the College Board.

Practice with Khan Academy®



- ▶ The College Board and Khan Academy have partnered to provide personalized SAT® test practice programs and resources entirely free of charge.
- ▶ Features include:
 - ▶ Thousands of practice problems
 - ▶ Personalized tutorials on test content
 - ▶ Official SAT practice questions and full-length tests
 - ▶ Comprehensive reporting for students
 - ▶ Access anytime, anywhere — for free
- ▶ We are working with educators, community groups, college access organizations, and parents to provide the necessary resources to propel students to college success.



PROVIDING WORLD-CLASS
FREE SAT® PREPARATION
TOGETHER.




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Presentation Notes

SLIDE 39	ESTIMATED TIME (IN MINUTES): 1
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When students create their online accounts with Khan Academy, they can take diagnostic assessments that allow Khan Academy to evaluate their scores and create a **practice program that is individually targeted to address that student's greatest areas of need**. Students have the opportunity not only to practice for the SAT, but also to build their college and career readiness skills.

Students who took the SAT, PSAT/NMSQT, PSAT 10, or PSAT 8/9 can link their College Board account and their Khan Academy account. Khan Academy will use the data from the SAT and PSAT-related assessments to further customize each student's practice SAT on Khan Academy.

Ask whether anyone is using Khan Academy with their students. Ask them to comment or share their ideas for using Khan Academy for instruction or supplementation.

Official SAT Practice with Khan Academy — It's FREE!

- ▶ Sign up for Official SAT Practice for free.
 - satpractice.org
- ▶ Complete practice problems and diagnostic quizzes.
- ▶ Link College Board and Khan Academy accounts.
 - All SAT Suite results will be sent to further customize practice on Khan Academy using actual results.
- ▶ See a linking video at <https://youtu.be/Vhfaw8w4G2w>



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Presentation Notes

SLIDE 40

ESTIMATED TIME (IN MINUTES): 1

Begin discussion of reports available to inform instruction.

The image shows a presentation slide with a dark gray background. In the top right corner, the word "SAT" is written in a white, serif font. The main title of the slide, "Using Scores and Reporting to Inform Instruction", is centered in a white, sans-serif font and is preceded by a vertical white line. In the bottom right corner, the CollegeBoard logo is displayed, consisting of a shield icon and the text "CollegeBoard". Below the logo, the copyright notice "© 2016 The College Board" is written in a small font.

Presentation Notes

SLIDE 41

ESTIMATED TIME (IN MINUTES): 1

Reports that accompany all assessments in the SAT Suite provide educators with insightful information about student performance. Reports and data can be used to identify students in need of instructional support, to inform curricular and instructional decisions, and to help set strategic goals for schools and districts. Many reports are available to educators, but only two of them will be discussed in this presentation. The Question Analysis Reports and the Instructional Planning Reports will provide science teachers with data about strengths and weaknesses in student performance.

Participants can access these and all other educator reports through their Education Professional College Board account. Teachers must create a professional account and be granted access to the reporting portal by the Access Manager in their school. They can then log in to their account and review K–12 reporting.

**SAT Suite of Assessments —
Scores and Reporting**

SAT

- ▶ Instructional Planning Report
- ▶ Question Analysis Report

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Presentation Notes

SLIDE 42

ESTIMATED TIME (IN MINUTES): 2

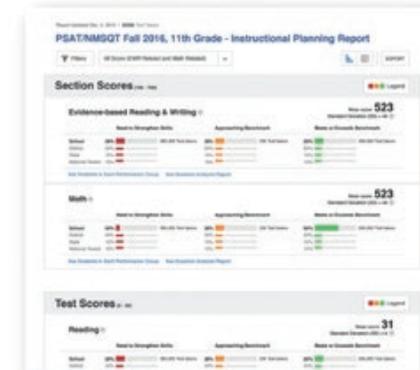
Handout: Instructional Planning Report (p. 69)

The Instructional Planning report can be configured to show section scores, test scores, cross-test scores, and subscores. Student performance at each level is compared to the district, state, and nation. The subscores are linked to state standards (specific questions cannot be aligned to state standards, but subscores are aligned to the standards). The Instructional Planning Report also lists students in each performance group (school level only), drills through to the Question Analysis Report, and exports the reports to PDF or .xls files. The legend for the colors is as follows: need to strengthen skills (red), approaching benchmark (yellow), meets or exceeds benchmark (green).

Instructional Planning Report

SAT

- ▶ Provides breakout of student performance in section scores, test scores, cross-test scores, and subscores:
 - ▶ Need to strengthen skills (red)
 - ▶ Approaching benchmark (yellow)
 - ▶ Meets or exceeds benchmark (green)
- ▶ Lists students in each performance group (school-level only)
- ▶ Links to state standards aligned to subscores
- ▶ Drills through to Question Analysis report
- ▶ Exports reports to PDF or .xls files



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Presentation Notes

SLIDE 43

ESTIMATED TIME (IN MINUTES): 2

Handout: Question Analysis Report (p. 70)

The Question Analysis report allows users to see the answers that the students selected for each question. The sample report used in this slide is a disclosed form,* so users can click on the question number to read the question and all of the distractors. The report gives the correct answer to each question. It then compares your school's performance on that question to the district, state, and nation. Additional detail is provided, giving the percentage of students who selected each answer (and the percentage who omitted the question). This is also compared to the district, state, and nation. Question difficulty level is identified in the next column. Each question is mapped to cross-test scores and subscores. The last column identifies students who answered the question correctly (and incorrectly) — with their answer choices.

Note that the sample on the slide is filtered for Analysis in Science. Only questions contributing to the Analysis in Science subscore are showing.

Ask participants: How will you use the data in this report and/or the Instructional Planning Report? What do you want to discuss in PLCs? What will you share with students?

*Disclosed forms will have test questions available for review. Questions on nondisclosed forms will not be available for review.

Question Analysis Report

- ▶ Provides performance, by question
- ▶ For disclosed forms:*
 - ▶ Provides individual answer choice performance
 - ▶ Links to actual question content (including answer explanations)
- ▶ For nondisclosed forms:*
 - ▶ Provides percent correct/incorrect
 - ▶ Does not provide question content
- ▶ Links to individual student performance
- ▶ Links to subscores and state standards aligned to subscores

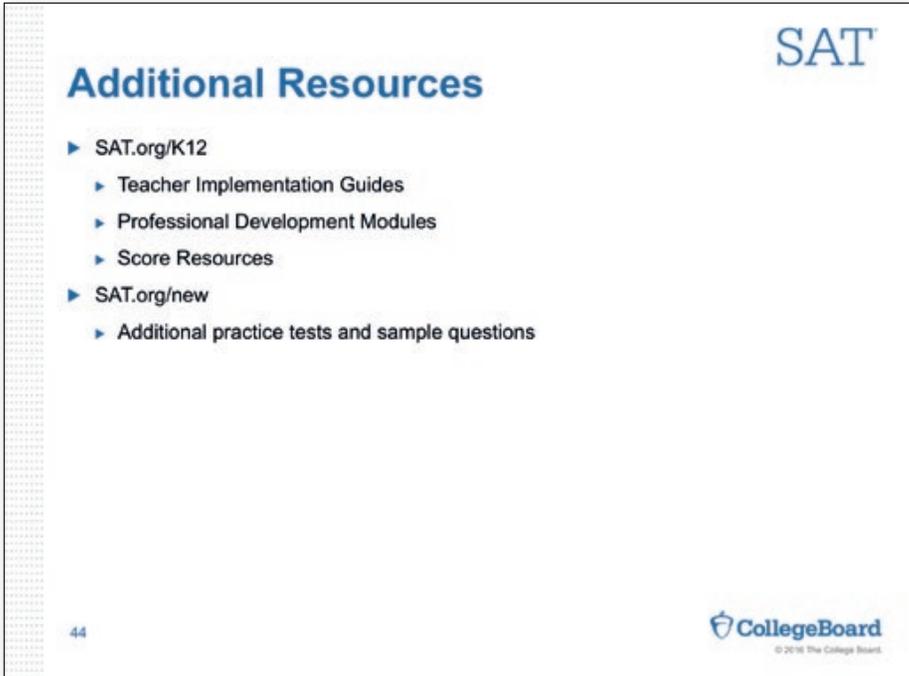
*PSAT™ 8/9 is a nondisclosed form in 2015–16. PSAT™ 10 and April SAT® School Day are disclosed forms.

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Presentation Notes

SLIDE 44**ESTIMATED TIME (IN MINUTES): 2**

If participants are interested in learning more about the SAT Suite of Assessments, sat.org/k12 and sat.org/new are two great websites filled with resources for educators. Participants can find teacher implementation guides, additional professional development modules and webinars, score resources — including a student lesson plan, and four full length SAT practice tests with scoring guides and answer explanations.



The slide features a vertical column of small, faint text on the left side. The main content is titled "Additional Resources" in a large blue font. Below the title is a bulleted list of resources. The SAT logo is in the top right corner, and the CollegeBoard logo with the copyright notice "© 2016 The College Board." is in the bottom right corner. The slide number "44" is located in the bottom left corner.

Additional Resources

- ▶ SAT.org/K12
 - ▶ Teacher Implementation Guides
 - ▶ Professional Development Modules
 - ▶ Score Resources
- ▶ SAT.org/new
 - ▶ Additional practice tests and sample questions

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 SAT

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Presentation Notes

SLIDE 45

ESTIMATED TIME (IN MINUTES): 1

The Redesigned SAT Teacher Implementation Guide was created for teachers and curriculum specialists to generate ideas about integrating SAT practice and skill development into challenging classroom course work through curriculum and instruction. We've been reaching out to K–12 teachers, curriculum specialists, counselors, and administrators throughout the development process. Educator feedback is the basis and inspiration for this guide, which covers the whys and hows of the SAT and its benefits for you and your students.

At the heart of this guide are annotated sample SAT items, highlighting connections to the instruction and best practices occurring in classrooms like yours. We indicate Keys to the SAT (information about test changes), General Instructional Strategies for each test, and Skill-Building Strategies linked to specific sample items from the Reading Test, the Writing and Language Test, the optional SAT Essay, and the Math Test. In sum, these recommendations are intended to support teachers to enhance instruction that will build skills necessary for college and career success for each student.

What's in the SAT Teacher Implementation Guide?

SAT

- ▶ Information and strategies for teachers in all subject areas
- ▶ Overview of SAT content and structure
- ▶ Test highlights
- ▶ General Instructional Strategies
- ▶ Sample test items and annotations
 - ▶ Skill-Building Strategies for the classroom
 - ▶ Keys to SAT
 - ▶ Rubrics and sample essays
- ▶ Scores and reporting
- ▶ Advice to share with students

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Presentation Notes

SLIDE 46

ESTIMATED TIME (IN MINUTES): 5

Ask participants to give feedback on the Analysis in Science PD Module at www.surveymonkey.com/r/analysisinscience.

The slide features the SAT logo in the top right corner. The main title "Exit Survey" is centered in a large blue font. Below the title, a blue arrow points to the survey URL: <https://www.surveymonkey.com/r/analysisinscience>. The slide number "46" is located in the bottom left corner, and the CollegeBoard logo with the copyright notice "© 2016 The College Board" is in the bottom right corner. The slide is framed by a thin black border.

Questions 1-11 are based on the following passages. Passage 1 is adapted from Nicholas Carr, “Author Nicholas Carr: The Web Shatters Focus, Rewires Brains.” ©2010 by Condé Nast.

Passage 2 is from Steven Pinker, “Mind over Mass Media.” ©2010 by The New York Times Company.

Passage 1

1 The mental consequences of our online
info-crunching are not universally bad. Certain
cognitive skills are strengthened by our use of
computers and the Net. These tend to involve
5 more primitive mental functions, such as hand-eye
coordination, reflex response, and the processing
of visual cues. One much-cited study of video
gaming revealed that after just 10 days of playing
action games on computers, a group of young
10 people had significantly boosted the speed with
which they could shift their visual focus between
various images and tasks.

It’s likely that Web browsing also strengthens
brain functions related to fast-paced problem
15 solving, particularly when it requires spotting
patterns in a welter of data. A British study of the
way women search for medical information online
indicated that an experienced Internet user can,
at least in some cases, assess the trustworthiness
20 and probable value of a Web page in a matter
of seconds. The more we practice surfing and
scanning, the more adept our brain becomes at
those tasks.

But it would be a serious mistake to look
25 narrowly at such benefits and conclude that the
Web is making us smarter. In a Science article
published in early 2009, prominent developmental
psychologist Patricia Greenfield reviewed more
than 40 studies of the effects of various types
30 of media on intelligence and learning ability.
She concluded that “every medium develops
some cognitive skills at the expense of others.”
Our growing use of the Net and other screen-
based technologies, she wrote, has led to the
35 “widespread and sophisticated development of
visual-spatial skills.” But those gains go hand
in hand with a weakening of our capacity for
the kind of “deep processing” that underpins
“mindful knowledge acquisition, inductive
40 analysis, critical thinking, imagination, and
reflection.”

We know that the human brain is highly
plastic; neurons and synapses change as
circumstances change. When we adapt to a new
45 cultural phenomenon, including the use of a
new medium, we end up with a different brain,

says Michael Merzenich, a pioneer of the field
of neuroplasticity. That means our online habits
continue to reverberate in the workings of our
50 brain cells even when we’re not at a computer.
We’re exercising the neural circuits devoted to
skimming and multitasking while ignoring those
used for reading and thinking deeply.

Passage 2

Critics of new media sometimes use science
55 itself to press their case, citing research that
shows how “experience can change the brain.”
But cognitive neuroscientists roll their eyes at
such talk. Yes, every time we learn a fact or skill
the wiring of the brain changes; it’s not as if the
60 information is stored in the pancreas. But the
existence of neural plasticity does not mean the
brain is a blob of clay pounded into shape by
experience.

Experience does not revamp the basic
65 information-processing capacities of the brain.
Speed-reading programs have long claimed to do
just that, but the verdict was rendered by Woody
Allen after he read Leo Tolstoy’s famously long
novel War and Peace in one sitting: “It was about
70 Russia.” Genuine multitasking, too, has been
exposed as a myth, not just by laboratory studies
but by the familiar sight of an SUV undulating
between lanes as the driver cuts deals on his cell
phone.

Moreover, the effects of experience are highly
specific to the experiences themselves. If you
train people to do one thing (recognize shapes,
solve math puzzles, find hidden words), they get
better at doing that thing, but almost nothing
80 else. Music doesn’t make you better at math,
conjugating Latin doesn’t make you more logical,
brain-training games don’t make you smarter.
Accomplished people don’t bulk up their brains
with intellectual calisthenics; they immerse
85 themselves in their fields. Novelists read lots of
novels, scientists read lots of science.

The effects of consuming electronic media
are likely to be far more limited than the panic
implies. Media critics write as if the brain takes
90 on the qualities of whatever it consumes, the
informational equivalent of “you are what you
eat.” As with ancient peoples who believed
that eating fierce animals made them fierce,
they assume that watching quick cuts in rock
95 videos turns your mental life into quick cuts or
that reading bullet points and online postings
turns your thoughts into bullet points and online
postings.

1. The author of Passage 1 indicates which of the following about the use of screen-based technologies?
 - A) It should be thoroughly studied.
 - B) It makes the brain increasingly rigid.
 - C) It has some positive effects.
 - D) It should be widely encouraged.
2. Which choice provides the best evidence for the answer to the previous question?
 - A) Lines 2-4 (“Certain... Net”)
 - B) Lines 24-26 (“But... smarter”)
 - C) Lines 26-30 (“In a... ability”)
 - D) Lines 31-32 (“She... others”)
3. The author of Passage 1 indicates that becoming adept at using the Internet can
 - A) make people complacent about their health.
 - B) undermine the ability to think deeply.
 - C) increase people’s social contacts.
 - D) improve people’s self-confidence.
4. As used in line 43, “plastic” most nearly means
 - A) creative.
 - B) artificial.
 - C) malleable.
 - D) sculptural.
5. The author of Passage 2 refers to the novel *War and Peace* primarily to suggest that Woody Allen
 - A) did not like Tolstoy’s writing style.
 - B) could not comprehend the novel by speed-reading it.
 - C) had become quite skilled at multitasking.
 - D) regretted having read such a long novel.
6. According to the author of Passage 2, what do novelists and scientists have in common?
 - A) They take risks when they pursue knowledge.
 - B) They are eager to improve their minds.
 - C) They are curious about other subjects.
 - D) They become absorbed in their own fields.
7. The analogy in the final sentence of Passage 2 has primarily which effect?
 - A) It uses ornate language to illustrate a difficult concept.
 - B) It employs humor to soften a severe opinion of human behavior.
 - C) It alludes to the past to evoke a nostalgic response.
 - D) It criticizes the view of a particular group.
8. The main purpose of each passage is to
 - A) compare brain function in those who play games on the Internet and those who browse on it.
 - B) report on the problem-solving skills of individuals with varying levels of Internet experience.
 - C) take a position on increasing financial support for studies related to technology and intelligence.
 - D) make an argument about the effects of electronic media use on the brain.
9. Which choice best describes the relationship between the two passages?
 - A) Passage 2 relates first-hand experiences that contrast with the clinical approach in Passage 1.
 - B) Passage 2 critiques the conclusions drawn from the research discussed in Passage 1.
 - C) Passage 2 takes a high-level view of a result that Passage 1 examines in depth.
 - D) Passage 2 predicts the negative reactions that the findings discussed in Passage 1 might produce.
10. On which of the following points would the authors of both passages most likely agree?
 - A) Computer-savvy children tend to demonstrate better hand-eye coordination than do their parents.
 - B) Those who criticize consumers of electronic media tend to overreact in their criticism.
 - C) Improved visual-spatial skills do not generalize to improved skills in other areas.
 - D) Internet users are unlikely to prefer reading onscreen text to reading actual books.
11. Which choice provides the best evidence that the author of Passage 2 would agree to some extent with the claim attributed to Michael Merzenich in lines 44-46, Passage 1?
 - A) Lines 54-56 (“Critics... brain”)
 - B) Lines 58-59 (“Yes... changes”)
 - C) Lines 60-63 (“But... experience”)
 - D) Lines 89-90 (“Media... consumes”)

QUESTION 1 – Difficulty: easy

Choice C is the best answer. The author of Passage 1 indicates that people can benefit from using screen-based technologies as these technologies strengthen “certain cognitive skills” (line 3) and the “brain functions related to fast-paced problem solving” (lines 14-15). Choice A is incorrect because the author of Passage 1 cites numerous studies of screen-based technologies. Choice B is incorrect because it is not supported by Passage 1, and choice D is incorrect because while the author mentions some benefits to screen-based technologies, he does not encourage their use.

QUESTION 2 – Difficulty: medium

Choice A is the best answer. In lines 2-4, the author of Passage 1 provides evidence that the use of screen-based technologies has some positive effects: “Certain cognitive skills are strengthened by our use of computers and the Net.” Choices B, C, and D are incorrect because they do not provide the best evidence that the use of screen-based technologies has some positive effects. Choices B, C, and D introduce and describe the author’s reservations about screen-based technologies.

QUESTION 3 – Difficulty: easy

Choice B is the best answer. The author of Passage 1 cites Patricia Greenfield’s study, which found that people’s use of screen-based technologies weakened their ability to acquire knowledge, perform “inductive analysis” and “critical thinking,” and be imaginative and reflective (lines 36-41). The author of Passage 1 concludes that the use of screen-based technologies interferes with people’s ability to think “deeply” (lines 51-53). Choices A, C, and D are incorrect because the author of Passage 1 does not address how using the Internet affects people’s health, social contacts, or self-confidence.

QUESTION 4 – Difficulty: medium

Choice C is the best answer. In lines 42-44, the author states, “We know that the human brain is highly plastic; neurons and synapses change as circumstances change.” In this context, the brain is “plastic” because it is malleable, or able to change. Choices A, B, and D are incorrect because in this context “plastic” does not mean creative, artificial, or sculptural.

QUESTION 5 – Difficulty: medium

Choice B is the best answer. In lines 64-70, the author of Passage 2 explains how speed-reading does not “revamp,” or alter, how the brain processes information. He supports this statement by explaining how Woody Allen’s reading of *War and Peace* in one sitting caused him to describe the novel as “about Russia.” Woody Allen was not able to comprehend the “famously long” novel by speed-reading it. Choices A and D are incorrect because Woody Allen’s description of *War and Peace* does not suggest he disliked Tolstoy’s writing style or that he regretted reading the book. Choice C is incorrect because the anecdote about Woody Allen is unrelated to multitasking.

QUESTION 6 – Difficulty: easy

Choice D is the best answer. The author of Passage 2 states that people like novelists and scientists improve in their profession by “immers[ing] themselves in their fields” (lines 84-85). Both novelists and scientists, in other words, become absorbed in their areas of expertise. Choices A and C are incorrect because the author of Passage 2 does not suggest that novelists and scientists both take risks when they pursue knowledge or are curious about other subjects. Choice B is incorrect because the author of Passage 2 states that “accomplished people” don’t perform “intellectual calisthenics,” or exercises that improve their minds (lines 83-85).

QUESTION 7 – Difficulty: hard

Choice D is the best answer. In lines 89-98, the author of Passage 2 criticizes media critics for their alarmist writing: “Media critics write as if the brain takes on the qualities of whatever it consumes, the informational equivalent of ‘you are what you eat.’” The author then compares media critics’ “you are what you eat” mentality to ancient people’s belief that “eating fierce animals made them fierce.” The author uses this analogy to discredit media critics’ belief that consumption of electronic media alters the brain. Choices A, B, and C are incorrect because the final sentence of Passage 2 does not use ornate language, employ humor, or evoke nostalgia for the past.

QUESTION 8 – Difficulty: easy

Choice D is the best answer. The author of Passage 1 argues that online and other screen-based technologies affect people’s abilities to think deeply (lines 51-53). The author of Passage 2 argues that the effects of consuming electronic media are less drastic than media critics suggest (lines 88-89). Choices A and B are incorrect because they discuss points made in the passages but not the main purpose of the passages. Choice C is incorrect because neither passage argues in favor of increasing financial support for certain studies.

QUESTION 9 – Difficulty: medium

Choice B is the best answer. The author of Passage 1 cites scientific research that suggests online and screen-based technologies have a negative effect on the brain (lines 24-41). The author of Passage 2 is critical of the research highlighted in Passage 1: “Critics of new media sometimes use science itself to press their case, citing research that shows how ‘experience can change the brain.’ But cognitive neuroscientists roll their eyes at such talk” (lines 54-58). Choices A, C, and D are incorrect because they do not accurately describe the relationship between the two passages. Passage 1 does not take a clinical approach to the topic. Passage 2 does not take a high-level view of a finding examined in depth in Passage 1, nor does it predict negative reactions to the findings discussed in paragraph 1.

QUESTION 10 – Difficulty: medium

Choice C is the best answer. In Passage 1, the author cites psychologist Patricia Greenfield’s finding that “every medium develops some cognitive skills at the expense of others” (lines 31-32). In Passage 2, the author states “If you train people to do one thing (recognize shapes, solve math puzzles, find hidden words), they get better at doing that thing, but almost nothing else” (lines 75-80). Both authors would agree that an improvement in one cognitive area, such as visual spatial skills, would not result in improved skills in other areas. Choice A is incorrect because hand-eye coordination is not discussed in Passage 2. Choice B is incorrect because Passage 1 does not suggest that critics of electronic media tend to overreact. Choice D is incorrect because neither passage discusses whether Internet users prefer reading printed texts or digital texts.

QUESTION 11 – Difficulty: medium

Choice B is the best answer. In Passage 1, the author cites Michael Merzenich’s claim that when people adapt to a new cultural phenomenon, including the use of a new medium, we end up with a “different brain” (lines 44-46). The author of Passage 2 somewhat agrees with Merzenich’s claim by stating, “Yes, every time we learn a fact or skill the wiring of the brain changes” (lines 58-59). Choices A, C, and D do not provide the best evidence that the author of Passage 2 would agree to some extent with Merzenich’s claim. Choices A and D are incorrect because the claims are attributed to critics of new media. Choice C is incorrect because it shows that the author of Passage 2 does not completely agree with Merzenich’s claim about brain plasticity.

GENETICAL IMPLICATIONS OF THE STRUCTURE OF DEOXYRIBONUCLEIC ACID

Questions 1-10 are based on the following passage and supplementary material. This passage is adapted from J. D. Watson and F. H. C. Crick, "Genetical Implications of the Structure of Deoxyribonucleic Acid." ©1953 by Nature Publishing Group. Watson and Crick deduced the structure of DNA using evidence from Rosalind Franklin and R. G. Gosling's X-ray crystallography diagrams of DNA and from Erwin Chargaff's data on the base composition of DNA.

The chemical formula of deoxyribonucleic acid (DNA) is now well established. The molecule is a very long chain, the backbone of which consists of a regular alternation of sugar and phosphate groups. To each sugar is attached a nitrogenous base, which can be of four different types. Two of the possible bases — adenine and guanine — are purines, and the other two — thymine and cytosine — are pyrimidines. So far as is known, the sequence of bases along the chain is irregular. The monomer unit, consisting of phosphate, sugar and base, is known as a nucleotide.

The first feature of our structure which is of biological interest is that it consists not of one chain, but of two. These two chains are both coiled around a common fiber axis. It has often been assumed that since there was only one chain in the chemical formula there would only be one in the structural unit. However, the density, taken with the X-ray evidence, suggests very strongly that there are two.

The other biologically important feature is the manner in which the two chains are held together. This is done by hydrogen bonds between the bases. The bases are joined together in pairs, a single base from one chain being hydrogen-bonded to a single base from the other. The important point is that only certain pairs of bases will fit into the structure. One member of a pair must be a purine and the other a pyrimidine in order to bridge between the two chains. If a pair consisted of two purines, for example, there would not be room for it.

We believe that the bases will be present almost entirely in their most probable forms. If this is true, the conditions for forming hydrogen bonds are more restrictive, and the only pairs of bases possible are: adenine with thymine, and guanine with cytosine. Adenine, for example, can occur on either chain; but when it does, its partner on the other chain must always be thymine.

The phosphate-sugar backbone of our model is completely regular, but any sequence of the pairs of bases can fit into the structure. It follows that in a long molecule many different

permutations are possible, and it therefore seems likely that the precise sequence of bases is the code which carries the genetical information. If the actual order of the bases on one of the pair of chains were given, one could write down the exact order of the bases on the other one, because of the specific pairing. Thus one chain is, as it were, the complement of the other, and it is this feature which suggests how the deoxyribonucleic acid molecule might duplicate itself.

The table shows, for various organisms, the percentage of each of the four types of nitrogenous bases in that organism's DNA.

Base Composition of DNA				
Organism	Percentage of base in organism's DNA			
	adenine (%)	guanine (%)	cytosine (%)	thymine (%)
Maize	26.8	22.8	23.2	27.2
Octopus	33.2	17.6	17.6	31.6
Chicken	28.0	22.0	21.6	28.4
Rat	28.6	21.4	20.5	28.4
Human	29.3	20.7	20.0	30.0
Grasshopper	29.3	20.5	20.7	29.3
Sea urchin	32.8	17.7	17.3	32.1
Wheat	27.3	22.7	22.8	27.1
Yeast	31.3	18.7	17.1	32.9
<i>E. coli</i>	24.7	26.0	25.7	23.6

Adapted from Manju Bansal, "DNA Structure: Revisiting the Watson-Crick Double Helix." ©2003 by Current Science Association, Bangalore.

GENETICAL IMPLICATIONS OF THE STRUCTURE OF DEOXYRIBONUCLEIC ACID

- The authors use the word “backbone” in lines 3 and 42 to indicate that
 - only very long chains of DNA can be taken from an organism with a spinal column.
 - the main structure of a chain in a DNA molecule is composed of repeating units.
 - a chain in a DNA molecule consists entirely of phosphate groups or of sugars.
 - nitrogenous bases form the main structural unit of DNA.
- A student claims that nitrogenous bases pair randomly with one another. Which of the following statements in the passage contradicts the student’s claim?
 - Lines 5-6 (“To each... types”)
 - Lines 9-10 (“So far... irregular”)
 - Lines 25-27 (“The bases... other”)
 - Lines 29-31 (“One member... chains”)
- In the second paragraph (lines 13-21), what do the authors claim to be a feature of biological interest?
 - The chemical formula of DNA
 - The common fiber axis
 - The X-ray evidence
 - DNA consisting of two chains
- The authors’ main purpose of including the information about X-ray evidence and density is to
 - establish that DNA is the molecule that carries the genetic information.
 - present an alternate hypothesis about the composition of a nucleotide.
 - provide support for the authors’ claim about the number of chains in a molecule of DNA.
 - confirm the relationship between the density of DNA and the known chemical formula of DNA.
- Based on the passage, the authors’ statement “If a pair consisted of two purines, for example, there would not be room for it” (lines 31-33) implies that a pair
 - of purines would be larger than the space between a sugar and a phosphate group.
 - of purines would be larger than a pair consisting of a purine and a pyrimidine.
 - of pyrimidines would be larger than a pair of purines.
 - consisting of a purine and a pyrimidine would be larger than a pair of pyrimidines.
- The authors’ use of the words “exact,” “specific,” and “complement” in lines 50-53 in the final paragraph functions mainly to
 - confirm that the nucleotide sequences are known for most molecules of DNA.
 - counter the claim that the sequences of bases along a chain can occur in any order.
 - support the claim that the phosphate-sugar backbone of the authors’ model is completely regular.
 - emphasize how one chain of DNA may serve as a template to be copied during DNA replication.
- Based on the table and passage, which choice gives the correct percentages of the purines in yeast DNA?
 - 17.1% and 18.7%
 - 17.1% and 32.9%
 - 18.7% and 31.3%
 - 31.3% and 32.9%
- Do the data in the table support the authors’ proposed pairing of bases in DNA?
 - Yes, because for each given organism, the percentage of adenine is closest to the percentage of thymine, and the percentage of guanine is closest to the percentage of cytosine.
 - Yes, because for each given organism, the percentage of adenine is closest to the percentage of guanine, and the percentage of cytosine is closest to the percentage of thymine.
 - No, because for each given organism, the percentage of adenine is closest to the percentage of thymine, and the percentage of guanine is closest to the percentage of cytosine.
 - No, because for each given organism, the percentage of adenine is closest to the percentage of guanine, and the percentage of cytosine is closest to the percentage of thymine.
- According to the table, which of the following pairs of base percentages in sea urchin DNA provides evidence in support of the answer to the previous question?
 - 17.3% and 17.7%
 - 17.3% and 32.1%
 - 17.3% and 32.8%
 - 17.7% and 32.8%
- Based on the table, is the percentage of adenine in each organism’s DNA the same or does it vary, and which statement made by the authors is most consistent with that data?
 - The same; “Two of... pyrimidines” (lines 6-9)
 - The same; “The important... structure” (lines 27-29)
 - It varies; “Adenine... thymine” (lines 39-41)
 - It varies; “It follows... information” (lines 44-48)

QUESTION 1 – Difficulty: medium

Choice B is the best answer. Lines 3-5 of the passage describe DNA as “a very long chain, the backbone of which consists of a regular alternation of sugar and phosphate groups.” The backbone of DNA, in other words, is the main structure of a chain made up of repeating units of sugar and phosphate. Choice A is incorrect because the passage describes DNA on the molecular level only and never mentions the spinal column of organisms. Choice C is incorrect because the passage describes the backbone of the molecule as having “a regular alternation” of sugar and phosphate, not one or the other. Choice D is incorrect because the nitrogenous bases are not the main structural unit of DNA; rather, they are attached only to the repeating units of sugar.

QUESTION 2 – Difficulty: medium

Choice D is the best answer. The authors explain that hydrogen bonds join together pairs of nitrogenous bases, and that these bases have a specific structure that leads to the pairing: “One member of a pair must be a purine and the other a pyrimidine in order to bridge between the two chains” (lines 29-31). Given the specific chemical properties of a nitrogenous base, it would be inaccurate to call the process random. Choice A is incorrect because lines 5-6 describe how nitrogenous bases attach to sugar but not how those bases pair with one another. Choice B is incorrect because lines 9-10 do not contradict the student’s claim. Choice C is incorrect because lines 25-27 describe how the two molecules’ chains are linked, not what the specific pairing between nitrogenous bases is.

QUESTION 3 – Difficulty: easy

Choice D is the best answer. In lines 13-15 the authors state: “the first feature of our structure which is of biological interest is that it consists not of one chain, but of two.” Choices A and B are incorrect because lines 13-15 explicitly state that it is the two chains of DNA that are of “biological interest,” not the chemical formula of DNA, nor the common fiber axis those two chains are wrapped around. Choice C is incorrect because, while the X-ray evidence did help Watson and Crick to discover that DNA consists of two chains, it was not claimed to be the feature of biological interest.

QUESTION 4 – Difficulty: easy

Choice C is the best answer. In lines 13-15 the authors claim that DNA molecules appear to be comprised of two chains, even though “it has often been assumed . . . there would be only one” (lines 16-18). The authors support this claim with evidence compiled from an X-ray: “the density, taken with the X-ray evidence, suggests very strongly that there are two [chains]” (lines 19-21). Choices A, B, and D are incorrect because the authors mention density and X-ray evidence to support a claim, not to establish that DNA carries genetic information, present a hypothesis about the composition of a nucleotide, or confirm a relationship between the density and chemical formula of DNA.

QUESTION 5 – Difficulty: medium

Choice B is the best answer. The authors explain that “only certain pairs of bases will fit into the structure” (lines 27-29) of the DNA molecule. These pairs must contain “a purine and the other a pyrimidine in order to bridge between the two chains” (lines 29-31), which implies that any other pairing would not “fit into the structure” of the DNA molecule. Therefore, a pair of purines would be larger than the required purine/pyrimidine pair and would not fit into the structure of the DNA molecule. Choice A is incorrect because this section is not discussing the distance between a sugar and phosphate group. Choice C is incorrect because the passage never makes clear the size of the pyrimidines or purines in relation to each other, only in relation to the space needed to bond the chains of the DNA molecule. Choice D is incorrect because the lines do not make an implication about the size of a pair of pyrimidines in relation to the size of a pair consisting of a purine and a pyrimidine.

QUESTION 6 – Difficulty: medium

Choice D is the best answer. The authors explain how the DNA molecule contains a “precise sequence of bases” (lines 47-48), and that the authors can use the order of bases on one chain to determine the order of bases on the other chain: “If the actual order of the bases on one of the pair of chains were given, one could write down the exact order of the bases on the other one, because of the specific pairing. Thus one chain is, as it were, the complement of the other, and it is this feature which suggests how the deoxyribonucleic acid molecule might duplicate itself ” (lines 52-55). The authors use the words “exact,” “specific,” and “complement” in these lines to suggest that the base pairings along a DNA chain is understood and predictable, and may explain how DNA “duplicate[s] itself ” (line 55). Choice A is incorrect because the passage does not suggest that most nucleotide sequences are known. Choice B is incorrect because these lines are not discussing the random nature of the base sequence along one chain of DNA. Choice C is incorrect because the authors are describing the bases attached only to the sugar, not to the sugar-phosphate backbone.

QUESTION 7 – Difficulty: medium

Choice C is the best answer. Lines 6-8 state that “Two of the possible bases — adenine and guanine — are purines,” and on the table the percentages of adenine and guanine in yeast DNA are listed as 31.3% and 18.7% respectively. Choices A, B, and D are incorrect because they do not state the percentages of both purines, adenine and guanine, in yeast DNA.

QUESTION 8 – Difficulty: medium

Choice A is the best answer. The authors state: “We believe that the bases will be present almost entirely in their most probable forms. If this is true, the conditions for forming hydrogen bonds are more restrictive, and the only pairs of bases possible are: adenine with thymine, and guanine with cytosine” (lines 34-39). The table shows that the pairs adenine/thymine and guanine/cytosine have notably similar percentages in DNA for all organisms listed. Choice B is incorrect. Although the choice of “Yes” is correct, the explanation for that choice misrepresents the data in the table. Choices C and D are incorrect because the table does support the authors’ proposed pairing of nitrogenous bases in DNA molecules.

QUESTION 9 – Difficulty: easy

Choice A is the best answer because it gives the percentage of cytosine (17.3%) in sea urchin DNA and the percentage of guanine (17.7%) in sea urchin DNA. Their near similar pairing supports the authors’ proposal that possible pairings of nitrogenous bases are “adenine with thymine, and guanine with cytosine” (line 39). Choices B, C, and D do not provide the best evidence for the answer to the previous question. Choice B (cytosine and thymine), Choice C (cytosine and adenine), and Choice D (guanine and adenine) are incorrect because they show pairings of nitrogenous bases that do not compose a similar percentage of the bases in sea urchin DNA.

QUESTION 10 – Difficulty: medium

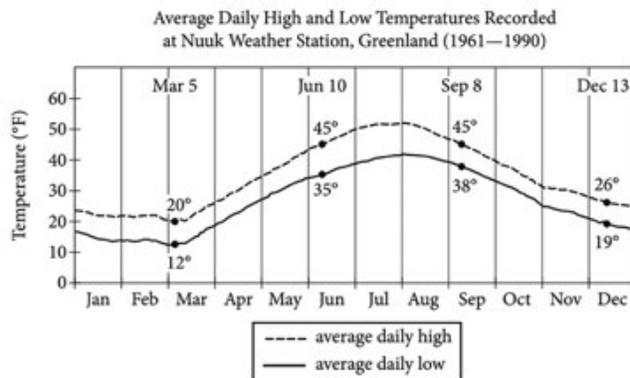
Choice D is the best answer. The table clearly shows that the percentage of adenine in each organism’s DNA is different, ranging from 24.7% in E.coli to 33.2% in the octopus. That such a variability would exist is predicted in lines 44-46, which states that “in a long molecule many different permutations are possible.” Choices A and B are incorrect because the table shows that the percentage of adenine varies between 24.7% and 33.2% in different organisms. Choice C is incorrect because lines 39-41 state that adenine pairs with thymine but does not mention the variability of the base composition of DNA.

Questions 1-11 are based on the following passage and supplementary material.

Dark Snow

Most of Greenland's interior is covered by a thick layer of ice and compressed snow known as the Greenland Ice Sheet. The size of the ice sheet fluctuates seasonally: in summer, average daily high temperatures in Greenland can rise to slightly above 50 degrees Fahrenheit, partially melting the ice; in the winter, the sheet thickens as additional snow falls, and average daily low temperatures can drop **1** to as low as 20 degrees.

1. (Sci)
 Which choice most accurately and effectively represents the information in the graph?
- A) NO CHANGE
 - B) to 12 degrees Fahrenheit.
 - C) to their lowest point on December 13.
 - D) to 10 degrees Fahrenheit and stay there for months.



Adapted from WMO. ©2014 by World Meteorological Organization.

Typically, the ice sheet begins to show evidence of thawing in late **2** summer. This follows several weeks of higher temperatures. **3** For example, in the summer of 2012, virtually the entire Greenland Ice Sheet underwent thawing at or near its surface by mid-July, the earliest date on record. Most scientists looking for the causes of the Great Melt of 2012 have focused exclusively on rising temperatures. The summer of 2012 was the warmest in 170 years, records show. But Jason **4** Box, an associate professor of geology at Ohio State believes that another factor added to the early **5** thaw; the “dark snow” problem.

2. (Sci)
Which choice most effectively combines the two sentences at the underlined portion?
 - A) summer, following
 - B) summer, and this thawing follows
 - C) summer, and such thawing follows
 - D) summer and this evidence follows

3. (Sci)
 - A) NO CHANGE
 - B) However,
 - C) As such,
 - D) Moreover,

4.
 - A) NO CHANGE
 - B) Box an associate professor of geology at Ohio State,
 - C) Box, an associate professor of geology at Ohio State,
 - D) Box, an associate professor of geology, at Ohio State

5.
 - A) NO CHANGE
 - B) thaw; and it was
 - C) thaw:
 - D) thaw: being

According to Box, a leading Greenland expert, tundra fires in 2012 from as far away as North America produced great amounts of soot, some **6** of it drifted over Greenland in giant plumes of smoke and then **7** fell as particles onto the ice sheet. Scientists have long known that soot particles facilitate melting by darkening snow and ice, limiting **8** it's ability to reflect the Sun's rays. As Box explains, "Soot is an extremely powerful light absorber. It settles over the ice and captures the Sun's heat." The result is a self-reinforcing cycle. As the ice melts, the land and water under the ice become exposed, and since land and water are darker than snow, the surface absorbs even more heat, which **9** is related to the rising temperatures.

- 6.
- A) NO CHANGE
 - B) soot
 - C) of which
 - D) DELETE the underlined portion.
- 7.
- A) NO CHANGE
 - B) falls
 - C) will fall
 - D) had fallen
- 8.
- A) NO CHANGE
 - B) its
 - C) there
 - D) their
9. (Sci)
- Which choice best completes the description of self-reinforcing cycle?
- A) NO CHANGE
 - B) raises the surface temperature.
 - C) begins to cool at a certain point.
 - D) leads to additional melting

[1] Box's research is important because the fires of 2012 may not be a one-time phenomenon. [2] According to scientists, rising Arctic temperatures are making northern latitudes greener and thus more fire prone. [3] The pattern Box observed in 2012 may repeat **10**, with harmful effects on the Arctic ecosystem. [4] Box is currently organizing an expedition to gather this crucial information. [5] The next step for Box and his team is to travel to Greenland to perform direct sampling of the ice in order to determine just how much the soot is contributing to the melting of the ice sheet. [6] Members of the public will be able to track his team's progress — and even help fund the expedition — through a website Box has created. **11**

10. (Sci)

- A) NO CHANGE
- B) itself,
- C) itself, with damage and
- D) itself possibly,

11. (Sci)

To make this paragraph most logical, sentence 4 should be placed

- A) where it is now.
- B) after sentence 1.
- C) after sentence 2.
- D) after sentence 5.

QUESTION 1 – Difficulty: easy

Choice B is the best answer because the graph clearly indicates that, on March 5, average low temperatures are at their lowest point: 12 degrees Fahrenheit. Choice A is incorrect because the phrase “as low as” suggests that the temperature falls no lower than 20 degrees Fahrenheit, but the chart shows that in January, February, and March, the temperature frequently falls below that point. Choices C and D are incorrect because the information each provides is inconsistent with the information on the chart.

QUESTION 2 – Difficulty: easy

Choice A is the best answer because it concisely combines the two sentences while maintaining the original meaning. Choices B, C, and D are incorrect because each is unnecessarily wordy, thus undermining one purpose of combining two sentences: to make the phrasing more concise.

QUESTION 3 – Difficulty: medium

Choice B is the best answer because it provides a conjunctive adverb that accurately represents the relationship between the two sentences. “However” signals an exception to a case stated in the preceding sentence. Choices A, C, and D are incorrect because each provides a transition that does not accurately represent the relationship between the two sentences, and as a result each compromises the logical coherence of these sentences.

QUESTION 4 – Difficulty: easy

Choice C is the best answer because it provides commas to offset the nonrestrictive modifying clause “an associate professor of geology at Ohio State.” Choices A, B, and D are incorrect because each provides punctuation that does not adequately separate the nonrestrictive modifying clause about Jason Box from the main clause.

QUESTION 5 – Difficulty: medium

Choice C is the best answer because the colon signals that the other factor that contributed to the early thaw is about to be provided. Choice A is incorrect because it results in a sentence that deviates from grammatical standards: a semicolon should be used to separate two independent clauses, but in choice A the second clause only has a subject, not a verb. Choice B is incorrect because it is unnecessarily wordy. Choice D is incorrect because “being” is unnecessary and creates an incoherent clause.

QUESTION 6 – Difficulty: easy

Choice C is the best answer because it provides the correct preposition (“of”) and relative pronoun (“which”) that together create a dependent clause following the comma. Choices A, B, and D are incorrect because each results in a comma splice. Two independent clauses cannot be joined with only a comma.

QUESTION 7 – Difficulty: easy

Choice A is the best answer because the verb tense is consistent with the preceding past tense verbs in the sentence, specifically “produced” and “drifted.” Choices B, C, and D are incorrect because each utilizes a verb tense that is not consistent with the preceding past tense verbs in the sentence.

QUESTION 8 – Difficulty: hard

Choice D is the best answer because “their” is the possessive form of a plural noun. In this case, the noun is plural: “snow and ice.” Choices A and B are incorrect because the possessive pronoun must refer to a plural noun, “snow and ice,” rather than a singular noun. Choice C is incorrect because “there” would result in an incoherent sentence.

QUESTION 9 – Difficulty: medium

Choice D is the best answer. The preceding sentences in the paragraph have established that a darker surface of soot-covered snow leads to more melting 21 because this darker surface absorbs heat, whereas a whiter surface, free of soot, would deflect heat. As the passage points out, exposed land and water are also dark and cannot deflect heat the way ice and snow can. Only choice D reflects the self-reinforcing cycle that the preceding sentences already imply. Choices A, B, and C are incorrect because the information each provides fails to support the previous claim that the “result” of the soot “is a self-reinforcing cycle.”

QUESTION 10 – Difficulty: medium

Choice B is the best answer because it is free of redundancies. Choices A, C, and D are incorrect because each of the three presents a redundancy: Choice A uses “repeat” and “again”; Choice C uses “damage” and “harmful effects”; and Choice D uses “may” and “possibly.”

QUESTION 11 – Difficulty: medium

Choice D is the best answer because sentence 5 describes the information Box seeks: “to determine just how much the soot is contributing to the melting of the ice sheet.” Unless sentence 4 comes after sentence 5, readers will not know what the phrase “this crucial information” in sentence 4 refers to. Choices A, B, and C are incorrect because each results in an illogical sentence progression. None of the sentences that would precede sentence 4 provides details that could be referred to as “this crucial information.”

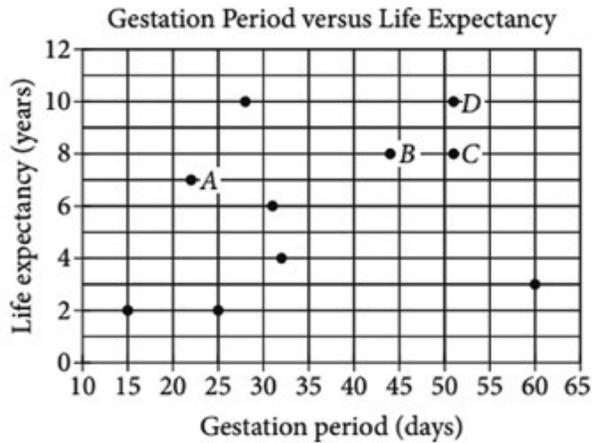
Heart of Algebra – No Calculator, student-produced response question

- The mesosphere is the layer of Earth’s atmosphere between 50 kilometers and 85 kilometers above Earth’s surface. At a distance of 50 kilometers from Earth’s surface, the temperature in the mesosphere is -5° Celsius, and at a distance of 80 kilometers from Earth’s surface, the temperature in the mesosphere is -80° Celsius. For every additional 10 kilometers from Earth’s surface, the temperature in the mesosphere decreases by k° Celsius, where k is a constant. What is the value of k ?

Question difficulty: hard

Problem Solving and Data Analysis – Calculator allowed

Use the following graph for questions 2 and 3.



A curator at a wildlife society created the scatterplot above to examine the relationship between the gestation period and life expectancy of 10 species of animals.

- What is the life expectancy, in years, of the animal that has the longest gestation period?

- A) 3
- B) 4
- C) 8
- D) 10

Question difficulty: easy

- Of the labeled points, which represents the animal for which the ratio of life expectancy to gestation period is greatest?

- A) A
- B) B
- C) C
- D) D

Question difficulty: hard

Problem Solving and Data Analysis – Calculator allowed

4. Katarina is a botanist studying the production of pears by two types of pear trees. She noticed that Type A trees produced 20 percent more pears than Type B trees did. Based on Katarina's observation, if the Type A trees produced 144 pears, how many pears did the Type B trees produce?
- A) 115
 - B) 120
 - C) 124
 - D) 173

Question difficulty: hard

Passport to Advanced Math – No Calculator

5. $h = -4.9t^2 + 25t$
The equation above expresses the approximate height h , in meters, of a ball t seconds after it is launched vertically upward from the ground with an initial velocity of 25 meters per second. After approximately how many seconds will the ball hit the ground?
- A) 3.5
 - B) 4.0
 - C) 4.5
 - D) 5.0

Question difficulty: hard

- Answer explanation: The correct answer is 25. In the mesosphere, an increase of 10 kilometers in the distance above Earth results in a decrease in the temperature by k° Celsius where k is a constant. Thus, the temperature in the mesosphere is linearly dependent on the distance above Earth. Using the values provided and the slope formula, one can calculate the unit rate of change for the temperature in the mesosphere to be $\frac{-80-(-5)}{80-50} = \frac{-75}{30} = \frac{-2.5}{1}$. The slope indicates that, within the mesosphere, if the distance above Earth increases by 1 kilometer, the temperature decreases by 2.5° Celsius. Therefore, if the distance above Earth increases by $(1 \times 10) = 10$ kilometers, the temperature will decrease by $(2.5 \times 10) = 25^\circ$ Celsius. Thus, the value of k is 25.
- Answer explanation: Choice A is correct. According to the graph, the animal with the longest gestation period (60 days) has a life expectancy of 3 years. Choices B, C, and D are incorrect. All the animals that have a life expectancy of 4, 8, or 10 years have a gestation period that is shorter than 60 days, which is the longest gestation period.
- Answer explanation: Choice A is correct. The ratio of life expectancy to gestation period for the animal represented by point A is approximately $\frac{7 \text{ years}}{23 \text{ days}}$, or about 0.3 years/day, which is greater than the ratio for the animals represented by the other labeled points (the ratios for points B, C, and D, in units of years of life expectancy per day of gestation, are approximately $\frac{8}{44}$, $\frac{8}{51}$, and $\frac{10}{51}$ respectively, each of which is less than 0.2 years/day). Choices B, C, and D are incorrect and may be the result of errors in calculating the ratio or in reading the graph.
- Answer explanation: Choice B is correct. Let x represent the number of pears produced by the Type B trees. Then the Type A trees produce 20 percent more pears than x , which is $x + 0.20x = 1.20x$ pears. Since Type A trees produce 144 pears, the equation $1.20x = 144$ holds. Thus $x = \frac{144}{1.20} = 120$. Therefore, the Type B trees produced 120 pears. Choice A is incorrect because while 144 is reduced by approximately 20 percent, increasing 115 by 20 percent gives 138, not 144. Choice C is incorrect; it results from subtracting 20 from the number of pears produced by the Type A trees. Choice D is incorrect; it results from adding 20 percent of the number of pears produced by Type A trees to the number of pears produced by Type A trees.
- Answer explanation: Choice D is correct. When the ball hits the ground, its height is 0 meters. Substituting 0 for h in $h = -4.9t^2 + 25t$ gives $0 = -4.9t^2 + 25t$, which can be rewritten as $0 = t(-4.9t + 25)$. Thus, the possible values of t are $t = 0$ and $t = \frac{25}{4.9} \approx 5.1$. The time $t = 0$ seconds corresponds to the time the ball is launched from the ground, and the time $t \approx 5.1$ seconds corresponds to the time after launch that the ball hits the ground. Of the given choices, 5.0 seconds is closest to 5.1 seconds, so the ball returns to the ground approximately 5.0 seconds after it is launched. Choice A, B, and C are incorrect and could arise from conceptual or computation errors while solving $0 = -4.9t^2 + 25t$ for t .

INSTRUCTIONAL STRATEGIES

Reading Test

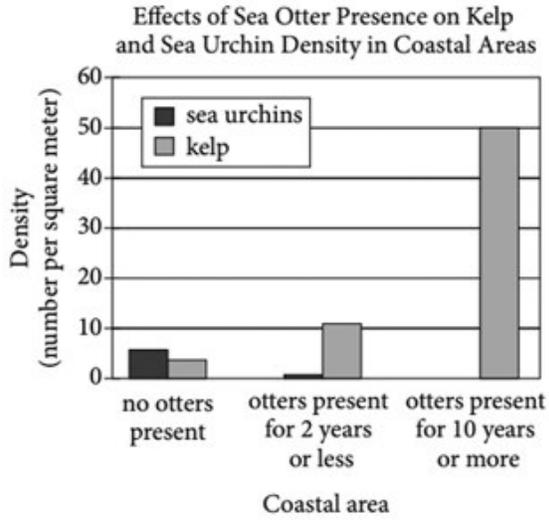
- » Give students opportunities to practice reading long passages of 500+ words in which text and data (tables or graphs) are paired. Give students the opportunity to read and analyze not only authentic science articles, but also articles written about science.
- » Allow students to examine tables, charts, and graphs prior to reading or discussing explanations of the data. Give them an opportunity to generate hypotheses about the data and then confirm or contrast their ideas with the textual conclusions.
- » Practice synthesis by asking students to read primary and secondary sources on the same science topic, identifying ambiguities, areas of disagreement among authors, and the limits of scientific thinking.
- » Promote close reading of complex text by asking students to consider and discuss:
 - › What the text says explicitly
 - › What reasonable inferences and conclusions can be drawn
 - › What textual evidence supports their analysis (quotations, facts, figures, etc.)

Writing and Language Test

- » Teach students in all classes to practice writing and language analysis skills — using effective language, clearly expressing ideas, and properly utilizing Standard English Conventions — to develop their analyses of social studies, science, and career-related passages.
- » Familiarize students with the analysis of data, graphs, and charts in conjunction with text. Using the informational graphics in a textbook or periodical, provide students with inaccurate interpretations of graphics and ask them to correct the error(s). Have them explicitly describe the data they used to make each correction.
- » Provide students with a science paper accompanied by an informational graphic. Ask students to use evidence (i.e., descriptive details and data from informational graphics) to add or refine central ideas, develop and strengthen claims and points, sharpen focus, and improve precision and accuracy.

Math Test

- » Help students become fluent in working with numbers and data that are important in reading, writing, and communicating about texts and topics in science by regularly gathering, organizing, and analyzing relevant data.
- » Give students opportunities to practice fluency of mathematical skills by asking them to work to solve science problems without the use of calculators.
- » Emphasize finding relationships between variables — linear, quadratic, and exponential relationships.
- » Review data collection techniques and determine appropriateness of data collection methods; evaluate reports and develop conclusions based on the data.



Adapted from David O. Duggins, "Kelp Beds and Sea Otters: An Experimental Approach." ©1980 by the Ecological Society of America.

Create 3 incorrect and one correct interpretation of the graph.

1. _____

2. _____

3. _____

4. _____

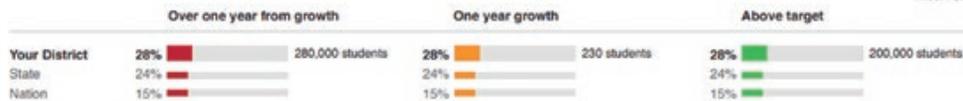
All Scores Evidence-Based Reading Related Scores Math Related Scores

Section Scores (160 - 760)

■ 160 - 300 Over one year growth from target ■ 301 - 555 One year growth from target ■ 556 - 760 Above target

Evidence Based Reading & Writing ^⓪

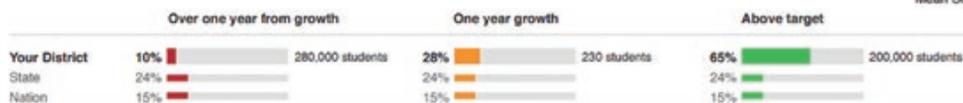
523^{(31)*}
Mean Score



[See Question Analysis Report](#)

Math ^⓪

523^{(31)*}
Mean Score



[See Question Analysis Report](#)

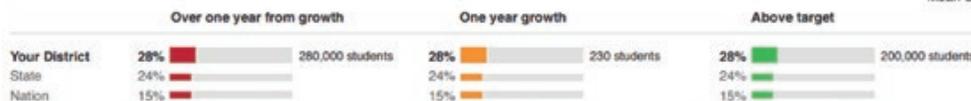
* Mean Score (Standard Deviation)

Test Scores (8 - 38)

■ 8 - 16 Over one year growth from target ■ 16 - 23 One year growth from target ■ 24 - 38 Above target

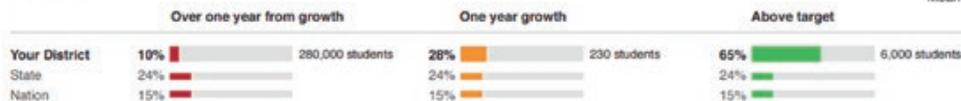
Reading ^⓪

31^{(2)*}
Mean Score



Writing ^⓪

31^{(2)*}
Mean Score



* Mean Score (Standard Deviation)

Cross Test Scores (8 - 38)

Analysis in Science ^⓪

31^{(2)*}
Mean Score

Analysis in Social Studies/History ^⓪

31^{(2)*}
Mean Score

* Mean Score (Standard Deviation)

Subscores (1 - 15)

QUESTION ANALYSIS REPORT

William E. Grady Career and Technical Education High School
 PSAT/NMSQT Fall 2016, 11th Grade - Question Analysis Report

[Export](#)

Form A - 25120 Test Takers

91 Evidence-Based Reading & Writing Questions

48 Math Questions

All % Correct All Difficulties All Score Relationships

Test Portion	Question	Correct Answer	Percentage Correct by Group	Student Responses					Difficulty Level	Related Cross-test scores and Subscores	Students Performance
				A%	B%	C%	D%	Omit%			
Reading	1	A	School 22% District 24% State 15% Nation 17%	22	15	43	15	15	Easy	Expressions of Ideas ⓘ Command of Evidence ⓘ	See Student Performance
Reading	2	B	School 22% District 24% State 15% Nation 17%	22	13	43	13	13	Easy	Expressions of Ideas ⓘ Words in Context ⓘ Command of Evidence ⓘ	See Student Performance
Reading	3	D	School 27% District 24% State 15% Nation 17%	27	15	43	15	15	Medium	Expressions of Ideas ⓘ Words in Context ⓘ Command of Evidence ⓘ	See Student Performance
Reading	4	C	School 22% District 24% State 15% Nation 17%	22	15	43	15	15	Medium	Expressions of Ideas ⓘ Command of Evidence ⓘ	See Student Performance
Reading	5	B	School 27% District 24% State 15% Nation 17%	27	15	43	15	15	Hard	Expressions of Ideas ⓘ Words in Context ⓘ Command of Evidence ⓘ	See Student Performance
Reading	6	D	School 22% District 24% State 15% Nation 17%	22	15	43	15	15	Hard	Expressions of Ideas ⓘ Command of Evidence ⓘ	See Student Performance
Writing	5	B	School 27% District 24% State 15% Nation 17%	27	15	43	15	15	Hard	Expressions of Ideas ⓘ Words in Context ⓘ Command of Evidence ⓘ	See Student Performance
Writing	6	D	School 22% District 24% State 15% Nation 17%	22	15	43	15	15	Hard	Expressions of Ideas ⓘ Command of Evidence ⓘ	See Student Performance