

Official SAT Practice

Lesson Plans

for Teachers by Teachers

LESSON 11

Reading—Quantitative Texts

Subscore: Command of Evidence**Focus:** Analyzing quantitative texts on the Reading Test**Objective:**

Students will analyze information presented quantitatively and connect that information to the ideas presented in a print text.

Before the Lesson:

- Review Chapter 8 of the *SAT[®] Study Guide for Students* if you haven't yet done so.
- Preview the video on Official SAT Practice on Khan Academy[®].
- Preview and print (if necessary) the student materials.

Introductory Activity | 20 minutes

1. Let students know that in addition to reading print texts, they will also need to “read” quantitative texts. Or, as the Official Study Guides describes it: “You’ll find one or more informational graphics—tables, graphs, charts, and the like—accompanying one of the history/social studies passages and also one of the science passages on the test. There’ll be questions about those graphics as well. These questions fall into three general kinds (although the first two are fairly similar):
 - ◆ Questions that ask you to locate information in one or more informational graphics
 - ◆ Questions that ask you to draw reasonable conclusions from data presented in one or more graphics
 - ◆ Questions that ask you to connect the information displayed in one or more graphics with the information in the accompanying passage”
2. Ask students to look carefully at Chart #1 in their student materials. Ask students to examine the chart by discussing the following questions:
 - ◆ What is the title of the chart? What information is it communicating?
 - ◆ What are the x and y axes? What is being compared?
 - ◆ What are some conclusions that can be drawn only from this chart?
3. Then, ask students to consider the following SAT Question 3, going through each individual claim in the questioning, explaining why it is supported or not by the graph. Share some of the elements of the rationale, if needed. An extension activity could be to have students reconstruct a portion of the graph to make one of the incorrect claims correct. What would have to change visually for the claim to be correct? Additionally, there is a video tutorial about this question here: <https://www.khanacademy.org/test-prep/sat/sat-reading-writing-practice/new-sat-reading/v/reading-social-science-questions>; the relevant section begins at the 0:2:37:00 mark.

Rationale for #3:

Explanation: Choice C is the best answer. Higher bars on the graph represent longer annual commuter delays than lower bars; moreover, the number of hours of annual commuter delay generally decreases as one moves from left to right on the graph. The bar for Washington, D.C., is higher than and to the left of that for New York City, meaning that D.C. automobile commuters experience greater amounts of delay each year.

Choice A is not the best answer because the graph’s bar for New York City is higher than and to the left of that for the average for very large cities, meaning that New York City automobile commuters experience greater, not lesser, amounts of delay each year.

Choice B is not the best answer because the graph’s bar for Los Angeles is lower than and to the right of that for Washington, D.C., meaning that Los Angeles automobile commuters experience lesser, not greater, amounts of delay each year.

Choice D is not the best answer because the graph’s bar for Detroit is lower than and to the right of those for Houston, Atlanta, and Chicago, meaning that Detroit automobile commuters experience lesser, not greater, amounts of delay each year.

4. Let students know that another way students will use visual texts in the Reading Test is when they are asked to connect the information in a chart or graph to the information presented in the print text. To help students with this, ask them to return to the summaries and annotations that they did in Lesson 1 on the text about the turtles and their “GPS,” which is included in their student materials for this lesson. Students should skim back through their summaries and annotations, reminding themselves about the content of the print text, and then look carefully at the diagram. Students should try to summarize the information that the diagram is communicating. Then, ask students to consider the SAT question that follows. To help them, be sure to point out the following step-by-step explanations to help students draw connections between the graphic and the print text:
- ◆ We know from the passage that loggerhead turtle hatchlings in a specially constructed tank in Ken Lohmann’s lab will start “swimming in the opposite direction” if the direction of the magnetic field around them is reversed.
 - ◆ From the graphic and its accompanying caption, we learn, among other things, that geographic north on the diagram is represented by 0 degrees and that loggerhead hatchlings swimming in a magnetic field simulating that of a position in the East Atlantic Ocean near the Cape Verde Islands will normally move in a southwesterly direction (around 218 degrees).
 - ◆ Putting these bits of information together, we can reasonably infer that if the magnetic field affecting these “East Atlantic” turtles were reversed, the hatchlings would also reverse direction, swimming in a northeasterly direction.
 - ◆ The best answer here, then, is choice B.
5. Summarize for students the two ways that visual texts are used on the SAT: read and interpreted separately from the print text, and used in conjunction with the print text.

Pair/Group Practice | 10 minutes

1. Ask students to look closely at the chart in their student materials about global digital information and to discuss the following:
 - a. What is the title of the chart? What information is it communicating?
 - b. What are the x and y axes? What is being compared?
 - c. What are some conclusions that can be drawn only from this chart?
2. Then, ask students to discuss possible answers to Questions 18 and 19, specifically explaining why certain responses are not supported by the graph. Discuss the rationales for these, if necessary. Point out specifically that, in some cases, like in #18, there are conclusions that are probably true, but **not supported by the information from the graph**.

Rationale for #18:

Choice C is the best answer. The graph shows a steady increase in digital information created and shared in recent years, beginning with less than one zettabyte in 2005 and rising to nearly 8 zettabytes projected for 2015. Choices A, B, and D are incorrect because they do not summarize the information presented in the graph. Choices A and B provide details that, while likely true, cannot be directly inferred from the information in the graph, and choice D provides a detail from the graph but not a summary of it.

Rationale for #19:

Choice D is the best answer. The graph shows that the amount of digital information projected to be created and shared in 2012 is about 2.5 zettabytes. Since the graph shows a steady increase in the creation and sharing of digital information, and the digital information created and shared in 2011 was approximately 1.75 zettabytes, the graph shows that the 2012 projections passes the 2 zettabyte barrier for the first time. Choice A is incorrect because the graph shows the projected 2012 numbers to be part of a steady increase consistent with the 2011 and 2013E numbers. Choice B is incorrect because the graph projects the 2012 number to continue the increase started in 2005. Choice C is incorrect because the 2012 numbers are projected to continue increasing through at least 2015.

Individual Practice | 15 minutes

1. Ask students to read the excerpts from an article about bears' hibernation practices, annotating as they read.
2. Next, students should look carefully at the graph at the end of the excerpt and to consider the following:
 - a. What is the title of the graph? What information is it communicating?
 - b. What are the x and y axes? What is being compared?
 - c. What are some conclusions that can be drawn only from this graph?
 - d. What are some ways that the graph is related to the print text?
3. Then, students should try to answer Question 28, which asks for a conclusion about only the graph, and Question 27, which asks students to relate the graph to a section of the print text.
4. Discuss the rationales with students if necessary. Be sure to spend time tracing the connections between the print and visual text, as seen in Question 27.

Rationale for #28:

Choice A is the best answer because the graph shows that six of the seven bears experienced increased plasma cholesterol during hibernation; the seventh bear experienced neither an increase nor a decrease in plasma cholesterol. Choices B, C, and D are incorrect because they are not supported by the graph.

Rationale for #27:

Choice A is the best answer. The graph compares the total plasma cholesterol found in seven bears during periods of their hibernation and nonhibernation, exemplifying how that cholesterol is generally higher during the hibernating stage. Meanwhile, lines 58–62 describe the very phenomena that the graph depicts: “Recent analyses revealed that Scandinavian brown bears spend the summer with plasma cholesterol levels considered high for humans; those values then increase substantially for hibernation, Fröbert and his colleagues reported.” Choices B, C, and D are incorrect because none of the other lines in paragraph 10 discuss the comparative levels of plasma cholesterol found in bears during their hibernating and nonhibernating phases. Lines 62–64 describe how bears spend their hibernating phase. Lines 64–66 describe the poor circulation those bears experience during hibernation. Lines 67–69 explain the heart risks that may occur in humans who are overweight and inactive.

5. Ask students to evaluate their current skills by reading graphs and charts in the manner of the SAT Reading Test questions.

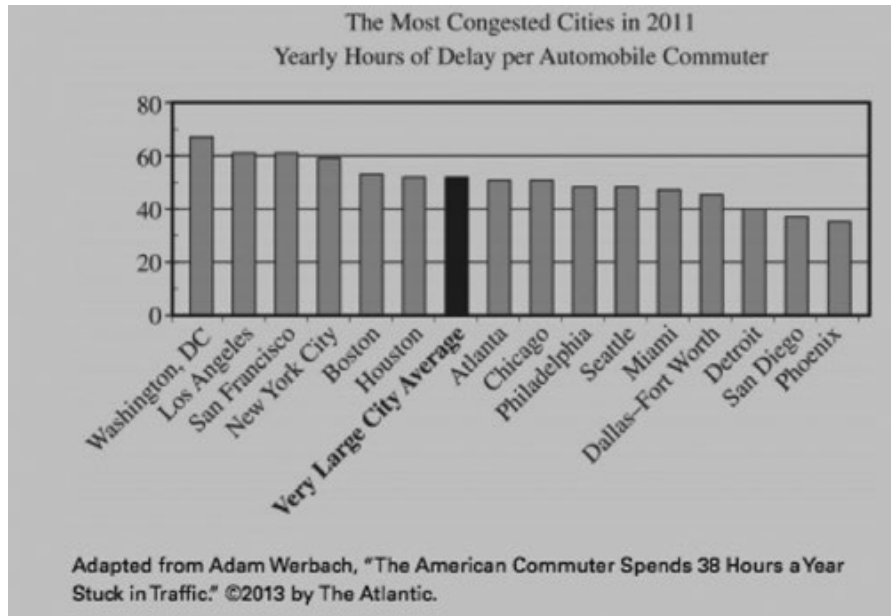
Homework | 20 minutes

- As students continue to practice Reading on Official SAT Practice on Khan Academy, they should make note of the questions that ask about quantitative texts. Not every passage contains one, but they will see at least two on the Reading Test. Students may want to practice in Reading Science or Reading Social Studies to increase the likelihood of encountering a graph during their practice.

Student Materials—Lesson 11

Introductory Activity

Chart #1



3

Which claim about traffic congestion is supported by the graph?

- A) New York City commuters spend less time annually delayed by traffic congestion than the average for very large cities.
- B) Los Angeles commuters are delayed more hours annually by traffic congestion than are commuters in Washington, D.C.
- C) Commuters in Washington, D.C., face greater delays annually due to traffic congestion than do commuters in New York City.
- D) Commuters in Detroit spend more time delayed annually by traffic congestion than do commuters in Houston, Atlanta, and Chicago.

This passage is adapted from Ed Yong, "Turtles Use the Earth's Magnetic Field as Global GPS." ©2011 by Kalmbach Publishing Co.

In 1996, a loggerhead turtle called Adelita swam across 9,000 miles from Mexico to Japan, crossing the entire Pacific on her way. Wallace J. Nichols tracked this epic journey with a satellite tag. But
Line Adelita herself had no such technology at her disposal. How did
5 she steer a route across two oceans to find her destination?

Nathan Putman has the answer. By testing hatchling turtles in a special tank, he has found that they can use the Earth's magnetic field as their own Global Positioning System (GPS). By sensing the field, they can work out both their latitude and longitude and head
10 in the right direction.

Putman works in the lab of Ken Lohmann, who has been studying the magnetic abilities of loggerheads for over 20 years. In his lab at the University of North Carolina, Lohmann places hatchlings in a large water tank surrounded by a large grid of
15 electromagnetic coils. In 1991, he found that the babies started swimming in the opposite direction if he used the coils to reverse the direction of the magnetic field around them. They could use the field as a compass to get their bearing.

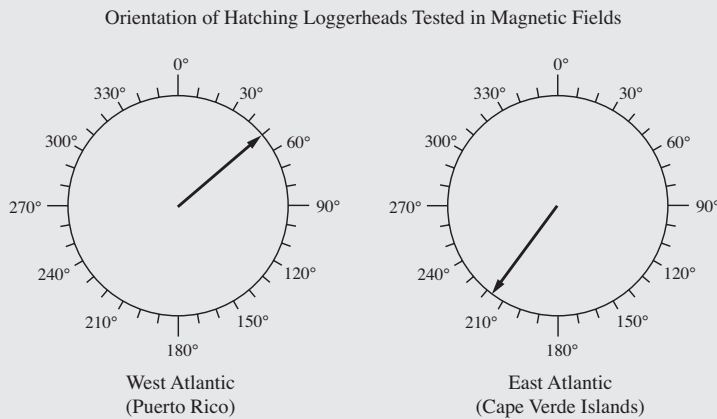
Later, Lohmann showed that they can also use the magnetic
20 field to work out their position. For them, this is literally a matter of life or death. Hatchlings born off the sea coast of Florida spend their early lives in the North Atlantic gyre, a warm current that circles between North America and Africa. If they're swept towards the cold waters outside the gyre, they die. Their magnetic
25 sense keeps them safe.

Using his coil-surrounded tank, Lohmann could mimic the magnetic field at different parts of the Earth's surface. If he simulated the field at the northern edge of the gyre, the hatchlings swam southwards. If he simulated the field at the gyre's southern
30 edge, the turtles swam west-northwest. These experiments showed that the turtles can use their magnetic sense to work out their latitude—their position on a north-south axis. Now, Putman has shown that they can also determine their longitude—their position on an east-west axis.

He tweaked his magnetic tanks to simulate the fields in two
35 positions with the same latitude at opposite ends of the Atlantic. If the field simulated the west Atlantic near Puerto Rico, the turtles swam northeast. If the field matched that on the east Atlantic near the Cape Verde Islands, the turtles swam southwest. In the wild,
40 both headings would keep them within the safe, warm embrace of the North Atlantic gyre.

Before now, we knew that several animal migrants, from loggerheads to reed warblers to sparrows, had some way of working out longitude, but no one knew how. By keeping the
45 turtles in the same conditions, with only the magnetic fields around them changing, Putman clearly showed that they can use these fields to find their way. In the wild, they might well also use other landmarks like the position of the sea, sun and stars.

Putman thinks that the turtles work out their position using two
 50 features of the Earth’s magnetic field that change over its surface.
 They can sense the field’s inclination, or the angle at which it dips
 towards the surface. At the poles, this angle is roughly 90 degrees
 and at the equator, it’s roughly zero degrees. They can also sense
 its intensity, which is strongest near the poles and weakest near
 55 the Equator. Different parts of the world have unique
 combinations of these two variables. Neither corresponds directly
 to either latitude or longitude, but together, they provide a
 “magnetic signature” that tells the turtle where it is.



Adapted from Nathan Putman, Courtney Endres, Catherine Lohmann, and Kenneth Lohmann, “Longitude Perception and Bicoordinate Magnetic Maps in Sea Turtles.” ©2011 by Elsevier Inc.

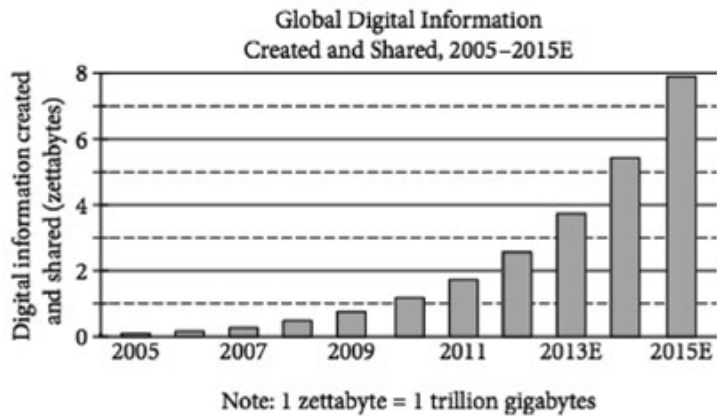
Orientation of hatchling loggerheads tested in a magnetic field that simulates a position at the west side of the Atlantic near Puerto Rico (left) and a position at the east side of the Atlantic near the Cape Verde Islands (right). The arrow in each circle indicates the mean direction that the group of hatchlings swam. Data are plotted relative to geographic north ($N = 0^\circ$).

It can reasonably be inferred from the passage and the graphic that if scientists adjusted the coils to reverse the magnetic field simulating that in the East Atlantic (Cape Verda Islands), the hatchlings would most likely swin in which direction?

- A) Northwest
- B) Northeast
- C) Southeast
- D) Southwest

Group/Pair Activity

The following graph, from a 2011 report from the International Data Corporation, projects trends in digital information use to 2015 (E = Estimated).



18

Which statement best summarizes the information presented in the graph?

- A) Far more people around the world own computers and cell phones today than in 2005.
- B) The number of people sharing digital information has more than tripled since 2005.
- C) The volume of digital information created and shared has increased tremendously in recent years.
- D) The amount of digital information created and shared is likely to be almost 8 zettabytes in 2015.

19

According to the graph, which statement is true about the amount of digital information projected to be created and shared globally in 2012?

- A) Growth in digital information creation and sharing was projected to be wildly out of proportion to growth in 2011 and 2013E.
- B) The amount of digital information created and shared was projected to begin a new upward trend.
- C) The amount of digital information created and shared was projected to peak.
- D) The amount of digital information created and shared was projected to pass 2 zettabytes for the first time.

Independent Activity

Excerpts from text:

This passage is adapted from Tina Hesman Saey, “Lessons from the Torpid.” ©2012 by Society for Science & the Public.

Understanding how hibernators, including ground squirrels, marmots and bears, survive their long winter’s naps may one day offer solutions for problems such as heart disease, osteoporosis and muscular dystrophy.

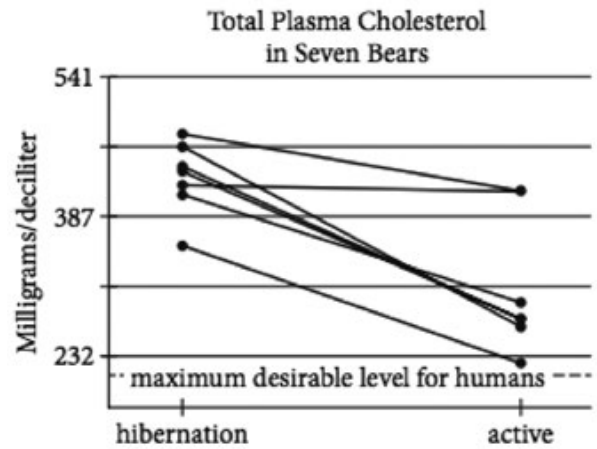
Nearly everything about the way an animal’s body works changes when it hibernates, and preparations start weeks or months in advance. The first order of business is to fallen up.

“Fat is where it’s at for a hibernator,” says Matthew Andrews, a molecular biologist at the University of Minnesota Duluth who studies 13-lined ground squirrels. “You bring your own lunch with you”. Packing lunch is necessary because the animals go on the world’s strictest diet during the winter, surviving entirely off their white fat. “They have their last supper in October; they don’t eat again until March,” Andrews says.

Recent analyses revealed that Scandinavian brown bears spend the summer with plasma cholesterol levels considered high for humans; those values then increase substantially for hibernation, Fröbert and his colleagues reported. These “very, very fat” bears with high cholesterol also get zero exercise during hibernation. Lolling about in the den pinches off blood vessels,

contributing to sluggish circulation. “That cocktail would not be advisable in humans,” Fröbert says. It’s a recipe for hardened arteries, putting people at risk for heart attacks and strokes.

Even healthy young adult humans can develop fatty streaks in their arteries that make the blood vessels less flexible, but the bears don’t build up such artery-hardening streaks. “Our bears, they had nothing,” Fröbert says. It’s not yet clear how the bears keep their arteries flexible, but Fröbert hopes to find some protective molecule that could stave off hardened arteries in humans as well.



28

Which statement about the effect of hibernation on the seven bears is best supported by the graph?

- A) Only one of the bears did not experience an appreciable change in its total plasma cholesterol level.
- B) Only one of the bears experienced a significant increase in its total plasma cholesterol level.
- C) All of the bears achieved the desirable plasma cholesterol level for humans.
- D) The bear with the lowest total plasma cholesterol level in its active state had the highest total plasma cholesterol level during hibernation.

27

What information discussed in paragraph 10 (lines 58–68) is represented by the graph?

- A) The information in lines 58–62 (“Recent ... reported”)
- B) The information in lines 62–64 (“These ... hibernation”)
- C) The information in lines 64–65 (“Lolling ... circulation”)
- D) The information in lines 67–68 (“It’s ... strokes”)