#### **OVERVIEW**

# Mapping the Unknown

## **FOCUS QUESTION**

## How do people create maps of new places?

## **About the Lesson**

#### **OBJECTIVES**

#### **Content Objectives**

- Make inferences by combining what the text says with what is already known.
- Support inferences with details from the text.
- Understand how and why maps are made.

#### Language Objectives

- Combine details from the text with what is known to make inferences, using graphic organizers.
- Justify inferences about a character with supporting details during partner discussion.
- Explain in writing how people create maps of new places.

#### ACADEMIC TALK

See **Glossary of Terms** on pp. 478–485. *inference, text evidence, supporting detail* 

#### **Spanish Cognates**

inferencia, evidencia de texto

## **Build Knowledge**

Lesson texts build knowledge about:

- How Marie Tharp created the first map of the ocean floor in 1957
- How Stephen Bishop explored and mapped Mammoth Cave in 1842
- How LiDAR technology is used to map the rainforest floor and make discoveries about ancient Mayan civilization

## **Plan Student Scaffolds**

- Use **i-Ready data** to guide grouping and choose strategic scaffolds.
- Use this **Teacher Toolbox** resource as needed to address related skills:
  - Make inferences in informational texts
- For novice English learners, it may be helpful to chunk the text in Session 3 into smaller sections for discussion within a small group. **EL**
- Preview texts and activities to anticipate barriers to engagement, access, and expression. Modify based on needs.

# Use Protocols That Meet the Needs of All Students

In order to increase engagement and validate cultural and linguistic behaviors, specific protocols are included in the lesson. To further customize activities for your students, consider optional protocols listed on pp. A46–A51.

PROTOCOL	SESSION	VALIDATES
Pick a Stick	1	spontaneity
Individual Think Time	1	independence
Somebody Who	1, 2, 4	social interaction
Stand and Share	2,4	spontaneity, multiple ways to show focus
Pass It On	3	spontaneity, connectedness
Shout Out	5	spontaneity, multiple ways to show focus
Merry-Go- Round Share	5	multiple ways to show focus, connectedness
Give One, Get One	6	movement, shared responsibility

#### LEARNING PROGRESSION | Make Inferences

#### **Students build on this skill: RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

#### Students learn this skill:

**RI.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

## Students prepare for this skill:

**RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

#### Students review and practice:

• **RI.4.4** Determine word meanings

#### **LESSON 10**

## **LESSON PLANNING GUIDE**

TEXT 1: Marie Maps the Sea • BIOGRAPHY

	SCAFFOLD		TEXT AT-A-GLANCE	ENGLISH LEARNER SUPPORT (EL)
<b>SESSION 1</b>	READING		Concepts/Background • map making • plotting a 3-D graph • theory of plate tectonics • barriers in the past to women doing ocean research	<ul> <li>Listening/Reading</li> <li>Chunk text, Explore descriptive language</li> <li>Speaking/Reading</li> <li>Rephrase questions</li> </ul>
SESSION 2	<ul> <li>PRACTICE THE FOCUS STANDARD</li> <li>Formative Assessment O</li> </ul>	<ul> <li>Language</li> <li>Vocabulary: (to) map, Midwest, revealed, data, depth, mountain range, Earth's crust, plates, centimeters</li> <li>Figurative Language: she put the graphs together like slices of bread</li> <li>Descriptive Language: (a crack) running through the mountain range, solve an old puzzle</li> </ul>	<ul> <li>Listening/Speaking</li> <li>Reinforce academic vocabulary, Leverage cognate knowledge</li> <li>Writing</li> <li>Use sentence frames</li> </ul>	

#### TEXT 2: Braving the Cave • BIOGRAPHY

<b>SESSION 3</b>	SCAFFOLD READING	Formation of the second secon	Concepts/Background <ul> <li>Mammoth Cave in Kentucky</li> <li>enslaved people</li> <li>tourist attraction</li> </ul> Language <ul> <li>Vocabulary: braving, passageway, (tour) guide, original, crystals,</li> </ul>	<ul> <li>Reading</li> <li>Explore content vocabulary, Analyze phrases</li> <li>Listening/Speaking</li> <li>Use sentence frames, Use visual support</li> </ul>
SESSION 4	PRACTICE THE FOCUS STANDARD • Formative Assessment	Vertrain and the second	<ul> <li>bottomless, explorations, eyeless, chamber, against the law, full credit, of all time</li> <li>Idioms: follow his own dreams</li> <li>Figurative Language: yawning entrance</li> </ul>	Reading <ul> <li>Use a dictionary</li> </ul> <li>Writing <ul> <li>Use sentence frames</li> </ul> </li>

#### TEXT 3: The Rainforest's Hidden Cities • TECHNOLOGY ARTICLE

SESSION 5	<section-header></section-header>	<ul> <li>Concepts/Background</li> <li>rainforests of northern Guatemala</li> <li>Mayan empire and its ruins</li> <li>LiDAR technology</li> <li>PACUNAM Foundation</li> <li>Language</li> <li>Vocabulary: pyramids, palaces, stretch (across), trace their roots, remains, technology, vegetation, detection, ranging, organization, teamed up</li> <li>Idioms: blew our minds</li> <li>Figurative Language: pyramids tell the story, covering up the past</li> </ul>	<ul> <li>Reading</li> <li>Leverage cognate knowledge, Activate prior knowledge</li> <li>Listening</li> <li>Read aloud questions and answer choices</li> <li>Writing</li> <li>Collaborate with a partner, Explore content vocabulary</li> </ul>
KN	OWLEDGE BUILDING		
SESSION 6	<ul> <li><b>RESPOND TO THE FOCUS QUESTION</b></li> <li>How do people create maps of new places?</li> </ul>	<ul> <li>Integrate information from the lesson texts</li> <li>Collaborative discussion</li> <li>Short response</li> </ul>	<ul><li>Writing</li><li>Use sentence frames, Use word bank</li></ul>

#### **Before Teaching the Lesson**

Preview the texts before teaching the lesson and plan scaffolds to use. If needed, provide the background information below to students before they read a text. Alternate means of representation are suggested below.

- Marie Maps the Sea: The Sea Floor The land at the bottom of the sea is not flat. It has high and low spots just as land above the sea does.
- Braving the Cave: Mammoth Cave Mammoth Cave in Kentucky is the longest cave system in the world. The person in this text was an enslaved man required to explore and give tours of the cave. His accomplishments helped make money for the men who enslaved him. Use a map to show Mammoth Cave's location in Kentucky.
- The Rainforest's Hidden Cities: Tropical Climate Mexico and Central America, where the ancient Maya lived, are in a tropical climate where plant life grows thickly over Mayan ruins. If possible, find photographs of Mayan ruins within the Central American rainforest.

## Talk About the Topic

#### **BUILD STUDENTS' INTEREST**

- Introduce the lesson topic and the Focus Question. Tell students that throughout the lesson, they will read, talk, and write about different kinds of maps and the people who created them.
- Have students **Pick a Stick** to share ways in which they have used maps.
- Introduce the focus standard. **Say**, *As you read*, you will use details from the text and things you already know to make inferences. Be sure to pay close attention as you read.
- Ask students to complete Notice and Wonder with a partner.
  - Allow students **Individual Think Time** before discussing with a partner. **EL**
  - Circulate to identify gaps in background knowledge to address during reading.

# Mapping the Unknown

1 FOCUS QUESTION

# How do people create maps of new places?

## **2** NOTICE AND WONDER

Look at the three texts you will read in this lesson. What do you notice? What do you wonder? Discuss your ideas with a partner.

## **3** CREATE A WORD WEB

What are some words that are related to maps? Add words to the word web below. Then, discuss your choices with a partner.





#### **3** INTRODUCE ESSENTIAL CONCEPTS

- Display a world map that has topographic features and review its basic parts. Tell students they should think about a map of the world as they work on the Create a Word Web activity.
- If needed, encourage students to brainstorm words for the activity in their home language and then look up the English translation for them in a bilingual dictionary. Have students add the words from both languages to their word webs. **EL**
- Have students complete their word web independently and then compare their word web with a partner's.
- With the whole class, create a class word web as students **Raise a Hand** to contribute words they added to their own word web.
- Invite students to brainstorm additional words for the class word web.
- Have students create entries for words in their word journals.
- Use LOOK FOR to monitor understanding. Use Help & Go scaffolds as needed.
- **LOOK FOR** Students include words naming a variety of map features in their word maps.

#### HELP & GO: Background

- Refer students back to the world map with topographic features. Ask them to point out and name the major elements of land and water.
- Then guide students to name natural parts of the map for each element (e.g., land: continents, mountains, deserts; water: oceans, rivers, lakes) as well as human-made parts (e.g., countries, cities, highways). Add them to the class word web.
- Tell students that the maps they will read about in this lesson are different from world maps, but each kind includes many different kinds of details in the same way that a world map does.

## Support Reading

**SESSION 1** 

- Set a purpose for reading. **Say,** In this session, you will read to learn how a woman named Marie Tharp created a map of the sea floor.
- Have students read paragraphs 1–6. Have them circle unknown words and mark confusing parts with a question mark.
- Support students by chunking text into paragraphs. Include comprehension checks for paragraphs 3–6. EL
- Use CHECK INs and related Help & Go scaffolds as needed to support understanding of the text. Monitor based on annotations, observation, and your knowledge of students.
- **CHECK IN** Students understand the use of *map* and *like slices of bread*.

#### HELP & GO: Vocabulary

- Call students' attention to the title and elicit that *map* can be both a noun and a verb.
- Explain that "put the graph together like slices of bread" in paragraph 6 means that Tharp was piling the graphs one atop the other.

## 2 Stop & Discuss

- Have students **Turn and Talk** to complete **Stop & Discuss** with a partner.
- Have students rephrase the **Stop & Discuss** question to ensure understanding. **EL**
- **LOOK FOR** Students understand that the questions in paragraph 3 reflect what Tharp was curious about.

#### HELP & GO: Comprehension

• Have students reread paragraph 3. **Ask**, What questions arose in Tharp's college geology class? What was under water? Was the sea floor flat? Or were there mountains and valleys? What was Tharp's reaction to these questions? She was curious. Marie Maps the Sea

- 1 Young Marie Tharp thought her dad had the best job ever. During the 1920s, he traveled around the Midwest, making maps. His maps were special—they revealed details about the soil that helped farmers know what to plant. He taught Marie to draw maps too.
- **2** In college, Marie took art, music, and math classes. She also took geology, the study of Earth's surface and how it has changed over time.
- One day, Marie's geology teacher pointed to a big map of Earth. Almost three-quarters of it was plain blue ocean.
   What was under all that water? Was the sea floor flat, like a beach? Or were there mountains and valleys, as on land? No one knew. Marie Tharp was intrigued.
- 4 After college, in 1948, Tharp got a job in New York with a group of geologists who were studying the oceans. Women weren't allowed on research ships back then, so her job was to stay in the office and keep track of data that ships sent back. One number she often recorded was how deep the water was in different places.
- 5 Tharp noticed there were huge books in the office that listed how deep the ocean was along routes where ships had sailed in the past. The numbers gave her an idea. Could she use them to make a map of the whole sea floor?
- 6 Tharp recorded the numbers as dots on a graph. When she connected the dots, each line showed the changing depth of the water. She put the graphs together, like slices of bread, and created a 3-D view of the ocean floor.

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**intrigued** = curious about

**Stop & Discuss** 

What was Tharp curious

Tharp wanted to know

more information about

about in her college

Underline details in

geology class?

the text.

**RI.4.1** 

something

SESSIO

READ



- 7 Another geologist, Bruce Heezen, collected more numbers to add to the map. Ocean scientists from other countries shared their measurements. Finally, in 1957, the first map of the ocean floor was complete.
- 8 This new map showed that the bottom of the ocean was full of mountains and valleys. A long mountain range went down the middle of the Atlantic Ocean. Running through the mountain range was another surprise—a crack, or rift, right down the center. That rift helped solve an old puzzle.
- 9 In 1912, a geologist named Alfred Wegener had suggested that the continents move. Most people laughed at or ignored his idea. But Tharp's map proved that Wegener was right. The Earth's crust is made of huge, rocky, slowmoving plates. Where the plates pull apart, magma bubbles up and hardens, forming new mountains. In other places, the plates move toward each other and crunch together.
- 10 Today, satellites can measure the continents moving—very slowly, a few centimeters a year. And Marie Tharp's map showed the way.

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Marie Tharp (*left*) looks at the map of the sea floor that she created (*right*). The circled area shows a long rift through the Atlantic Ocean.

**magma** = liquid rock deep within Earth

satellites = objects in space
that collect and send
information

#### 4 RI.4.1 Stop & Discuss

What new information did Tharp's map provide? Discuss details from the text with a partner.

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## **3** Support Reading

- Have students read paragraphs 7–10.
- **CHECK IN** Students understand phrases and terms that describe the ocean floor.

#### HELP & GO: Vocabulary

- Clarify the phrases *running through the mountain range* and *solve an old puzzle* (paragraph 8). **EL**
- Have students reread paragraph 9. Explain that Earth's crust is like the shell of a hard-boiled egg that the continents and ocean floor rest on. The crust is made of sections called plates that can move apart or toward each other over time. If possible, show students a diagram or a web animation of this process.

## 4 Stop & Discuss

- Have students **Turn and Talk** to complete **Stop & Discuss** with a partner.
- **LISTEN FOR** Students understand that Tharp's map helped prove that Alfred Wegener's idea was correct.

#### **HELP & GO:** Comprehension

- Have students reread paragraphs 8 and 9. Reinforce that Tharp's map showed mountains, valleys, and a crack in the sea floor.
- Ask, What was Alfred Wegener's idea? The continents move over time. What did Tharp's map prove? The sea floor includes giant cracks where the plates move apart from each other. This shows that Wegener's idea is correct: because the plates move, the continents move.

## **Discuss the Whole Text**

Use **Somebody Who** to have students answer the Focus Question as it relates to this text. Record responses, telling students they will revisit the question after they read other texts.

## **Reconnect to the Text**

Use **Somebody Who** to have students recall details about how Tharp mapped the sea floor.

## **1** Introduce the Standard

• Introduce making inferences. **Say,** Not all important ideas in a text are directly stated. An inference is a way to make meaning from text by combining what the text says with what you know.

**MODEL THE STANDARD** Read the text at the top of the chart, then use the chart to model making an inference.

- Point out the headings for each column on the chart. **Say,** *The first column shows what the text says. It is from paragraph 3, where there are several questions asked. The next column is where I can write what I know. I know people ask questions about things they want to know. I can combine these pieces of information to make an inference. I can infer that the questions in the text are those that Marie Tharp was wondering about as she looked at the map of Earth.*
- Have students add the sample inference to the chart.
- Assess students' familiarity with academic terms: inference, infer, map, caption, details, graph. Teach word meanings as needed. **EL**

## 2 Reread/Think

**GUIDE STANDARDS PRACTICE** Have students complete the chart for each of the given quotations from the text. Provide guidance as needed.

- Tell students to focus on one quotation at a time to complete the chart.
- Provide some guiding questions to students to help them make inferences. **Ask**, What does that detail help you know? What do you know already that can help you figure out what the text means?

2 PRACTICE - an

**RI.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

## Make Inferences

An **inference** is an idea about the text that makes sense based on details in the text and what you already know.

What the Text Says	+ What I Know	= Inference
"What was under all that water? Was the sea floor flat, like a beach? Or were there mountains and valleys, as on land? No one knew. Marie Tharp was intrigued." (paragraph 3)	Asking questions is what you do when you are trying to learn something.	The questions in the text are ones that Tharp asked herself as she looked at a map of Earth in geology class.

## 2 Reread/Think

Reread "Marie Maps the Sea." Complete the chart to make inferences.

What the Text Says	+ What I Know :	= Inference
"Young Marie Tharp thought her dad had the best job ever."	Family members can have an effect on young people.	Watching her father made Marie interested in maps.
"He taught Marie to draw maps too." (paragraph 1)		
"Women weren't allowed on research ships back then." (paragraph 4)	Some people think women can't or shouldn't do the same jobs as men.	Tharp faced challenges reaching her goals because people had unfair ideas about what women should do.

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## **3** Talk

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- Have partners complete the Talk activity.
- Explain that *to infer* is a verb that means "to come to a conclusion about something based on ideas you learn and know." Have students identify the Spanish cognate *inferir* to help support meaning. **EL**
- LISTEN FOR Students share what they already knew to make an inference. Use Help & Go scaffolds as needed.

#### **HELP & GO:** Standards Practice

• Ask, What do you already know about how some people used to think about women and work? In the past, some people thought women couldn't do some of the same jobs as men. How did your knowledge help you make an inference about why Marie Tharp couldn't go on the ship to work? Men wouldn't allow her to go on the ship because they thought women should not do that type of job.

## 4 Write

- Introduce the Write task.
- Explain to students that they should use text evidence when answering the prompt. Remind them to combine that evidence with what they know about how people we respect can impact our decisions.
- Suggest students use sentence frames to help them begin: *The text says*, and I know.
   I can infer that
   EL
- Use written responses to determine whether students need additional support.
- Invite 2–3 students to **Stand and Share** their written responses. Ask the class to **Raise a Hand** any time the speaker uses a text detail.

## Talk

Share your chart with a partner. Discuss your inferences and the background knowledge you used to support them. Take turns sharing your thinking and then make changes to your chart if needed.



I had a similar/different idea. I thought \_\_\_\_.

5555

WRITING CHECKLIST

☐ I made an inference

question.

□ I included text

I used complete sentences.

□ I used correct

spelling, punctuation,

and capitalization.

evidence.

in response to the

#### Write

Reread paragraphs 1 and 2 of the text. How did Marie Tharp's father influence her career? Use text evidence to support your response.

Sample response: I think Tharp and her father were close and

had a good relationship. The text says that Tharp thought

her dad had the best job ever. He also taught her to draw

maps. Tharp was very interested in her dad's work, and this

led her to learn and think about maps. Eventually, she used

her knowledge to map the ocean floor. All of this evidence

suggests that Tharp's father had a strong and positive influence on her career.

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## Support Reading

- Set a purpose for reading. **Say**, *In this session*, you'll read to learn about a man who explored a huge cave and mapped where he had gone.
- Clarify the meaning of *enslaved*. Explain that Bishop was forced to work without pay and had no freedom to make decisions about his life.
- Have students read paragraphs 1–4. Have them circle unknown words and mark confusing parts with a question mark.
- Use CHECK INs and related Help & Go scaffolds as needed.
- **CHECK IN** Students understand the use of *yawning entrance, guide,* and *brave.*

#### HELP & GO: Vocabulary

- Clarify the figurative language of *yawning entrance* (paragraph 1) by showing how a yawn is similar to a cave entrance.
- Have students write sentences using the word *guide* from paragraph 2. **EL**
- Explain how "braving" in the title hints that the cave might be scary or hard to be in.

## 2 Stop & Discuss

- Have students **Turn and Talk** to complete **Stop & Discuss** with a partner.
- **LOOK FOR** Students realize that Bishop was forced to become a guide by his enslaver. Then he continued to explore.

#### **HELP & GO:** Comprehension

- Provide sentence starters: *Bishop first went into the cave because* \_\_\_\_. **EL**
- Have students reread paragraph 2. **Ask**, *Why did* Gorin buy Mammoth Cave? to make it a tourist attraction Why did Bishop go into the cave? Gorin forced Bishop to be a cave guide.
- Reread paragraph 4. **Ask**, *Why do you think Bishop returned to the cave?*



- 1 One evening in the mid-1800s, enslaved 17-year-old Stephen Bishop entered the yawning entrance to Kentucky's Mammoth Cave to begin his night's work. He lit his kerosene lantern, raised it high, squeezed through a narrow passageway, and disappeared into darkness.
- 2 Bishop first entered Mammoth Cave in 1838 as an enslaved Black teenager. Frank Gorin, Bishop's enslaver, had purchased the cave to make it a tourist attraction. Gorin made Bishop work as a cave guide.
- 3 Bishop knew little about caves, but this changed as he began to explore them. It wasn't long before he knew the eight miles of the original cave routes. Soon, he began giving tours. Unlike white tour guides, however, Bishop wasn't paid for his work. Enslaved people were forced to do hard jobs every day without pay.
- 4 With only a lantern and a rope, Bishop spent many hours in Mammoth Cave. During his tours, he often spotted trails off the main routes. Later, he would explore beyond the known trails. He climbed up slick walls and high **domes** and down into deep pits. He saw rocks that looked like icicles growing down from the cave ceilings and up from the cave floor. He also discovered cave rooms filled with sparkling crystals shaped like roses.

spurking erystuis shuped like re

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both things.

Stephen Bishop as a

**domes** = rounded shapes

Stop & Discuss

Why did Bishop first

enter and then keep

Underline details in paragraphs 2 and 3 that

tell why Bishop did

returning to Mammoth

**RI.4.1** 

young man.

2

Cave?

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SESSION 3



- 5 The Bottomless Pit, however, was one part of the cave that Bishop had not explored beyond. The pit was so wide and deep that no one had ever dared to cross it—until one day a visitor challenged Bishop to cross over the pit with him.
- 6 After placing a long, shaky ladder across the pit, Bishop carried a lantern between his teeth as he and the man made the journey to the other side. They entered a part of the cave that no one had ever seen.
- 7 Bishop returned again and again to this part of the cave. He discovered new creatures hiding in the walls and swimming in underground rivers. Bishop was becoming known for his explorations and findings. It was because of him that scientists traveled from all over the world to see animals they had never known existed. There, they saw eyeless cave fish and different kinds of bats.
- Bishop discovered many miles of new passageways, domes, pits, and caverns. He gave his discoveries names like Snowball Room, Haunted Chamber, Giant's Coffin, and Gothic Avenue. These interesting names helped him remember details about each place.

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#### caverns = large caves

**Gothic** = a style of building known for extremely high walls and pointed ceilings

#### Stop & Discuss

RI.4.1

4

What happened as a result of Bishop crossing the Bottomless Pit?

Discuss with a partner what happened because Bishop crossed the pit.

When Bishop crossed the pit, \_\_\_.

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## **3** Support Reading

- Have students read paragraphs 5–8.
- **CHECK IN** Students understand *bottomless* and *eyeless*.

#### **HELP & GO:** Vocabulary

- Use the **Word Learning Routine** to provide the meaning of *-less* (without) and guide students to use it to determine the meaning of *bottomless* (paragraph 5) and *eyeless* (paragraph 7).
- Show students photographs of bottomless pits and eyeless cave fish to reinforce the words *bottomless* and *eyeless*. **EL**
- **CHECK IN** Students understand what Bishop found in various parts of the cave.

#### **HELP & GO:** Comprehension

- Draw students' attention to paragraphs 5 and 6. Ask, Where did Bishop discover new creatures in the cave? on the other side of the Bottomless Pit
- Refer students to paragraph 8. **Ask**, *Why did Bishop give names to some parts of the caves? The names helped him remember details about those places.*

## 4 Stop & Discuss

- Have students **Turn and Talk** to complete the **Stop & Discuss** with a partner.
- **LISTEN FOR** Students understand that no one was known to have crossed the Bottomless Pit or seen the creatures on the other side.

#### **HELP & GO:** Comprehension

- Have students reread paragraphs 5–7. **Ask**, *What* was the Bottomless Pit like? It was very wide and deep, and no one was known to have crossed it before.
- Ask, What happened after Bishop crossed the pit? He found new creatures that scientists did not know about.

## **5** Support Reading

- Have students read paragraphs 9–11.
- CHECK IN Students understand against the law, given full credit, and of all time.

#### HELP & GO: Vocabulary

- Ask students to share what they know about the phrases *against the law* (paragraph 9), *given full credit* (paragraph 10), and *of all time* (paragraph 11). Provide support as needed. **EL**
- After students read paragraph 9, discuss how remarkable Bishop's memory must have been for him to remember all the places in the cave.

## 6 Stop & Discuss

- Have students complete **Stop & Discuss** with a partner.
- **LISTEN FOR** Students recognize that enslaved people were rarely credited for their accomplishments.

#### HELP & GO: Comprehension

• Have students reread paragraphs 9 and 10. **Ask**, Why was it unusual for Bishop's map to be published in a book with his name? It was against the law for enslaved people to read and write. Enslavers did not usually give credit to people who were enslaved.

## **Discuss the Whole Text**

- Use **Compare and Connect** to revisit the Focus Question using examples from the text. Have students use **Pass It On** to share their responses.
- Display responses along with those recorded for "Marie Maps the Sea."
- Use **3-2-1** to ask students to tell 3 ways that Tharp and Bishop are similar, 2 ways that they are different, and 1 thing they liked about one of the maps.



**update =** add new information to

**accomplishments =** great actions



Why was it unusual for Bishop to get credit for mapping the cave? Discuss with a partner what was unusual about Bishop receiving credit. 9 After only a year of owning Mammoth Cave, Gorin sold the cave—and Bishop—to John Croghan. Because of Bishop's knowledge and the discoveries he had made, in 1842 Croghan told to him to update the map of the cave. He spent two weeks sketching the map without using any notes or drawings. Someone else wrote in the names of Bishop's findings. It was against the law for enslaved people to read and write.

10 Copies of the map were made available at the cave, and the map was later published in a book. Bishop was given full credit for his accomplishments, which was unusual for an enslaved person to receive.

11 Stephen Bishop is known as Mammoth's greatest cave explorer of all time. While this is amazing, it is still important to remember that, as an enslaved person, Bishop had no choice but to work in that cave. Imagine the exciting things Bishop might have done if he was free to follow his own dreams.





#### PRACTICE THE FOCUS STANDARD



**RI.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

LESSON 10

## Make Inferences

When explaining or writing about an inference, use text details to support the inference. This provides evidence to back up your ideas.

Inference	Supporting Detail
Mammoth Cave includes long, narrow tunnels.	(paragraph 1) "squeezed through a narrow passageway, and disappeared into darkness."
	(paragraph 3) "It wasn't long before he knew the eight miles of the original cave routes."

#### 2 Reread/Think

Reread "Braving the Cave." Complete the chart by supporting the inferences with details from the text.

Inference	Supporting Detail
Bishop wanted to discover	(paragraphs 4 and 7)
new things.	"During his tours, he often spotted trails off the main routes. Later, he would explore beyond the known trails."
	"Bishop returned again and again to this part of the cave."
Bishop had a detailed memory of the cave.	(paragraph 9) "He spent two weeks sketching the map without using any notes or drawings."

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## **Reconnect to the Text**

Use **Somebody Who** to have a student summarize "Braving the Cave."

## Practice the Standard

- Read the information at the top of the student page.
- Have a few students **Stand and Share** their explanation of how to make an inference.

**MODEL THE STANDARD** Read the first inference on the student page and model how to use evidence to support an inference.

• Say, I usually think of a cave as a big opening like a room in a hill or cliff, but it seems like Mammoth Cave was much bigger. Paragraph 1 says Bishop "squeezed through a narrow passageway, and disappeared into darkness." Paragraph 3 says, "It wasn't long before he knew the eight miles of the original cave routes." These details show that the opening was narrow and there were very long tunnels underground.

## 2 Reread/Think

**GUIDE STANDARDS PRACTICE** Have students work in pairs to find at least one supporting detail for each inference in the chart.

• Have students use sticky notes to flag any words they have trouble with. Allow them to use a bilingual dictionary to find the meanings. **EL** 

## Talk

- Have partners Turn and Talk to complete the Talk activity.
- Have students compare the details in their charts and give reasons why they chose the text evidence they did. Have them make any changes they feel are necessary after talking with their partner.
- Have partners discuss other inferences they can make about Bishop. Then have students find details in the text that support their inferences. Suggest they use the sentence starters to practice quoting from the text aloud.

## Write

- Have students work independently to complete the Write activity using the checklist.
- Suggest that students use the sentence starters in Talk to help them begin to write. EL
- LOOK FOR Students support inferences with details from the text.

#### HELP & GO: Writing

- Have students check to see that they have provided at least one detail for each inference they make in their writing.
- Remind students to use their chart after writing to be sure they've included all of the important information needed to make an inference.
- Ask 2–3 students to Stand and Share their written responses.
- Use written responses to determine whether students need additional support.



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# The Rainforest's Hidden Cities

by Kathryn Hulick

READ

SESSION

- 1 The rainforests of northern Guatemala hide a secret: ruins of ancient cities stretch across the forest floor. Pyramids, palaces, and roads built more than a thousand years ago tell the story of a large empire that once spread throughout Central America and Mexico. Some of the largest buildings rise above the trees. But thick forest has grown over other parts, covering up much of the past.
- 2 Today, about six million people trace their roots back to the Maya, the people who built these structures. Yet no one knows for sure why their empire didn't last. Was it disease? War? Archaeologists—scientists who study ancient buildings, tools, and other objects to understand past human life—have been trying for years to figure out what happened. The remains of these cities may give clues. But searching for ruins in a rainforest is slow, difficult work. Luckily, a special technology now allows scientists to take a closer look into areas with heavy vegetation, while also avoiding poisonous snakes, swarms of bees, and hot, moist air.

Some Mayan ruins are tall enough to rise above the rainforests of Central America and Mexico.

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ruins = what remains after something has fallen apart

LESSON 10

empire = kingdom

## **Reconnect to the Texts**

Display responses to the Focus Question for "Marie Maps the Sea" and "Braving the Cave." Invite students to make connections between the two texts.

## Independent Reading

- Set a purpose for learning. **Say,** *Today you will* work independently to read a text and learn how researchers are mapping an ancient civilization. Then you will answer questions that involve making inferences and finding text details.
- If students need more support, work with them in small groups to guide reading.
- Use CHECK INs and related Help & Go scaffolds as needed.
- **CHECK IN** Students understand *ruins, technology, vegetation, pyramids, palaces,* and *trace their roots.*

#### HELP & GO: Vocabulary

- Have students identify cognates for *ruins (ruinas;* paragraph 1) and *technology (technología;* paragraph 2) to understand meaning. **EL**
- Help students look around the word to understand *vegetation* (paragraph 2). Point to *thick forest* and *grown over* (paragraph 1) and give them the root word *vegetable*.
- Show photos of ancient *pyramids* and *palaces* (paragraph 1) and discuss their size.
- Clarify *trace their roots* (paragraph 2) by explaining that *roots* means "where you are from."
- **CHECK IN** Students understand that a rainforest is packed with plant and animal life.

#### HELP & GO: Background

• Show students a map of Mexico and Central America. Have them locate Guatemala. **Say,** For thousands of years, the Mayan people lived in large, complex cities. Although descendants of the Maya still live in the area, people left the ancient cities long ago.

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## Independent Reading

2 • CHECK IN Students understand *teamed up* and *blew our minds* in paragraph 4.

#### HELP & GO: Vocabulary

- Clarify the phrase *teamed up* in paragraph 4 by breaking down how a *team* is a group of people supporting a similar goal or cause.
- To help elaborate on the meaning of *teamed up*, ask students to share if they have ever worked together with friends or family to do something. Break the phrase by discussing what the noun *team* is and what it does. **EL**
- Draw students' attention to the phrase blew our minds in paragraph 4. Elicit that this is an expression of surprise. **Ask**, What were the researchers surprised by? They expected that LiDAR would help them find Mayan structures, but they didn't expect to find more than 61,000 of them.
- **CHECK IN** Students understand how LiDAR can help researchers even when the forest is thinner.

#### **HELP & GO:** Comprehension

- Have students reread paragraph 3. **Ask**, *How does LiDAR technology work? LiDAR shows important details, such as the shapes of buildings.*
- **CHECK IN** Students understand paragraph 4, sentence 1.

#### **HELP & GO:** Sentence Comprehension

- Help students unpack sentence 1 of paragraph 4. Explain that sometimes in an effort to provide as much information as possible in a clear and organized way, authors add smaller nuggets of information, or clauses, in sentences.
  - ---The first part of the sentence tells about the "when" (2015).
  - -The second part tells the "who" (PACUNAM).
  - The third part describes what PACUNAM does (preserves Mayan culture).
  - The last part tells what PACUNAM did (teamed up with a group of archaeologists).







LiDAR technology sees through the thick rainforest (*above*) to create a map of the structures that stand within it (*below*).

preserves = takes action to
protect something

scale = size



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The technology is called LiDAR. The letters stand for "Light Detection And Ranging." A helicopter flies over the forest while LiDAR equipment attached to the bottom of the helicopter shoots quick, powerful rays of light at the ground. These laser beams are narrow enough to pass through openings between branches and leaves. They hit the ground and then bounce back. The LiDAR equipment measures the distance the beams travel. When many measurements are put together, they show the shape of the ground and any buildings on it. The result is a 3-D map of the forest floor.

- 4 In 2015, the PACUNAM Foundation, a Guatemalan organization that preserves Mayan culture, teamed up with a group of archaeologists. They began using LiDAR to map the forest floor. By 2018, they had mapped more than 61,000 structures. "The scale of [the ruins] really blew our minds," said archaeologist Thomas Garrison.
- 5 Even when the forest isn't very thick, LiDAR maps make important details easier to see. In 2019, archaeologist Takeshi Inomata was studying a LiDAR map of part of Mexico. It showed 27 large shapes. From the ground, the shapes had seemed like part of the natural landscape. But the LiDAR map showed that they were flat, rectangular structures. They must have been built by humans. Researchers think the early Maya probably used these low platforms for special events and celebrations.
- 6 LiDAR has made mapping ancient ruins easier and faster than ever before. Each newly mapped site helps researchers learn more about the mystery of the Maya.

SESSION PRACTICE

**RI.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

#### LESSON 10

## **Respond to Text**

#### Reread/Think

Reread "The Rainforest's Hidden Cities." Choose the best response to each question.

#### 1. PART A

According to paragraph 2, why is searching for ruins in a rainforest "slow, difficult work"?

- **A.** It takes years to collect the equipment needed for a search.
- **(B.)** The region is difficult to explore.
- C. Archaeologists must make a map of the area.
- **D.** The Maya buried structures deep inside the thick forest.

#### PART B

Which key detail from the text **best** supports your answer in Part A?

- A. "... the Maya, the people who built these structures."
- B. "Yet no one knows for sure why their empire didn't last."
- C. "The remains of these cities may give clues."
- (D.) "... poisonous snakes, swarms of bees, and hot, moist air."
- 2. Which phrase helps you know what *laser beams* means in paragraph 3?
  - A. "attached to the bottom of the helicopter"
  - (B.) "quick, powerful rays of light"
  - **C.** "narrow enough to pass through openings"
  - D. "the shape of the ground"

• Have students complete the Reread/Think items

3 Reread/Think

- independently.
- Consider reading aloud questions and answer choices. EL
- Point out that item 1 has two parts. Students should answer Part A first. Then they should answer Part B.

## **Answer Analysis**

After students complete the independent practice, review each item and have students **Shout Out** their responses. Use the answer analysis below to clarify ideas.

 PART A The correct choice is B. Details toward the end of paragraph 2 describe some of the challenging conditions people face in the rainforest. Choices A and C are likely true, but paragraph 2 mentions neither issue. Choice D is false because the rainforest grew over the remnants of the Mayan civilization.

**PART B** The correct choice is **D**. This is the best choice because it lists examples of challenges faced by people who search for ruins in the rainforest. Choices **A**, **B**, and **C** provide no such examples. **DOK1** | **RI.4.1** 

The correct choice is B. The phrase quick, powerful rays of light is the one referred to by "these laser beams" in the text (paragraph 3). Choices A, C, and D do not provide any context that helps readers understand laser beams. DOK 2 | RI.4.4

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## Answer Analysis

- The correct choice is A. It explains why the groups teamed up. Choice B is incorrect because the groups wanted to search for human-made structures. Choice C could be true, but the text does not confirm this. Choice D misreads the text; the ancient Maya, not the modern teams, held special events. DOK 2 | RI.4.1
- The correct choice is C. It is the only choice that describes an idea in paragraph 5. Choices A, B, and D are inaccurate. DOK 2 | RI.4.1

## **5** Write

- Have students respond independently to the Write prompt. **DOK 3** | **RI.4.1**
- Have students work with a partner to identify the text evidence before writing. **EL**
- **LOOK FOR** Students quote from paragraph 4 to support the inference that researchers were surprised to find so many structures.

#### HELP & GO: Writing

- Help students make an inference to answer the Write question. Then **ask**, What details in the text support this inference?
- Remind students that *LiDAR* is an abbreviation for "Light Detection and Ranging." **EL**

## Lesson Wrap-Up

Have students use **Compare and Connect** to revisit the Focus Question using examples from the text. Record responses and display them along with those recorded for the other texts in the lesson. Invite students to take part in **Merry-Go-Round Share** to make connections between the three texts.

## 5 PRACTICE

ESSIO

#### 4 Reread/Think

- **3.** Why did the PACUNAM Foundation and a group of archaeologists work together to map the forest floor?
  - (A) Locating Mayan ruins benefited both groups, helping one to preserve the ruins and the other to study it.
  - B. Both groups wanted to explore the natural landscape of the rainforest.
  - **C.** One team mapped half of the structures they found, while the other team mapped the other half.
  - **D.** Neither group wanted special events to celebrate the work they did.
- 4. Which statement describes an idea from paragraph 5?
  - **A.** An archaeologist studied a LiDAR map to prove that 27 shapes in the forest were natural parts of the landscape.
  - **B.** The 27 large structures discovered on a LiDAR map proved that the forest was easy to travel through.
  - C. A LiDAR map showed that 27 structures on the ground were probably platforms for Mayan events.
  - **D.** The forest was not very thick, so a LiDAR map was easily able to show 27 large shapes.

#### 5 Write

Why were the LiDAR discoveries surprising? Use two details from the text in your response.

Sample response: Finding "more than 61,000 structures" was

a surprise to researchers because, as the text states, when

they first set out to map the forest floor, they expected LiDAR

to find only "some ruins." Researchers knew that locating

ruins in a rainforest was "slow, difficult work" and that ruins

were almost "impossible to see from the ground." Finding so

many was an unexpected surprise.

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WRITING CHECKLIST

introduction and a

☐ I included details

from the text.

I used complete

sentences.

concluding sentence.

I answered the

question.

☐ I provided an

5555

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#### PUT IT TOGETHER

LESSON 10

## **Respond to the Focus Question**

How do people create maps of new places?

#### 1 Reread/Think

SESSIO

Choose one text from this lesson to reread.

TEXT: "Marie Maps the Sea"

What did you learn from your text about how people create maps?

Sample response: In "Marie Maps the Sea," Tharp made a graph showing different

sea depths and then put those graphs together to create a 3-D map.

#### Talk

In a small group, first share your responses from Reread/Think.

#### WHAT WE LEARNED

Next, as a group, discuss how you would respond to this question:

How do people create maps of new places?



#### 3 Write

Think about how people create maps for new places. What would you do to create a map for your neighborhood or your school?

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## Respond to the Focus Question

Read the Focus Question. Tell students that today they will answer the question using information from all three texts.

## 1 Reread/Think

- Have students choose their favorite text from this lesson. Have them reread and record what they learned from that text about how people create maps.
- Use Help & Go scaffolds as needed.
- **LOOK FOR** Students identify examples of ways in which people create maps.

#### **HELP & GO:** Comprehension

• Guide students to review each text to find details about the maps created: "Marie Maps the Sea" (paragraphs 5–7), "Braving the Cave" (paragraphs 8 and 9), and "The Rainforest's Hidden Cities" (paragraph 3).

## 2 Talk

Have students complete the Talk activities. Use **Give One**, **Get One** to guide a class discussion.

## **3** Write

- Have students respond independently to the prompt.
- Have students use the Talk sentence frames to start writing. **EL**
- **LOOK FOR** Student responses include an introduction and information from all three texts.

#### HELP & GO: Writing

- Provide a word bank for writing: map, depth, ocean, caves, sketched, ruins, mapped. EL
- Create a checklist for content (introduction, details, conclusion) and conventions (spelling, punctuation, capitalization, grammar).