

In This Guide

This guide contains language arts and science or social studies lessons for articles in this issue of EXPLORER PIONEER.

Explorer Magazine

EXPLORER classroom magazines are written for each grade, 2-5. Through great storytelling and stunning photographs, the magazines develop literacy skills and teach standards-based content aligned with the Common Core State Standards (CCSS), Next Generation Science Standards (NGSS), or National Council for the Social Studies (NCSS). The activity on the magazine's back cover is tailored to the NG Learning Framework (see page 2).

EXPLORER magazines offer engaging reading opportunities for students with different ability levels in the same class. All articles have been measured using the Lexile® Framework for Reading. Articles in EXPLORER PIONEER will be within the 250-550L range.

For additional resources to extend your students' learning, visit EXPLORER's website, natgeo.org/explorermag-resources.



Your Subscription Includes:

- Magazines • Classroom Posters • Projectables
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INTRODUCTION

BACKGROUND

Since 1888, the National Geographic Society has funded scientists and explorers and shared their findings with the world. To support educators who use our resources, we have created a Learning Framework, which lays out what we believe students should learn from their experiences with the Society.

PURPOSE

The Learning Framework was designed to convey the Society's core beliefs and values. It is built around a set of attitudes, skills, and knowledge that embody the explorer mindset.

To determine the learning outcomes within the Learning Framework, we dug deep into national standards in key subject areas. We also sought advice from subject matter and child development experts, along with the combined expertise of NG instructional designers, researchers, and content developers. To learn more, go to: <https://www.nationalgeographic.org/education/learningframework/>.

IMPLEMENTATION

Each article in this magazine has a knowledge-based link to the Learning Framework. Students will use the skills and attitudes as they do the activity on the back cover. The activity relates to the article "In Search of the Lost City."

MINDSET OF AN EXPLORER

KEY FOCUS AREAS



Attitudes

National Geographic kids are:

CURIOS about how the world works, seeking out new and challenging experiences throughout their lives.

RESPONSIBLE, with concern for the welfare of other people, cultural resources, and the natural world. NG kids are respectful, considering multiple perspectives, and honoring others regardless of differences.

EMPOWERED to make a difference. NG kids act on curiosity, respect, and responsibility. They are adventurous and persist in the face of challenges.



Skills

National Geographic kids can:

OBSERVE and document the world around them and make sense of those observations.

COMMUNICATE experiences and ideas effectively through language and media. They are storytellers!

COLLABORATE with others to achieve goals.

SOLVE PROBLEMS by generating, evaluating, and implementing solutions after identifying alternatives, weighing trade-offs, and making well-reasoned decisions.



Knowledge

National Geographic kids understand:

THE HUMAN JOURNEY is all about where we have been, where we live now (and why), and where we are going.

OUR CHANGING PLANET encompasses all that coexists on our planet—interconnected through systems that generate and nurture each other.

WILDLIFE AND WILD PLACES inhabit our planet—from the butterflies in our backyards to the lions in Africa.

Standard Supported

- Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text. (CCSS.RI.2.2)

Resources

- Vocabulary Assessment Master (page 7)
- Language Arts Assessment Master (page 8)

Summary

- The article "Sailing With the Blue Fleet" introduces readers to a variety of creatures known as the "Blue Fleet" that spend their entire lives drifting on the surface of the ocean.

BUILD VOCABULARY AND CONCEPTS

- **polyp**
- **tentacle**

Display the vocabulary words on a word wall or on a whiteboard. Inform students that when they read they will encounter words they don't know. Remind them that using context clues such as the sentences before or after an unknown word and visuals such as photographs or illustrations can help them figure out what an unfamiliar word means.

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to record each vocabulary word from the article. Then divide the class into small groups. Have groups scan the article to locate each bold word in the text. Instruct them to find and record text and visual clues in the article related to each vocabulary word. Challenge each student record his or her own idea about what each word means.

Invite volunteers to read aloud the definitions from the Wordwise feature on page 9 of their student magazines. Have students record the definitions on their worksheets. As a class, compare the definitions students wrote with the definitions from the text.

READ

Give students a few minutes to scan the article in their magazines. **Then ask:** *What do you think this article is about? Why?* Encourage students to share their ideas.

Explain to students that what they just attempted to identify was the main idea or overall topic of the article. Everything in the article is connected to the main idea. Point out that paragraphs have a main idea, too. Everything in a paragraph is connected to its main idea.

Display pages 2-3 of the projectable magazine. Model how to identify the main idea of the article. **Say:** *When I look at these pages, the first thing I notice is the photo. I see a strange-looking animal floating on top of the water. But then I see the headline, "Sailing With the Blue Fleet." I wonder what that means?*

Explain to students that the headline and photo are often great clues that can help readers figure out what an article is about. **Say:** *But sometimes clues that aren't so obvious are even more helpful, particularly if you aren't sure what something in the headline—like Blue Fleet—means. Zoom in on the deck and read it aloud. Say: Now I know what this article is about. It is going to explain how animals like the one in the photograph survive as they spend their entire lives drifting on the open sea.*

Have students read the article in small groups. As they read, encourage student to search for details that support the main idea of the article.

The Blue Fleet

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about the "Blue Fleet." **Ask:** *What is the "Blue Fleet?"* (animals that live their entire lives drifting on the open sea) *What makes some "Blue Fleet" animals move?* (wind and waves) *Which "Blue Fleet" animal can move on its own?* (blue dragon sea slug) Invite students to share what else they learned about the "Blue Fleet."

- **Strengthen Understanding** Inform students that combining what you already know with what you learn can help readers understand new words. **Say:** *Once you understand what a word means, it's easier to use it correctly in a sentence.* Challenge students to make accurate statements using each of the vocabulary words. Encourage them to use their **Vocabulary Assessment Masters** as a resource. Remind students to be original. They shouldn't restate sentences from the article. They should create new sentences of their own.

- **Identify Main Ideas** Remind students that the article has a main idea. (Some animals, known as the "Blue Fleet," spend their entire lives drifting on the open sea.) But paragraphs have main ideas, too. Explain that they can find the main idea of a paragraph the same way they found the main idea of the article. They must search for important clues. Give each student a copy of the **Language Arts Assessment Master**. Instruct students to write the main idea of the article in the middle circle. Then have them select four paragraphs in the article. Challenge them to write the main idea of each. Encourage students to turn and talk to analyze and compare results. Challenge them to recognize how the main idea of each paragraph ultimately supports the main idea of the text.

WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *How does the wind help some "Blue Fleet" animals survive?*
- *Do you think the "Blue Fleet" is a good name for this group of animals? Why or why not?*
- *What surprised you about what you read?*

The Blue Fleet

SCIENCE

Standard Supported

- There are many different kinds of living things in an area, and they exist in different places on land and in water. (NGSS.2-LS4-1)

Resources

- Content Assessment Master (page 9)
- Comprehension Check (page 10)

Science Background

Many animals live in the ocean. Some thrive in the shallows and others flourish in the deepest seas. A few spend their entire lives on the surface of Earth's warmer oceans. They live in the pleustal zone, the thin space between seawater and air. These animals are known as the "Blue Fleet."

The "Blue Fleet," a name coined by British marine biologist Sir Alister Hardy, is an assortment of strange creatures. As the name suggests, many of these animals are blue. And sometimes, fueled by wind and ocean currents, they are pushed together into large groups.

Some members of the "Blue Fleet" are not singular creatures but colonies of smaller animals. Good examples are the blue button jellyfish and the Portuguese man-of-war. Both are groups of smaller animals that live together but could not survive on their own.

Most "Blue Fleet" members are immobile. They just drift on the water. But each has found a way to get food and defend itself. The blue button jellyfish, Portuguese man-of-war, and by-the-wind sailor all have stinging tentacles. So does the blue dragon sea slug. But the poison in this mobile creature's tentacles comes from the man-of-war, which it eats.

The violet sea snail doesn't have tentacles. It has color. Its shell is dark on the bottom and lighter on top. This helps the snail blend in and hide from predators searching for prey above and below.

ENGAGE

Tap Prior Knowledge

Invite students to imagine that they are tiny animals living on the surface of the sea. They can float, but they can't move by themselves. They can eat, but they can't pursue food. And since they're always on top of the water, there is no place they can go to hide from predators. Brainstorm ideas about how a simple animal like this could survive.

EXPLORE

Preview the Lesson

Display pages 2-3 of the projectable magazine. Read aloud the headline and deck. Then invite students to examine the photo. **Say:** *According to the text, this animal drifts on the open sea.* **Ask:** *Why do you think that is? (It can't move on its own.) What do you think causes it to drift? (wind and water currents) Look at the animal's body. Which part do you think helps the animal drift? (The thin part at the top.) Why? (Possible response: When the wind blows on the part, it makes the animal move—just like a boat sail.)* Have students examine the long, thin parts hanging from the bottom of the animal's body. Brainstorm ideas about what those parts do. Tell students that they will learn more about this creature and other members of a group called the "Blue Fleet" as they read the article.

Set a Purpose and Read

Have students read the article in order to understand what the "Blue Fleet" is, recognize that some members of the "Blue Fleet" live in groups, and compare and contrast "Blue Fleet" creatures.

EXPLAIN

Understanding the "Blue Fleet"

Display page 4 of the projectable magazine. Read aloud the last paragraph. **Ask:** *Where do "Blue Fleet" animals live?* (where seawater meets air) Have students examine the photos in their student magazines to note the water line in as many photos as possible. Point out that this is the ocean's surface. **Ask:** *How did they get their name?* (Many of them are blue.) Have students look at the photos again to note the blue coloring on each animal. As a class, scan the article to find more facts about the "Blue Fleet." Invite students to share what they learned with the class.

Recognizing "Blue Fleet" Groups

Display page 5 of the projectable magazine. **Say:** *The Portuguese-man-of-war might look like one animal, but it's actually a group of tiny animals that live together.* As a class, review the diagram and the section "To Battle!" Identify each animal that is part of a man-of-war. Guide the class to understand that none of these animals could survive on its own. **Ask:** *What other "Blue Fleet" animals are actually groups of animals living together?* (blue button jellyfish and by-the wind sailor) Discuss how living as a group helps these "Blue Fleet" creatures survive.

Comparing and Contrasting the "Blue Fleet"

Display pages 4-5 of the projectable magazine. Invite volunteers to describe the blue button jellyfish and the Portuguese man-of-war. Remind students that the "Blue Fleet" got its name because many of the animals in this group are blue. **Say:** *Both of these animals have blue parts. Other than that, they look very different. But that doesn't mean they aren't alike in other ways.* As a class, review the text to compare and contrast these two "Blue Fleet" animals. Then divide the class into pairs. Give each student a copy of the **Content Assessment Master**. Tell partners to select two animals from the article and draw a picture of each. Then have them make a list of ways the animals are alike and different.

ELABORATE

Find Out More

Display page 6 of the projectable magazine. As a class, review the feature about the by-the-wind sailor. Discuss reasons why this fact is "Weird but True." Then divide the class into small groups. Instruct groups to conduct research to identify other "Weird but True" facts about the animals in the article. Whenever possible, challenge them to find a photo that illustrates the fact they uncovered. Invite groups to share what they learned with the class.

Extend Your Thinking About the "Blue Fleet"

Remind the class that several members of the "Blue Fleet" are actually groups of animals that live together in order to survive. As a class, discuss what would happen to animals like these if one organism in the colony disappeared. Then discuss what would happen to the "Blue Fleet" as a whole, given that some members eat others to survive.

EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *Which "Blue Fleet" members are actually groups of animals that live together?* (blue button jellyfish, Portuguese man-of-war, and by-the wind sailor)
- *What does a violet sea snail do so it can float?* (It builds a life raft.)
- *Which "Blue Fleet" animals have tentacles?* (blue button jellyfish, Portuguese man-of-war, and by-the wind sailor)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

Name _____

Date _____

VOCABULARY ASSESSMENT: Sailing With the Blue Fleet

Record information from the article about each vocabulary word.

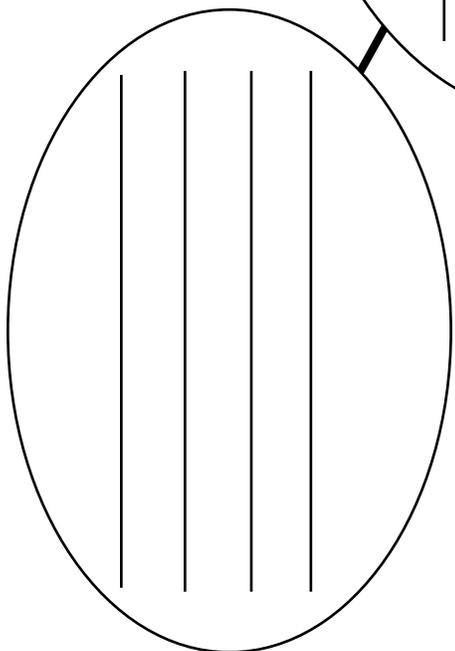
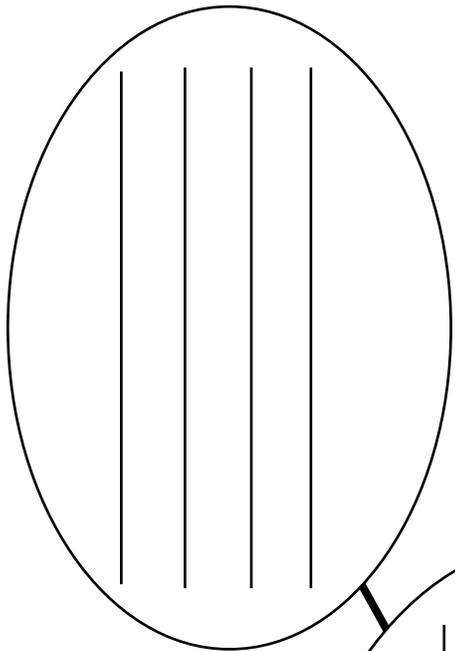
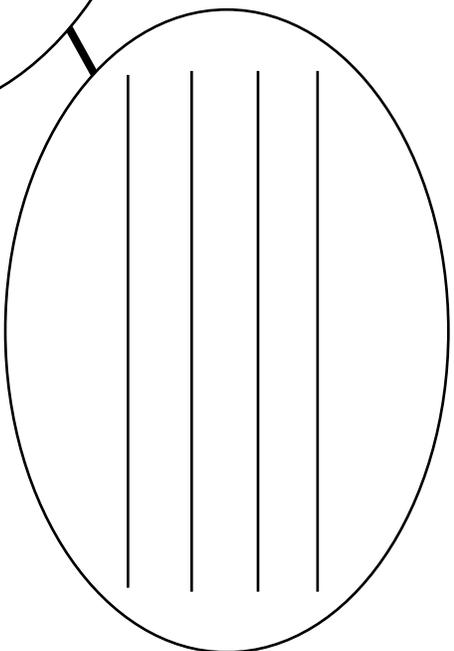
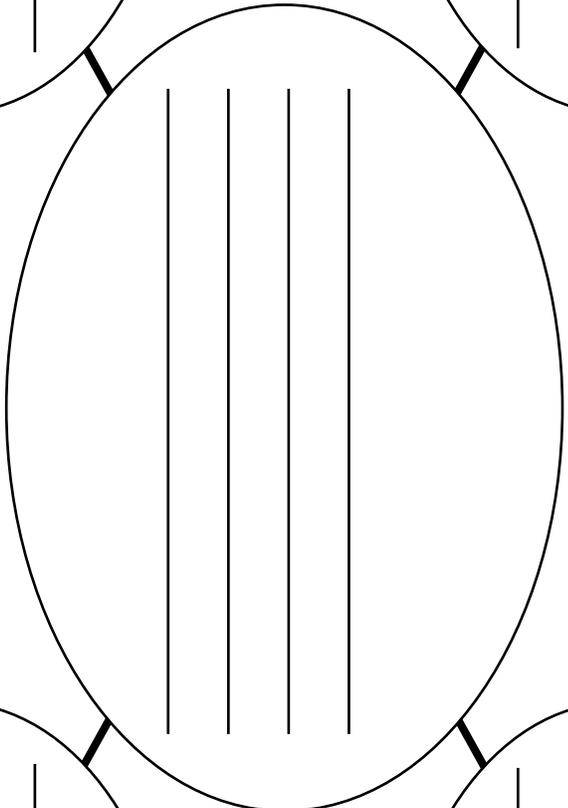
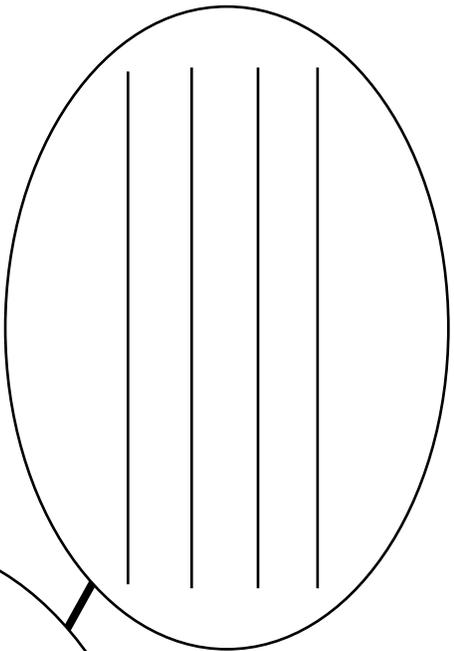
Word		
Text Clues		
Visual Clues		
What I Think the Word Means		
Definition		

Name _____

Date _____

LANGUAGE ARTS ASSESSMENT: Sailing With the Blue Fleet

Write the main idea of the article in the middle circle. Pick four paragraphs. Write the main idea of each.



Name _____

Date _____

CONTENT ASSESSMENT: Sailing With the Blue Fleet

Identify two "Blue Fleet" animals. Draw a picture of each animal.

Animal: _____

Animal: _____

Tell how the animals are alike and different.

Alike

Different

COMPREHENSION CHECK: Sailing With the Blue Fleet

Read each question. Fill in the circle next to the correct answer and then write your response on the lines.

- 1. Where do "Blue Fleet" animals live?
 - Ⓐ on top of the ocean
 - Ⓑ in lakes
 - Ⓒ in rivers

- 2. Which "Blue Fleet" animal has long tentacles?
 - Ⓐ by-the-wind sailor
 - Ⓑ Portuguese man-of-war
 - Ⓒ blue dragon sea slug

- 3. What does a violet sea snail do to survive?
 - Ⓐ It hides in its shell.
 - Ⓑ It stings predators.
 - Ⓒ It builds a life raft.

- 4. How does the blue dragon sea slug get its poison?
 - Ⓐ It eats Portuguese man-of-wars.
 - Ⓑ It makes the poison in its cerata.
 - Ⓒ It oozes poison from its foot.

5. Explain why some "Blue Fleet" animals need wind and waves to survive.

Standard Supported

- Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (CCSS. RI.2.1)

Resources

- Vocabulary Assessment Master (page 15)
- Language Arts Assessment Master (page 16)

Summary

- The article "In Search of the Lost City" relates how archaeologists used new technology to locate ancient ruins in the rain forests of Honduras and Nicaragua.

BUILD VOCABULARY AND CONCEPTS

- **archaeologist**
- **excavation**
- **terrace**

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to record each vocabulary word as you read it aloud from the Wordwise feature on page 15.

Divide the class into pairs. Point out to students that they may have heard some or all of these words before. Using that background knowledge as a base, instruct partners to predict and write a definition for each word. Then have them write a sentence for each word, based on the definitions they wrote.

Display the Wordwise feature on page 15 of the projectable magazine. First, instruct students to make sure they spelled each word correctly. Then review the definitions as a class. Have students add these definitions to their worksheets. With their partners, have students write a new sentence for each word that accurately reflects how it was defined in the article.

READ

Inform students that the purpose of this article is to learn about how archaeologists used modern technology to find the ruins of ancient cities.

Tell students that the best way to learn more about topics like this is to ask themselves questions as they read the article. **Say:** *Good readers always ask questions as they read. It helps them learn more about the topic. And asking questions isn't as hard as you might think. Many questions begin with the same six question words: Who? What? Where? When? Why? and How?*

Display pages 10-11 of the projectable magazine. Model how to ask and answer questions. **Say:** *When I look at this page, the first thing I notice is the photo. The second thing I see is the headline. Together, they make me ask a lot of questions. Where is this place? How can a city become lost? And how would anyone ever find a lost city in a place like this?* Encourage students to introduce new questions of their own.

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, instruct them to write at least one question related to the article that begins with each question word. Challenge them to find answers to their questions in the text. Instruct students to record the answers on their worksheets.

TURN AND TALK

Have students turn and talk to discuss what they learned about the search for the lost city. **Ask:** *What does an archaeologist do?* (study human history through the excavation of sites and the study of items they find) *Where did the archaeologists in this article go?* (a rain forest in Honduras and Nicaragua) *Why is it dangerous to explore here?* (There are no roads. And there are deadly snakes, hungry jaguars, and biting insects.) Invite students to share what else they learned about the search for the lost city.

- **Predicting Definitions** Have students turn and talk to discuss what they learned about the article's vocabulary words in small groups. Encourage them to compare the before and after sentences they wrote for each word. As a class, examine how new knowledge contributes to students' understanding of each word.

- **Ask and Answer Questions** Remind students that asking and answering questions is a strategy that can help them understand what they are reading. **Say:** *Even the best readers come across words or ideas they don't understand. Asking questions is the first step toward figuring those things out. If you ask questions, you know which answers to search for as you read the text.* Have students share and compare their **Language Arts Assessment Masters** in small groups. Do they have the same questions? Did they find the same answers? If not, encourage them to identify where in the text they found the answer and make any necessary corrections.

WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *What is the legend of "Ciudad Blanca," or the White City?*
- *What did archaeologist Chris Fisher expect to find in the rain forest? What did he actually find?*
- *What surprised you about what you read?*

Standard Supported

- Patterns in the natural and human designed world can be observed. (NGSS.2-PS1-1)

Resources

- Content Assessment Master (page 17)
- Comprehension Check (page 18)

Science Background

The story of the White City, or "Ciudad Blanca," started when the Spanish first came to Central America. They told of a city with white walls that was filled with treasure, hidden deep in the jungle. Over time, it became a legend.

People have searched for the White City. But in the past, that was no easy task. The rain forests in the Mosquitia region of Honduras and Nicaragua are filled with dense vegetation, dangerous animals, and deadly diseases. But now, thanks to modern technology, the ruins of real lost cities have been discovered.

Archaeologist Chris Fisher had a site in mind. So he used a new technology called lidar, which stands for "light detection and ranging," to search. Lidar sends pulses of light toward the ground. Most reflect off of the treetops. But some make it to the ground before they bounce back up. The time it takes for the light to return creates a "point cloud" that helps make a picture of what lies below the canopy.

In this case, lidar revealed the ruins of two ancient sites. There were roads, farming terraces, canals, and a reservoir. The jungle had revealed its secrets.

Fisher and filmmaker Steve Elkins trekked through the jungle to their target sites. When they got there, they found the outlines of buildings and an assortment of carved stone objects. Their discovery will help them learn about the ancient people who once lived here.

ENGAGE

Tap Prior Knowledge

Prior to conducting this activity, write the following words on notecards: *legend*, *rain forest*, *treasure*, *hidden*, *lost*, *city*, and *explore*. Display the cards one at a time. Invite students to share what they know about each word. As a class, brainstorm ideas for a legend that features all of the other words.

EXPLORE

Preview the Lesson

Display pages 10-11 of the projectable magazine. Read aloud the headline and deck as students examine the photo. **Ask:** *Why would it be hard to find a lost city in a place like this? How would you search?* Encourage students to share their ideas. As a class, discuss reasons why archaeologists would even want to search for a lost city. Brainstorm ideas about what they might see if they found one.

Set a Purpose and Read

Have students read the article in order to understand what lidar technology is and how it helps archaeologists make new discoveries.

EXPLAIN

Understanding Lidar Technology

Display pages 12-13 of the projectable magazine. As a class, review the feature "Archaeology From Above." **Ask:** *How does lidar technology work?* (Lidar sends pulses of light toward the ground. Scientists then use computers to collect information about the forest floor.) *What does lidar help archaeologists see?* (the shape of the land below the trees) *What can they find with this information?* (areas that may have been changed by people long ago)

Recognizing Lidar Discoveries

Display the "Archaeology From Above" feature on pages 12-13 of the projectable magazine." **Say:** *If you were flying above this part of Central America, you would look down and see the tops of trees in the rain forest below. But with lidar technology, scientists can see through the trees to the forest floor.* Draw students' attention to the diagram of the lost city. Review the lettered items, which identify different structures that lidar technology helped archeologists find in the lost city. Then give each student a copy of the **Content Assessment Master**. Encourage students to imagine that they are archaeologists flying above a rain forest. They are searching for lost cities with lidar technology. Tell them to draw a picture of the treetops they would see if they looked out the window. Then have them draw a picture of a lost city that lidar helped them find. Instruct students to add a map key that identifies important parts of the city.

ELABORATE

Find Out More

Point out to students that excavation, or digging, has traditionally been how archaeologists made new discoveries. But now, with lidar technology, they have a new tool that makes the search for the past easier, safer, and more precise. As a class, conduct research to learn more about lidar technology and how it's helping archaeologists make new discoveries. Encourage students to share what they learned about each discovery.

Extend Your Thinking About Observation

Display the National Geographic Learning Framework feature on the magazine's back cover. Discuss what observation is. Tell students that when people observe, they notice things. When scientists observe, they document what they see. Studying these notes helps scientists understand their observations. Take the class outside. Instruct students to pick a plant or animal and observe it for a while. Encourage students to take notes and draw pictures of what they see. Invite students to share their observations with the class. As a class, discuss what students' observations reveal about the area.

EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *What is a terrace?* (a flat area cut into a hillside so crops can be grown)
- *What did the archaeologists do after lidar helped them find the lost cities?* (They went to the rain forest and searched the area on the ground.)
- *How can excavation help them learn more about the sites?* (When they excavate, they will find more clues to the people who once lived there.)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

Name _____

Date _____

VOCABULARY ASSESSMENT: In Search of the Lost City

Use this organizer to study each vocabulary word in the article.

Word			
Predicted Definition			
Sentence			
Definition from the Article			
Sentence			

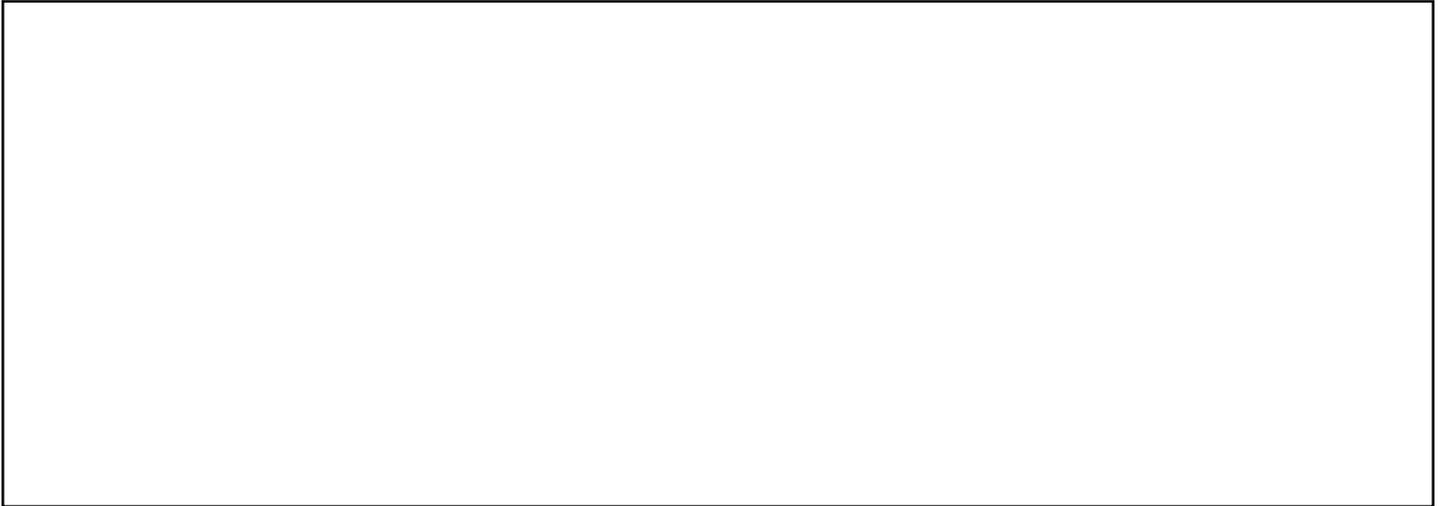
LANGUAGE ARTS ASSESSMENT: In Search of the Lost City

Use these question words to ask and answer questions about the search for the lost city.

Question Word	My Question	My Answer
Who?		
What?		
Where?		
When?		
Why?		
How?		

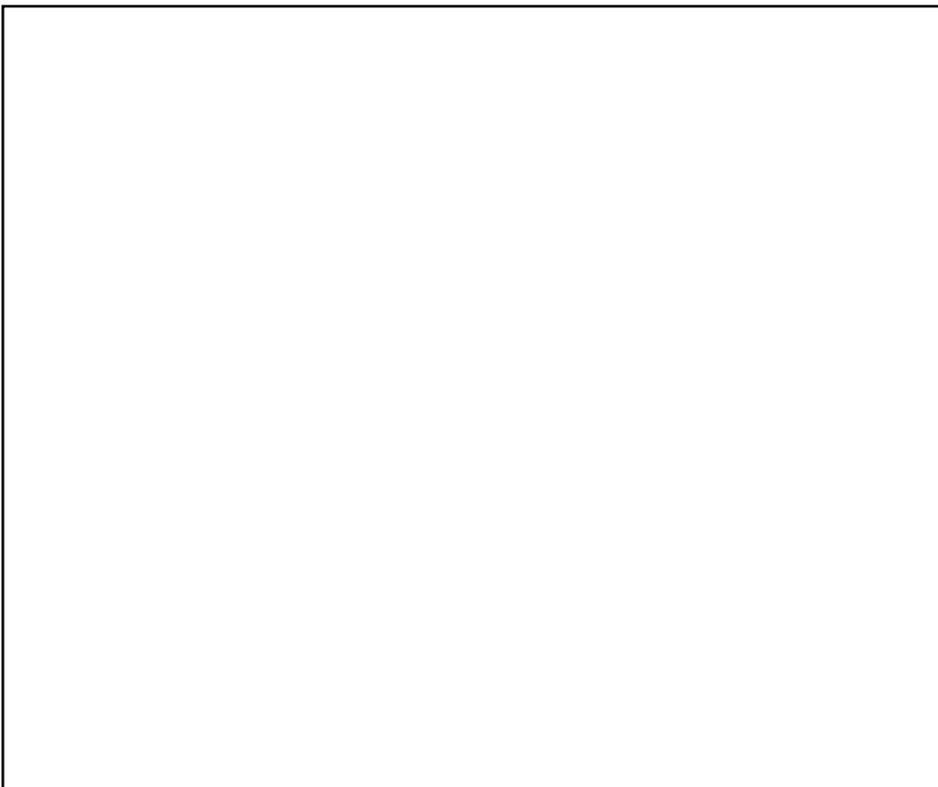
CONTENT ASSESSMENT: In Search of the Lost City

Imagine that you are an archaeologist flying above a rain forest in Central America. Draw a picture of the treetops you would see if you looked down.

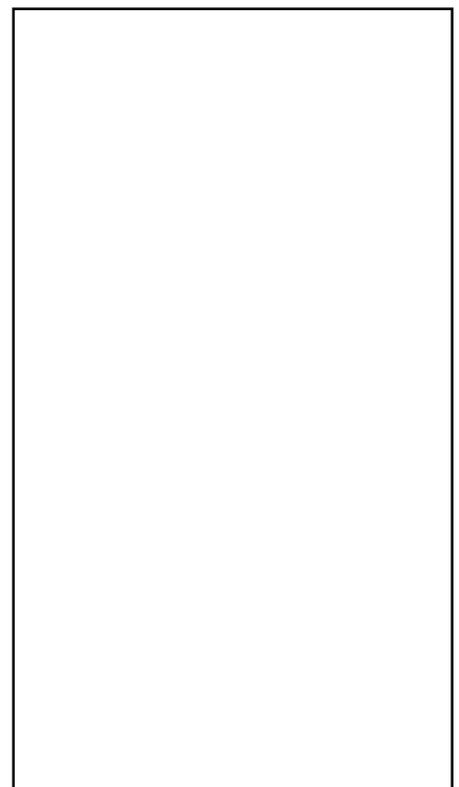


Now imagine that you used lidar technology to find a lost city. Draw a picture of the city. Make a map key that identifies important parts of the city.

Lost City



Map Key



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COMPREHENSION CHECK: In Search of the Lost City

Read each question. Fill in the circle next to the correct answer and then write your response on the lines.

1. Where did Chris Fisher go to find a lost city?
Ⓐ South America
Ⓑ Central America
Ⓒ Asia

2. What does lidar use to see the shape of the land below the trees?
Ⓐ pulses of light
Ⓑ pulses of sound
Ⓒ magnets

3. How many sites did lidar help Fisher find?
Ⓐ two
Ⓑ three
Ⓒ four

4. What did these sites contain?
Ⓐ stone pyramids
Ⓑ wooden ships
Ⓒ farming terraces

5. What did the archaeologists find when they went to the lost cities? What will they do next?

Standard Supported

- Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text. [CCSS.RI.2.7]

Resources

- Vocabulary Assessment Master (page 23)
- Language Arts Assessment Master (page 24)

Summary

- The article "The Ups and Downs of Ramps" introduces readers to ramps, a type of simple machine, and explores how ramps help people do work more easily.

BUILD VOCABULARY AND CONCEPTS

- **effort**
- **inclined plane**
- **load**
- **simple machine**

Display the Wordwise feature on page 21 of the projectable magazine. Invite volunteers to read aloud the words and their definitions. Encourage students to share what they know about each word.

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to record each word and its definition. As a class, discuss how the vocabulary words are related. Then divide the class into pairs. Challenge partners to create a diagram that illustrates how the words are connected. Have students label each word in their diagrams. Then invite pairs to share their ideas with the class.

READ

Inform students that the purpose of this article is to introduce them to inclined planes, or ramps, which are a type of simple machine.

Display pages 16-17 of the projectable magazine. **Say:** *When people read, they usually focus on the words. But photos can tell you a lot, too. For example, when I look at these pages, the first thing I notice is the roller coaster. The roller coaster is going downhill.* **Ask:** *Do you notice anything else in the photo?* Encourage students to share their ideas.

Invite a volunteer to read aloud the headline and deck. **Say:** *Articles are full of information. Sometimes, it's words, like the headline and deck. The main thing I notice about the headline and deck for this article is that they don't talk about roller coasters. But they do contain the words "ramp" and "inclined plane." It says an inclined plane makes work easier. So why is there a picture of a roller coaster? What does a roller coaster have to do with work? To figure this out, we could read the entire article. But we might find the answers to these questions quicker if we looked at the photos, captions, illustration, and other features in the article.*

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, instruct them to record the answer to each question. Tell students to circle the text feature that tells where they found each answer.

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about ramps. **Ask:** *What is another word for ramp?* (inclined plane) *What is a load?* (an object that is to be moved or the work that is to be done) *How do people get things to move with an inclined plane?* (They use force, or effort.) Encourage students to share other interesting facts they learned about ramps, or inclined planes.

- **Finding Connections** Explain to students that a word's definition tells you what the word means. But readers can get a more thorough understanding if they recognize how important words are connected. Point out that this is exactly what they did when they drew their diagrams. Instruct students to turn and share the diagrams they drew on their **Vocabulary Assessment Masters** with a partner. Encourage them to compare how they illustrated each word to show an overall relationship between each of the vocabulary words.

- **Interpreting Information** After reading the article, have students share their **Language Arts Assessment Masters** in small groups. Instruct students to compare the questions they came up with and the answers they recorded for each. Have students discuss how using text, photos, and the diagrams helped them answer their questions more quickly than if they had searched through the text. As a class, identify other types of resources that could help them quickly learn even more about inclined planes.

WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *Why is "The Ups and Downs of Ramps" a good headline for this article?*
- *Identify one ramp you have used. How did it help you do work more easily?*
- *What surprised you about what you read?*

Standard Supported

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (NGSS.K-2-ETS1-3)

Resources

- Content Assessment Master (page 25)
- Comprehension Check (page 26)

Science Background

When people think of machines, they generally picture complicated gadgets with lots of moving parts. But not all machines are this complex. Some, called "simple machines," only have a few parts. And they are extremely helpful when you want to get work done.

In this article, the second of a six-part series about simple machines, students will learn about inclined planes. An inclined plane is a ramp. It is, quite simply, just a sloping surface.

Inclined planes make it easier for people to move things from one level to another. If a ramp is long and the slope is gentle, less force is needed to move a load. But it takes more force if the ramp is short and the slope is steep.

People use inclined planes every day. A ladder is an inclined plane. So are stairs. If a driveway goes up a hill, it's an inclined plane, too.

Inclined planes make it easier to lift and load things. But sometimes, they just let you have fun. Slides are inclined planes. Roller coasters are one inclined plane after another. And many sports, such as skiing, snowboarding, and skateboarding, use inclined planes to help people gain speed so they can zip along or fly through the air.

ENGAGE

Tap Prior Knowledge

As a class, pick one place in the school where there are stairs. Tell students to imagine that same place without stairs. Brainstorm ideas about how people could now get from one level of the building to another. Discuss the pros and cons of each option.

EXPLORE

Preview the Lesson

Display pages 16-17 of the projectable magazine. Read aloud the headline and deck. Inform students that this article is about ramps, or inclined planes. **Ask:** *What clues show or tell you what a ramp is?* (The headline says ramps go up and down. The diagram shows what an inclined plane looks like. The diagram's header says an inclined plane is a simple machine. The deck says a ramp, or inclined plane, makes work easier to do.) Challenge students to identify the ramp in the photo (roller coaster). Brainstorm ideas about how roller coasters make it easier to do work.

Set a Purpose and Read

Have students read the article in order to recognize that inclined planes are simple machines and to understand the relationship between inclined planes, effort, and load. Students will also do an experiment to see how inclined planes make it easier to do work.

EXPLAIN

Recognizing Ramps as Simple Machines

Display the Wordwise feature on page 21 of the projectable magazine. Review the definitions of *inclined plane* and *simple machine*. Remind students that an inclined plane and a ramp are the same thing. **Say:** *According to the article, an inclined plane is actually the simplest of simple machines.* **Ask:** *Why do you think that is?* (Possible response: An inclined plane only has one part, whatever is used to create the ramp.) As a class, review the photos on pages 20-21. Challenge students to identify the inclined plane in each.

EXPLAIN

(continued)

Understanding Relationships

Display the Wordwise feature on page 21 of the projectable magazine. Review the definitions of *inclined plane*, *effort* and *load*. Then display pages 18-19. Challenge students to identify the inclined plane (board), effort or force (people pushing and pulling), and load (piano) in the illustration. Brainstorm ideas about why the illustration also has an arrow for distance. Invite volunteers to read aloud the problem and solution in the yellow box. Encourage students to summarize what they learned. **Then say:** *Just because you have an inclined plane, it doesn't mean that inclined plane will solve the problem. You need the right tool for the job. Stairs are an inclined plane. But you can't lift a piano up stairs. You need a ramp. And in this case, the longer ramp did the trick. It took less effort to move the piano because the piano was moving up over a longer distance.* Guide students to recognize that there is an inverse relationship between effort and distance when using an inclined plane.

Putting Ramps to Work

Prior to conducting this activity, gather the supplies noted on page 22 of the article. Divide the class into small groups. Provide each group with the necessary supplies. Give each student a copy of the **Content Assessment Master**. Then inform students that they are going to conduct an experiment to see how using a ramp makes it easier to do work. Instruct groups to follow the instructions on pages 22-23 of their student magazines. As they complete each step, instruct students to record data on their worksheets. Provide assistance as need as students complete the experiment. When all groups are finished, encourage them to share and compare their results with the class. Discuss how making a model helped students understand how ramps work.

ELABORATE

Find Out More

Point out to students that ramps help people solve many problems, such as moving a heavy piano from the floor to the stage. Divide the class into small groups. Challenge each group to find photographs of different kinds of ramps. Encourage them to write a caption telling how each ramp helps solve problems. Invite groups to share their work with the class.

Extend Your Thinking About Ramps

Point out to students that they use ramps, or inclined planes, every day. As a class, brainstorm a list of inclined planes in and around your school. Discuss how these ramps help people in the school move things faster, farther, and more easily.

EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *What is a simple machine?* (a machine with no more than a few parts)
- *What is a load?* (an object that is to be moved or the work that is to be done)
- *How can you decrease the amount of effort needed to move a load up a ramp?* (Use a longer ramp.)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

VOCABULARY ASSESSMENT: The Ups and Downs of Ramps

Record each vocabulary word and its definition.

Word	Definition

Draw a diagram that shows how the vocabulary words are connected.
Label each part of your drawing.



Name _____

Date _____

LANGUAGE ARTS ASSESSMENT: The Ups and Downs of Ramps

Answer each question. Circle where you found each answer in the article.

Question	Answer	Source	
What do simple machines help people do?		Text Caption	Photo Illustration
What is the easiest way to move a piano from one level to another?		Text Caption	Photo Illustration
What can an inclined plane help a skateboarder to?		Text Caption	Photo Illustration
How can an inclined plane help someone in a wheelchair?		Text Caption	Photo Illustration

CONTENT ASSESSMENT: The Ups and Downs of Ramps

Use this organizer to record data as you complete the experiment on pages 22-23 of your student magazine.

1. What problem are you are trying to solve? _____

2. What is the load in this experiment? _____

3. What is the inclined plane, or ramp? _____

4. Where is the effort coming from? _____

5. In Step 5, how far did the rubber band stretch? _____

6. In Step 7, how far did the rubber band stretch? _____

7. Did you use less effort in Step 5 or Step 7? _____

8. Why do you think that is? _____

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COMPREHENSION CHECK: The Ups and Downs of Ramps

Read each question. Fill in the circle next to the correct answer and then write your response on the lines.

1. What can you raise or lower with an inclined plane?
Ⓐ effort
Ⓑ a load
Ⓒ a ramp

2. What makes an inclined plane work?
Ⓐ effort
Ⓑ an engine
Ⓒ distance

3. How are all inclined planes alike?
Ⓐ They are steep.
Ⓑ They are long.
Ⓒ They are slanted.

4. Which of these objects could be used an inclined plane?
Ⓐ a shovel
Ⓑ a board
Ⓒ a screwdriver

5. Explain how ramps, or inclined planes, make it easier to do work.

Understanding Maps

AUSTRALIA AND OCEANIA

Standard Supported

- Identify some cultural and environmental characteristics of specific places. (NCSS. D2.Geo.6.K-2)

Resources

- Content Assessment Master (page 28)
- Comprehension Check (page 29)
- Australia and Oceania Physical Map poster (teacher's edition)
- Australia and Oceania Political Map poster (teacher's edition)

Social Studies Background

Spatial thinking is an essential skill for students to develop as they learn about geography and Earth and environmental sciences. Developing spatial concepts takes time and practice. Recognizing that, each month Explorer magazine will introduce students to a new set of physical and political maps. Use the accompanying lessons to guide students as they learn to recognize spaces and places in the natural world.

ENGAGE

Tap Prior Knowledge

Have students list three things they would expect to see in Australia and Oceania—besides kangaroos and koala bears. Review the lists. Invite students to share what they know about Australia and Oceania.

EXPLORE

Preview the Lesson

Display the **Australia and Oceania Physical Map poster** and the **Australia and Oceania Political Map poster**. Cover the captions. As a class, discuss what each photo tells about Australia and Oceania.

Set a Purpose and Read

Have students examine the posters in order to understand that physical and political maps can be used to describe the cultural and environmental characteristics of a location.

EXPLAIN

Explore the Physical Map

Display the **Australia and Oceania Physical Map poster**. Read aloud the text in the "Landforms" box on the left side of the poster. As a class, find the Great Dividing Range and the Australian Alps. Challenge students to identify and locate other mountain ranges in Australia and Oceania. Review the other boxes in this same way. Then read aloud the caption for each photo. Invite students to share what the map taught them about the physical characteristics of Australia and Oceania.

Explore the Political Map

Display the **Australia and Oceania Political Map poster**. Invite volunteers to read aloud the captions and text. As a class, find each location mentioned on the map. Challenge students to add another fact they know about each place.

ELABORATE

Find Out More

Display the **Australia and Oceania Political Map poster**. Invite a volunteer to locate New Caledonia. Point out "(France)" below the island's name. **Say:** *New Caledonia is not an independent country. It is a dependent nation controlled by another country, France. There are several dependent nations in Oceania.* As a class, conduct research to identify other dependent nations. Challenge students to find each place on a larger world map.

Extend Your Thinking

Give each student a copy of the **Australia and Oceania Map Content Assessment Master**. With a partner, have students create a physical or political map of this continent. Then have pairs conduct research to find and record two more facts.

EVALUATE

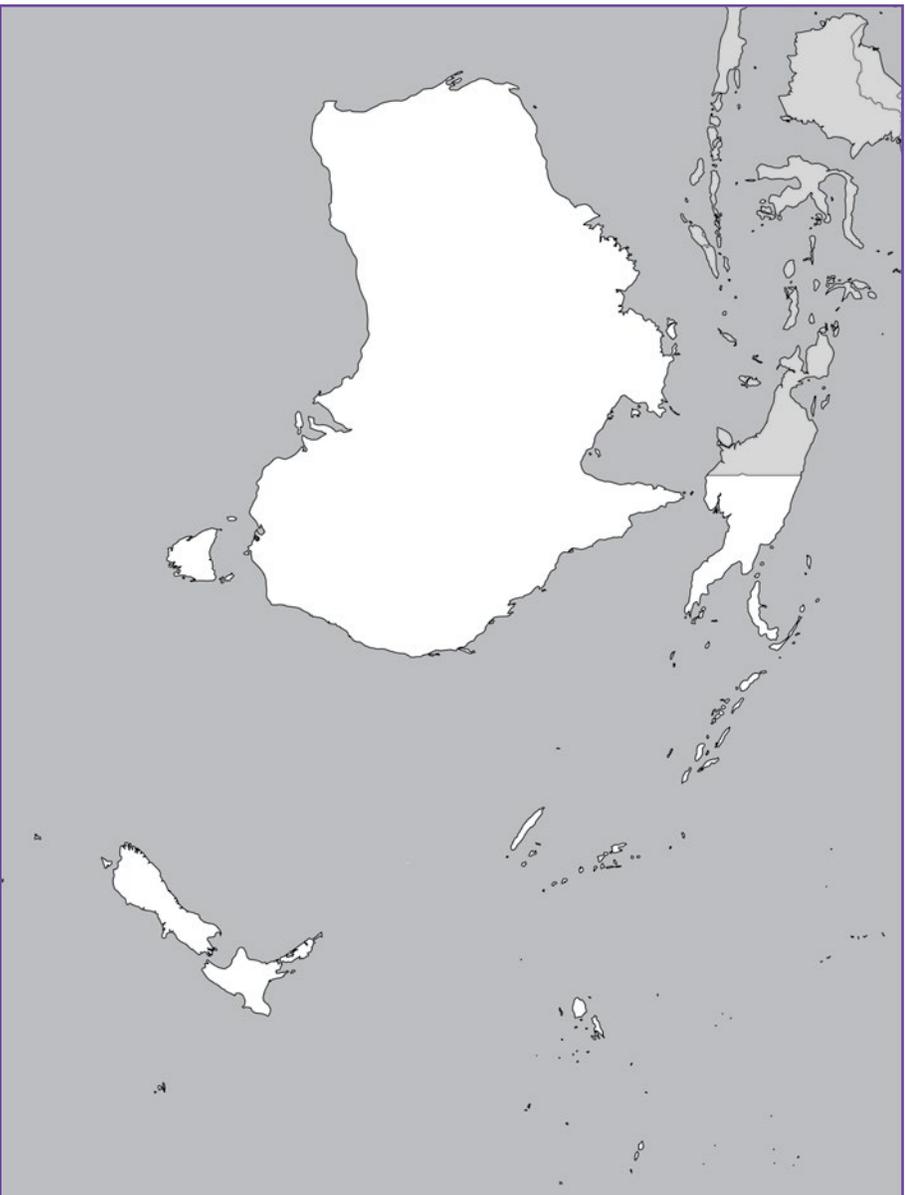
Have students ask and answer questions about the physical and political maps. If you wish, have them complete the **Comprehension Check** to assess their knowledge of the continent's geography.

Name _____

Date _____

CONTENT ASSESSMENT: Australia and Oceania Maps

Create a physical or political map of Australia and Oceania. Record two new facts about the continent.



Sample Box #1

Sample Box #2

COMPREHENSION CHECK: Australia and Oceania Maps

Read each question. Fill in the circle next to the correct answer and then write your response on the lines.

- 1. What is the largest country in Australia and Oceania?
Ⓐ Australia
Ⓑ New Zealand
Ⓒ Nauru

- 2. How do coconut seeds get from one island to another in Australia Oceania?
Ⓐ They blow in the wind.
Ⓑ They float in the ocean.
Ⓒ Sea turtles carry them.

- 3. Which of these sports is popular throughout Oceania?
Ⓐ baseball
Ⓑ football
Ⓒ cricket

- 4. What is the longest river in Australia and Oceania?
Ⓐ Murray River
Ⓑ Darling River
Ⓒ the Great Barrier Reef

5. Write one political fact and one physical fact you learned about Australia and Oceania.

ANSWER KEY

Sailing With the Blue Fleet

Assess Vocabulary, page 7

Students should record the words and definitions from the Wordwise feature on page 9.

polyp: a small sea animal that has a body shaped like a tube

tentacle: a long, flexible dangling arm used for grabbing or stinging other living things

Text clues, visual clues, and what students think each word means may vary. Evaluate answers for accuracy.

Assess Language Arts, page 8

Students should record the main idea of the article. (Some animals, known as the "Blue Fleet," spend their entire lives drifting on the open sea.) Additional responses will vary, depending on which paragraphs students choose to investigate.

Assess Content, page 9

Students should draw pictures and identify two "Blue Fleet" animals. Answers will vary depending on which animals students select.

Comprehension Check, page 10

1. A; 2. B; 3. C; 4: A; 5: Possible response: Some "Blue Fleet" animals can't move on their own. They need wind and waves to move them so they can get food as it drifts by.

In Search of the Lost City

Assess Vocabulary, page 15

Students' predictions and the sentences they write will vary. They should record the words and definitions from the Wordwise feature on page 15.

archaeologist: a scientist who studies human history through the excavation of sites and the study of items they find

excavation: the act of excavating, or unearthing something by cutting, digging, or scooping

terrace: a flat area cut into a hillside so crops can be grown

Assess Language Arts, page 16

Questions should begin with the identified question words. Answers should come directly from the text.

Assess Content, page 17

Drawings will vary but students should draw pictures of a rain forest as seen from above and a lost city. They should include a map key similar to the one in the "Archaeology From Above" feature on pages 12-13 of the article.

Comprehension Check, page 18

1. B; 2. A; 3. A; 4: C; 5: They found the outline of a building and carved stone figures. They plan to return so they can excavate the sites to find more clues to the people who once lived there.

The Ups and Downs of Ramps

Assess Vocabulary, page 23

Students should record the words and definitions from the Wordwise feature on page 21.

effort: the force that makes a simple machine do work

inclined plane: a surface that is slanted so that one end is higher than the other

load: an object that is to be moved or the work that is to be done

simple machine: a machine with no more than a few parts

Diagrams should show an accurate connection between the words. All terms should be labeled in the diagram.

Assess Language Arts, page 24

1. Inclined planes help people move things faster, farther, or more easily than they could without them; text

2. The easiest way to move a piano from one level to another is to push it up a ramp; illustration or text

3. Inclined planes help skateboarders do cool moves; caption or text

4. Inclined planes can help someone in a wheelchair get into a bus; photo or caption

(continued)

The Ups and Downs of Ramps

Assess Content, page 25

1. Possible Response: I am trying to move the load up the ramp with the least amount of effort.
2. bag of rice
3. cardboard
4. I am pulling on the free end of the rubber band.
5. Answers will vary.
6. Answers will vary.
7. Students should note that less effort was required in Step 7.
8. Step 7 required less effort because they pulled the load a longer distance.

Comprehension Check, page 26

1. B; 2. A; 3. C; 4. B; 5: An inclined plane helps you use less effort because it moves the load over a longer distance.

Australia and Oceania Maps

Assess Content, page 28

Students should create an accurate physical or political map of Australia and Oceania. Students should write two facts. Facts will vary, but they should relate to the type of map (physical or political) that the student chose to create.

Comprehension Check, page 29

1. A; 2. B; 3. C; 4: A; 5: Answers will vary.