

TEACHER'S GUIDE

Pathfinder

Vol. 17 No. 2

In This Guide

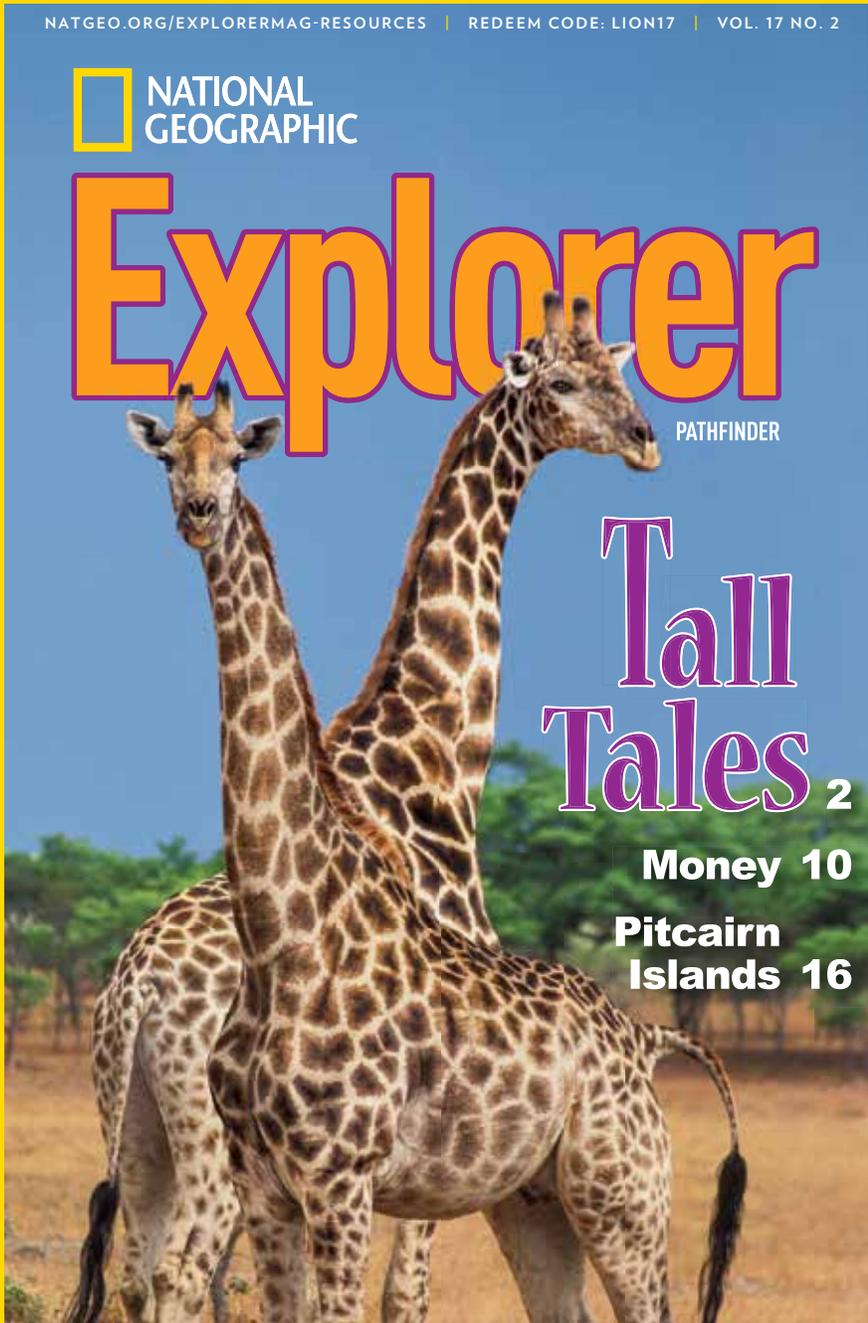
This guide contains language arts and science or social studies lessons for articles in this issue of EXPLORER PATHFINDER.

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 PATHFINDER will be within the 450-850L range.

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



Your Subscription Includes:

- Magazines
- Classroom Posters
- Projectable Magazine
- Teacher's Guide
- App (additional subscription required)

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 Pristine Seas."

MINDSET OF AN EXPLORER

KEY FOCUS AREAS



Attitudes

National Geographic kids are:

CURIIOUS 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

- Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. [CCSS.RI.4.3]
- Write opinion pieces on topics or texts, supporting a point of view with reasons and information. [CCSS.W.4.1]

Resources

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

Summary

- The article "Tall Tales" explores how new discoveries have changed people's ideas about giraffes and how this might impact conservation efforts in the future.

BUILD VOCABULARY AND CONCEPTS

- **conservationist**
- **habitat**
- **species**

Display the vocabulary words on a word wall or on a whiteboard. Say the words aloud and invite students to share what they know about each.

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to write each word and its definition on their papers. Then have students draw a picture to remind themselves of what each word means.

When students are finished drawing their interpretations of individual words, encourage them to share their ideas about how the words could be related to giraffes in small groups. Then challenge each student to sketch a larger picture showing how the three words are related in that context. Instruct students to label their representations of each term in their drawings.

READ

Inform students that the purpose of this article is to tell them about something important that people recently learned about giraffes.

Display pages 2-3 of the projectable magazine. Invite a volunteer to read aloud the headline and text. **Ask:** *What did scientists recently discover about giraffes?* (There is more than one species.) As a class, brainstorm ideas about how the species might be different.

Explain to students that learning that there is more than one species of giraffe is an important scientific discovery. To understand how and why, they must search for clues in the article. **Say:** *Science is based on facts. And what people think about science changes if they learn new facts. In this case, the new facts have already changed the way people view giraffes. That could lead to even bigger changes down the road.*

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 facts that explain what people learned about giraffes and how they uncovered this new information. Instruct students to record the facts they find on the top half of their worksheets.

TURN AND TALK

Have students turn and talk to discuss what they learned about giraffes. **Ask:** *What is a giraffe?* (Possible response: a very tall animal with long legs, a long neck, and brown spots) *Why did it take so long for people to learn there was more than one species of giraffe?* (People hadn't studied giraffes very much.) *Why are people worried about giraffes now?* (If all giraffes belonged to the same species, population numbers would not be a problem. But with four different species, giraffes could now be in danger of extinction.)

- **Explain Scientific Concepts** After reading the article remind students that science is based on facts. As the facts change, people's ideas about science evolve, too. Point out that the article contained all the facts they need to understand the new discovery about giraffes. Have students share their **Language Arts Assessment Masters** in small groups. Instruct them to compare the information they recorded. If group members overlooked any important facts, encourage them to add those details to their worksheets. Rejoin as a class. Invite groups to explain what they learned

- **Writing Opinions** Explain to students that learning about science is more than just collecting facts. Scientists must also interpret the facts to understand what they mean. Once they do that, they can form an opinion to help others understand why what they learned is important. In small groups, have students discuss reasons why this discovery about giraffes is important. Encourage them to use information on their **Language Arts Assessment Masters** or review the article for new facts that bolster their ideas. Then instruct students write a brief essay expressing how they think this new discovery will affect giraffes in the future on the lower portion of their **Language Arts Assessment Masters**. Encourage students to include facts and details from the article.

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 a conservationist?*
- *How does the subhead "Small Science, Big Difference" relate to giraffes?*
- *What surprised you about what you read?*

Standard Supported

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (NGSS.4-LS1-1)

Resources

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

Science Background

Giraffes are giant animals. As newborns, they are about 1.9 meters (6 feet) tall and weigh around 68 kilograms (150 pounds). By the time they become adults, they can reach up to 5.8 meters (19 feet) tall and weigh up to 1,270 kilograms (2,800 pounds). They are the tallest land animals on Earth.

Other than humans, the giraffe's only predators are lions and crocodiles. Although giraffes can deliver deadly blows with their long, strong legs, they gain additional protection by living together in groups called towers. One giraffe can stand guard while others catch the five to 30 minutes of sleep they need each day.

Until recently, it was believed that all giraffes belonged to the same species. However, a study of giraffe DNA released in 2016 revealed that there are actually four different species of giraffe—the Masai giraffe, reticulated giraffe, southern giraffe, and northern giraffe. The different varieties can be distinguished by examining the animals' spots.

While interesting, these findings are also cause for alarm. Fewer than 100,000 giraffes remain living in the wild. Now we know that number is actually divided into four distinct groups. It is more important than ever to protect giraffes, which are now one of the most endangered large mammals in the world.

ENGAGE

Tap Prior Knowledge

Draw a stick figure representing a giraffe on the board. Instruct students to write the name of the animal this drawing reminds them of on a piece of paper. Then ask students to raise their hands if they wrote the word "giraffe." Discuss reasons why. Invite students to share what they know about giraffes.

EXPLORE

Preview the Lesson

Display the cover of the projectable magazine. Invite volunteers to describe the giraffes they see. Then have them describe the place where the giraffes live. **Ask:** *What is it like in this habitat?* (Possible response: There is brown grass on the ground and there are some tall trees in the background.) Point out the giraffes' long necks. **Ask:** *Looking at how long the giraffes' necks are, do you think they're more likely to eat grass or leaves?* (leaves) *Why?* (Their long necks allow them to reach the leaves.) Tell students that as they read the article they will learn how a giraffe's body parts help it survive. They will also learn about the differences between the four species of giraffes.

Set a Purpose and Read

Have students read the article in order to understand how a giraffe's body parts help it survive and to distinguish between the four species of giraffes.

EXPLAIN

Identify Body Parts that Help Giraffes Survive

Display pages 4-5 of the projectable magazine. Read aloud the information in the brown blurb. Point out that each caption in the diagram tells how a particular body part helps a giraffe survive. Have students review the diagram in small groups. Rejoin as a class. Invite students to share what they learned. Then challenge them to explain why a giraffe's body parts are well-suited for the environment where it lives. (Possible responses: Brown spots help a giraffe blend in with a brown landscape. Long legs and a long neck allow it to reach food other animals can't eat. Long legs also help it move easily over flat, bare land.)

Compare and Contrast Giraffe Species

Display pages 6-7 of the projectable magazine. As a class, review the sections "Branching Out" and "Spot the Difference." Encourage students to identify similarities between the four species of giraffes. (Possible responses; All have long legs, long necks, small heads, horns, and brown spots. All live in Africa.) Remind the class that for a long time, people thought all giraffes were the same. Now, they know that there are four different species. Give each student a copy of the **Content Assessment Master**. Then divide the class into small groups. Instruct groups to review the article. Challenge them to compare and contrast the four species of giraffes.

ELABORATE

Find Out More

Point out to students that the article describes the physical traits of giraffes in detail. But it doesn't tell much about their behaviors. Divide the class into small groups. Have groups conduct research to learn about the habits and behaviors of giraffes. Invite groups to present their findings to the class.

Extend Your Thinking About Giraffes

Remind students that until recently, scientists had not studied giraffes in detail. Scientifically, the article states, giraffes didn't seem that interesting. As a class, discuss reasons why scientists might not have wanted to study giraffes. Challenge students to identify reasons why giraffes are interesting and should be the subject of further research.

EVALUATE

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

- *What are the four species of giraffes?* (Masai giraffe, reticulated giraffe, northern giraffe, and southern giraffe)
- *How do a giraffe's eyes help it survive?* (A giraffe's long eyelashes and thick eyelids protect it from sharp thorns in the trees. This makes it possible for them to eat the leaves.)
- *How do a giraffe's spots help it survive?* (The spots are camouflage. They help a giraffe blend in with dappled sunlight and shadows of trees and plants.)

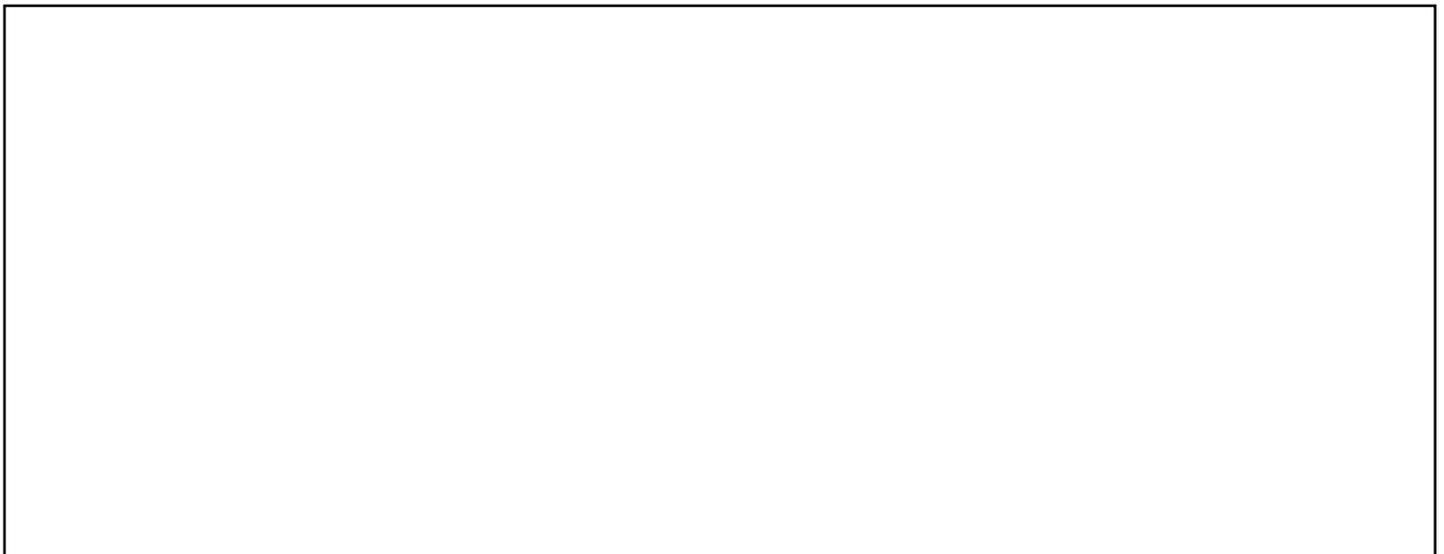
If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

VOCABULARY ASSESSMENT: Tall Tales

Record each vocabulary word and its definition. Draw a small picture to show what each word means.

| Word | Definition | Picture |
|------|------------|---------|
| | | |
| | | |
| | | |

Draw a larger picture to show how the words are related to giraffes. Add labels to show how you included each word in your sketch.



LANGUAGE ARTS ASSESSMENT: Tall Tales

Record facts from the article that tell what people learned about giraffes.
Tell how they found this new information.

| What They Found | How They Found It |
|-----------------|-------------------|
| | |

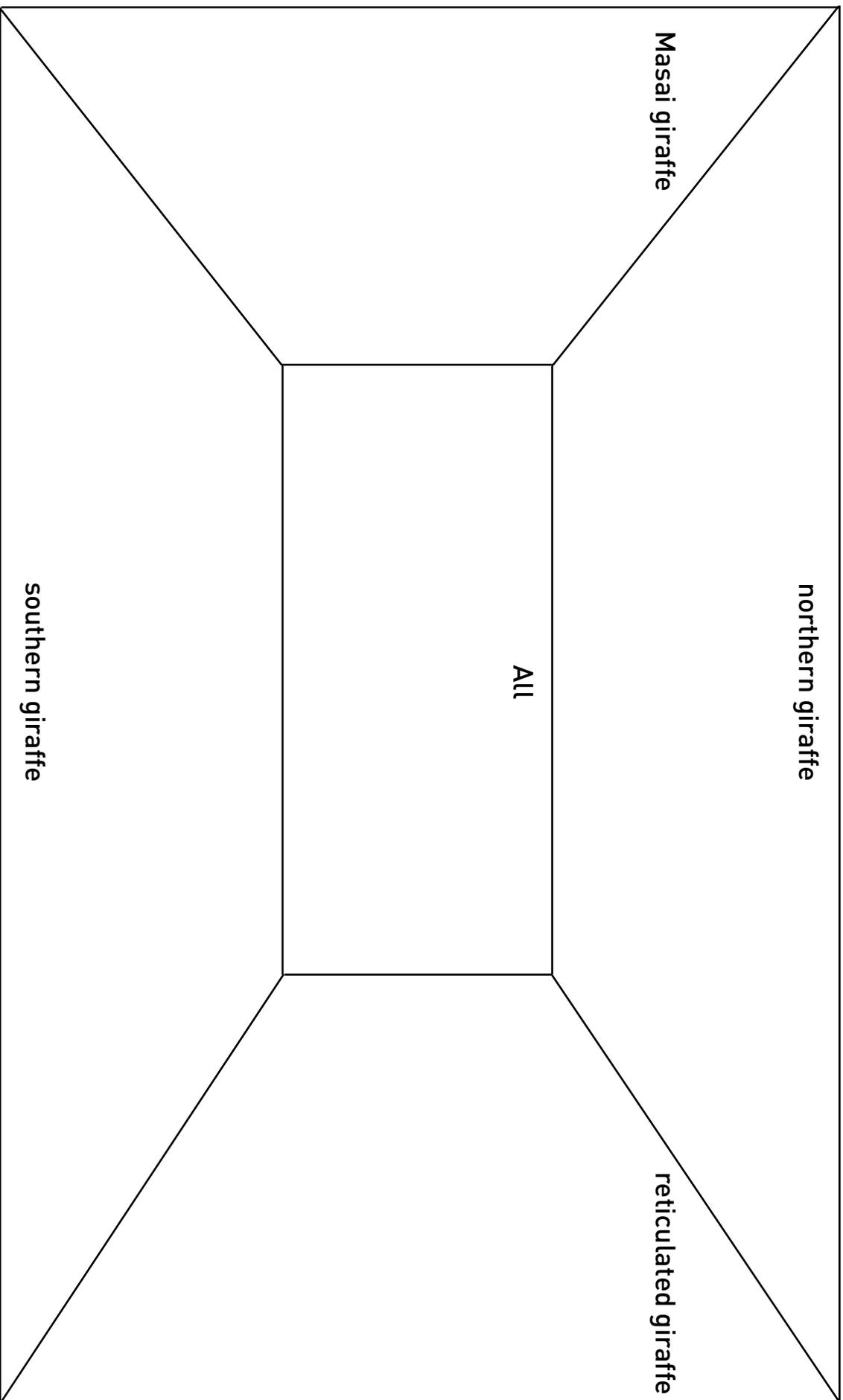
Why do you think this new discovery will affect giraffes in the future?
Write about it. Use facts from the article to support your opinion.

Name _____

Date _____

CONTENT ASSESSMENT: Tall Tales

Compare and contrast the four species of giraffes.



COMPREHENSION CHECK: Tall Tales

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

1. What proved to scientists that there were different species of giraffes?

- Ⓐ bone samples
- Ⓑ tissue samples
- Ⓒ muscle samples

2. What can you observe to see the difference between giraffe species?

- Ⓐ their height
- Ⓑ their horns
- Ⓒ their spots

3. Where do giraffes live?

- Ⓐ grasslands and woodlands of Africa
- Ⓑ deserts and plains of Australia
- Ⓒ forests and mountains of Europe

4. Which body part closes to protect a giraffe from sharp thorns?

- Ⓐ eyelashes
- Ⓑ ears
- Ⓒ nostrils

5. Why are conservationists concerned that there are four species of giraffes?

Show Me the Money!

LANGUAGE ARTS 660L

Standard Supported

- Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution of events, ideas, concepts, or information) in a text or part of a text. [CCSS.RI.4.5]

Resources

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

Summary

- The article "Show Me the Money!" examines the history of trade and money.

BUILD VOCABULARY AND CONCEPTS

- **barter**
- **commodity**
- **currency**
- **value**

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 or words that they are more familiar with in another context. Remind them that using context clues such as the sentences before or after an unknown word and visuals such as photographs or illustrations on the page 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. Have them scan the article to locate each bold word in the text.

Tell students to find and record text and visual clues in the article that are related to each vocabulary word. Then instruct each student to record his or her own idea about what each word means. Invite volunteers to read aloud the definitions from the Wordwise feature on page 15 of their student magazines. Have students record those definitions on their worksheets. Encourage students to compare the definitions they wrote with those in the text. Discuss how context clues helped them understand the meaning of each word.

READ

Give students a few minutes to scan the article's images in their student magazines. Then have them read the subheads. As a class, discuss how the images and subheads are related and how they connect with the article's headline.

Guide students to recognize that all of the images show something that has been used as money. The subheads tell or hint at how.

Explain to students that there are four basic types of text structure: chronology, comparison, cause/effect, and problem/solution. Review the basics of each. **Then say:** *When you're reading an article that gives multiple examples of the same thing, such as different types of money or different ways money has been used, chances are good that the author will incorporate more than one type of text structure in the text. For example, what kinds of things have been used as money? The article gives many examples for you to compare. How and why has the use of money changed over time? As you read, you'll learn about this. After you finish reading the entire article, review it once again. Challenge yourself to identify its central focus. If you look closely, you will recognize that the writer used one type of text structure to tie everything together.*

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they read, instruct students to identify sections where the writer used each type of text structure. Instruct them to explain how the text structure helps the writer relay information in each case. Then have them circle what they think is the overall text structure used in the article. Challenge them to explain why.

TURN AND TALK

Have students turn and talk to discuss what they learned about money. **Ask:** *What is a commodity?* (any good that is used in trade) *When does bartering work well?* (when the commodities being traded are of equal value) *What are some kinds of foods that have been used as currency in the past?* (salt, parmigiano cheese, and bricks of tea leaves) Invite students to share what else they learned about money .

- **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 Text Structure** Review with students the different types of text structure. Have students turn and talk to share their **Language Arts Assessment Masters** with a partner. Did they identify the same sections for each type of text structure? If so, did they explain the writer's choice in the same way? If students identified different sections, do both of their selections make sense? If not, instruct partners to read the section again. Then, encourage students to share what they identified as the overall text structure of this article. Challenge them to explain why they chose that particular format. Guide students to recognize that the article really follows a chronological approach. It begins with bartering and makes its way to the electronic money we use today.

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 has money affected the way people trade for goods over time?*
- *If you could pick one everyday item to use as currency, what would it be? Why?*
- *What surprised you about what you read?*

Show Me the Money!

SOCIAL STUDIES

Standard Supported

- Explain the role of money in making exchange easier. (NCSS.D2.Eco.5.3-5)

Resources

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

Social Studies Background

In modern society, money is a fact of life. People use money to buy the things they want or need. But that wasn't always the case. And the type of money we use today is quite different from the currencies people used thousands of years ago.

It all began with barter, or the exchange of one good or service for another. Bartering worked well when people wanted to trade objects of equal value. But it didn't work when the trades became more complex.

Because of that, people created a new system. They assigned values to objects that were beautiful, interesting, or rare. They used those items as currency.

About 3,500 years ago, people in Africa and China used a small shell called a cowrie as currency. Native Americans and early North American colonists traded wampum, a white cylindrical shell that they used as beads to embroider or decorate belts and other ornamental objects.

Coins were first used in Turkey around 630 B.C. Paper money, which was much more convenient for larger purchases, first appeared in China about 910 A.D.

Today, only eight percent of transactions involve physical cash. The rest are digital trades conducted electronically through bits and bytes on computers.

ENGAGE

Tap Prior Knowledge

Encourage students to think about the last time they or their parents bought something. Poll the class to see if they paid for the items with cash, credit cards, or some other means. As a class, compare and contrast the different types of payment.

EXPLORE

Preview the Lesson

Display pages 10-11 of the projectable magazine. Point out that each word in the subhead identifies a type of money used somewhere in the world.

Ask: *How are all of these types of money the same?* (Possible response: All can be used to buy things.)

How are they different? (Possible response: They are all made by and used in different countries. They look different and they have different values.) Tell students that as they read the article they will learn more about money and how people use it to trade.

Set a Purpose and Read

Have students read the article in order to understand the history of trade and to recognize how using money makes it easier for people to trade goods and services.

EXPLAIN

Understanding the History of Trade

Instruct students to compare the illustration of fish and corn on page 12 of their student magazines to the illustration of cell phones on page 14. Guide the class to recognize that these two illustrations summarize how trade has evolved over time. **Say:** *At one time, people only traded actual goods and services. Today, most of our transactions are completed using digital money on computers.* Divide the class into small groups. Then give each student a copy of the **Content Assessment Master**. Instruct students to review the article in their groups. Challenge them to write one sentence that summarizes each section of the article. Then have students create an illustrated timeline that summarizes the history of trade.

EXPLAIN

(continued)

Recognizing The Role of Money

Display the Wordwise feature on page 15 of the projectable magazine. Challenge students to explain the difference between currency and a commodity. (Currency is money. A commodity is a good.) **Say:** *Bartering was the first form of trade. It involved the exchange of commodities. Today, some people still barter. But usually people trade money for a good or service.* Review the article with students to note the different items that have been used as currency over the years. Discuss the advantages and disadvantages of using each. Challenge students to explain how using money makes the exchange of goods and services easier in today's society.

ELABORATE

Find Out More

Display pages 10-11 of the projectable magazine. Point out to the class that each word in the subhead identifies a type of currency used today. Instruct students to conduct research to identify at least one country where each one is used. (Possible responses: ruble/Russia; rupee/India; shekel/Israel; dinar/Serbia; rand/South Africa; yen/Japan; peso/Mexico) Challenge students to find five more types of currency and tell where they are used.

Extend Your Thinking About Money

Point out to the class that it costs 2.4 cents to make one penny, which is worth one cent. As a class, debate whether or not pennies should still be used as a form of U.S. currency.

EVALUATE

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

- *What was wampum? Who used it as a form of currency? Why did they consider wampum to be valuable? (Wampum was beads made from seashells. Native Americans and early colonists used wampum as currency. They considered it to be valuable because it was beautiful and took skill to make.)*
- *When and where were the first coins used? (The first coins were used in Turkey around 630 B.C.)*
- *Why is the term "paper money" incorrect to use today? (The bills we use aren't made out of paper. They're made out of cloth.)*

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

Name _____

Date _____

VOCABULARY ASSESSMENT: Show Me the Money!

Record information from the article about each vocabulary word.

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

LANGUAGE ARTS ASSESSMENT: Show Me the Money!

Identify sections that use each type of text structure. Explain how the text structure helps the writer make a point.

| Text Structure | Section | Explanation |
|------------------|---------|-------------|
| Chronology | | |
| Comparison | | |
| Cause/Effect | | |
| Problem/Solution | | |

Circle what you think is the article's overall text structure. Tell why.

CONTENT ASSESSMENT: Show Me the Money!

Write a sentence that summarizes the content of each section.

| Section | Summary Sentence |
|-----------------------------|------------------|
| The Price of Doing Business | |
| Is It Better to Barter? | |
| Changing Currency | |
| Its Worth in Weight | |
| Paper in Your Pocket | |
| Backed by a Promise | |

Create an illustrated timeline that summarizes the history of trade.

COMPREHENSION CHECK: Show Me the Money!

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

1. What happens when people barter?
Ⓐ People trade money for goods.
Ⓑ People exchange one good or service for another.
Ⓒ People give each other currency.

2. What item is the longest-used currency in history?
Ⓐ cowrie shells
Ⓑ wampum
Ⓒ Parmigiano cheese

3. What was the value of early coins based on?
Ⓐ how smooth the coins were
Ⓑ the shape of the coins
Ⓒ the weight of the coins

4. What do people use for most trades today?
Ⓐ coins
Ⓑ bills
Ⓒ digital money

5. Explain how money makes the exchange of goods easier.

Standard Supported

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

Resources

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

Summary

- The article "In Search of Pristine Seas" is a first-person account of Dr. Enric Sala's expedition to the Pitcairn Islands and his efforts to establish this area as a protected marine ecosystem.

BUILD VOCABULARY AND CONCEPTS

- **atoll**
- **ecosystem**
- **mutineer**
- **lagoon**
- **pristine**

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 23.

Point out to students that they may have heard some or all of these words before. Using that background knowledge as a base, instruct students 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 23 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. Instruct them to then write a new sentence for each word that accurately reflects how it was defined in the article.

READ

Inform students that in this article they will read about Dr. Enric Sala and his efforts to find, survey, and help protect the last wild places in the ocean.

Tell students that as they read, they will come across many facts that are stated clearly in the text. These facts are explicit statements. But they will also encounter clues that require them to make an educated guess, or inference. To do this, they must combine with the text says with what they know to reach a logical conclusion.

Display pages 16-17 of the projectable magazine. Read aloud the headline. Then model how to identify an explicit statement and make inferences. **Say:** *According to the headline, the man in this photo is searching for pristine seas. That is an explicit statement, or a stated fact. But what does pristine mean? To figure that out, I'll have to search for clues.*

Say: *If this man has to search for pristine seas, I can infer—or make a logical guess—that they're not easy to find. Based on what I see in the photos, I can make a few inferences about what they're like. Pristine seas have very clear water and they are home to sharks. Looking at the border, I can also guess that the ocean floor in pristine seas is covered with living things. To find out if my inferences are correct, I'll need to read the article.*

Give each student a copy of the **Language Arts Assessment Master**. Instruct students to read the article on their own. As they do, have them write five explicit statements and make five inferences about Sala's search for pristine seas.

In Search of Pristine Seas

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about pristine seas. **Ask:** *What does the word pristine mean? (unspoiled) What do pristine seas look like? (Possible response: Corals cover the ocean floor. The water is clear. There are many fish and lots of sharks.) Why aren't more of the world's oceans pristine? (Possible response: People's actions have spoiled ocean ecosystems.)* Encourage students to share other interesting facts they learned about pristine seas.

- **Predicting Definitions** Have students turn and talk to discuss what they learned about the article's vocabulary words. 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.

- **Making Inferences** Remind students that making inferences is a strategy that can help them understand what they read. **Say:** *Understanding what you just read is important. But interpreting information from a writer's clues takes practice. If you can't follow the clues, you might need to reread the text.* Have students compare their **Language Arts Assessment Masters** with a partner. Did students identify the same explicit statement? Did they find the same clues? If so and they developed different inferences, encourage students to review the text once again. Challenge them to explain to their partners how the clues they found created a path of knowledge that helped them reach each logical conclusion.

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 it important to have pristine seas?*
- *What is the ecosystem like in a pristine sea?*
- *What surprised you about what you read?*

In Search of Pristine Seas

SCIENCE

Standard Supported

- Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (NGSS.3-5-ETS1-2) (secondary to 4-ESS3-2)

Resources

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

Science Background

As a boy, growing up on the Mediterranean coast of Spain, Dr. Enric Sala loved the sea. His fascination with the ocean led him to become a marine ecologist. But after years of working in academia, Sala came to a realization. The ocean is dying. And he wanted to find a cure.

To do that, Sala took his career in a different direction. In 2008, he became a National Geographic Explorer-in-Residence. His project, Pristine Seas, combines science, exploration, and media. His goal is to collect essential data that will convince governments to create new policies to protect the last pristine marine ecosystems in the world.

This is no small task. The ocean covers 70 percent of the planet. It is home to an incredible diversity of life. It provides food, jobs, and even half of the oxygen we breathe. But people are taking too many fish out of the ocean. They are polluting the oceans and making them warmer and more acidic.

Despite this, only three percent of the ocean's waters are currently protected. Through Pristine Seas, Sala is working to increase that number. So far, Sala has gone on 23 expeditions. His work has helped protect 4.4 million square kilometers (1.7 million square miles) of ocean territory. It has also led to the creation of 13 marine reserves.

ENGAGE

Tap Prior Knowledge

Display a globe. Point out all of the blue areas on the globe that represent the ocean. As a class, identify plants and animals that live in the ocean. Then ask students to imagine that the ocean somehow changed. Discuss what could happen to the plants and animals that lived there.

EXPLORE

Preview the Lesson

Display pages 16-17 of the projectable magazine. Read aloud the headline. **Ask:** *What is this article about?* (the search for pristine seas) Remind students that the word *pristine* means "unspoiled." As a class, discuss reasons why the ocean shown in this photo could be described as pristine. Brainstorm a list of ways the ocean here could change if it became damaged or polluted by people.

Set a Purpose and Read

Have students read the article in order to understand how Dr. Enric Sala researched the problem of polluted seas, designed a solution, and tested it in a variety of conditions.

EXPLAIN

Researching a Problem

Display page 18 of the projectable magazine. Zoom in on the illustration of the globe and point out the Pitcairn Islands. **Ask:** *Why do you think Dr. Enric Sala chose this location when he was searching for pristine seas?* (Possible response: The Pitcairn Islands are very remote, which makes them less likely to be spoiled by human activities.) Instruct students to examine the article's photos in their student magazines. **Say:** *Sometimes when you want to solve a problem, it helps to see the results you could potentially achieve. That's what Sala hoped to find here.* Assign each student a partner and give each student a copy of the **Content Assessment Master**. Instruct pairs to identify Sala's research objective, describe what he found on each island he studied, and state his proposed solution. Then have partners predict how Sala's solution could protect the ocean here over time.

ELABORATE

Find Out More

Divide the class into pairs. Instruct partners to visit the "Pristine Seas" site at: <http://www.nationalgeographic.org/projects/pristine-seas/>. Inform students that the Pitcairn Islands are just one of 23 ocean ecosystems that Dr. Enric Sala and his team have explored. Each location they've visited is marked with a clickable dot on this globe. Have partners select four locations on the globe. Instruct them to write a short report describing the impact Sala's research has had on each area.

Extend Your Thinking About Problem Solving

Point out to students that they don't have to travel to remote locations like the Pitcairn Islands to solve problems. There are plenty of problems to solve here at home. Display the back cover of this month's magazine. Review the information about "Problem Solving" with the class. Identify a list of ways that people commonly waste resources. Brainstorm potential solutions. Encourage each student to pick one idea and draw a picture of his or her solution.

EVALUATE

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

- *What is an atoll?* (a ring-shaped reef, island, or chain of islands made of corals)
- *What did Sala's team hope to stop around the Pitcairn Islands?* (illegal fishing)
- *What did Sala's research help create?* (the world's largest marine protected area)

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 Pristine Seas

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 Pristine Seas

Record five explicit statements and make five inferences about the search for pristine seas.

| Explicit Statements | |
|---------------------|--|
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |

Inferences

| What the Text Says | What I Already Know | Inferences I Can Make |
|--------------------|---------------------|-----------------------|
| | | |
| | | |
| | | |
| | | |
| | | |

Name _____

Date _____

CONTENT ASSESSMENT: In Search of Pristine Seas

Use this organizer to record information about the article.

Identify the research objective:

| |
|--|
| |
|--|

Describe the areas studied:

| | |
|-------|-----------|
| Ducie | Henderson |
| Oeno | Pitcairn |

Identify the proposed solution:

| |
|--|
| |
|--|

Predict the outcome:

| |
|--|
| |
|--|

© 2017 National Geographic Society. All rights reserved. Teachers may copy this page to distribute to their students.

COMPREHENSION CHECK: In Search of Pristine Seas

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

1. In which ocean are the Pitcairn Islands located?
Ⓐ Atlantic Ocean
Ⓑ Pacific Ocean
Ⓒ Indian Ocean

2. What are pristine ecosystems like?
Ⓐ damaged
Ⓑ polluted
Ⓒ unspoiled

3. Which animal is the top predator in a coral reef ecosystem?
Ⓐ shark
Ⓑ coral
Ⓒ damselfish

4. How many of the Pitcairn Islands have been changed by human activities?
Ⓐ all
Ⓑ some
Ⓒ none

5. Describe how illegal fishing harms ocean ecosystems.

Understanding Maps

AFRICA

Standard Supported

- Use maps of different scales to describe the locations of cultural and environmental characteristics. (NCSS.D2.Geo.3.3-5)

Resources

- Content Assessment Master (page 28)
- Comprehension Check (page 29)
- Africa Physical Map poster (teacher's edition)
- Africa 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

Give students three minutes to make a list of things they know about Africa. Review the lists. Which items were recorded most often? Which are most amazing? Note any questionable items that show students could benefit from learning more about Africa.

EXPLORE

Preview the Lesson

Display the **Africa Physical Map poster** and the **Africa Political Map poster**. Cover the captions. Then instruct students to examine the photos. As a class, discuss what each photo might reveal about Africa.

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 **Africa Physical Map poster**. Invite a volunteer to read aloud the text in the "Landforms" box at the top of the poster. Challenge the student to locate the Sahara on the map. Review the other boxes in this same way. Then read aloud the captions for each photo. Invite students to share what the map taught them about the physical characteristics of Africa.

Explore the Political Map

Display the **World Political Map poster**. Invite volunteers to read aloud the captions and the text in the boxes at the top of the poster. Have them find each location mentioned on the map. Then point out that the map key identifies country capitals and cities. As a class, locate a few capitals on the map. Then name a capital and challenge students to find the country where it is located.

ELABORATE

Find Out More

Point out to students that color is an important part of both physical and political maps. **Say:** *On these maps, Africa is very colorful. But the two other continents shown, Europe and Asia, are gray.* **Ask:** *Why would the mapmaker want to include Europe and Asia on these maps?* (to help readers understand how Africa fits in on a global context)

Extend Your Thinking About Africa

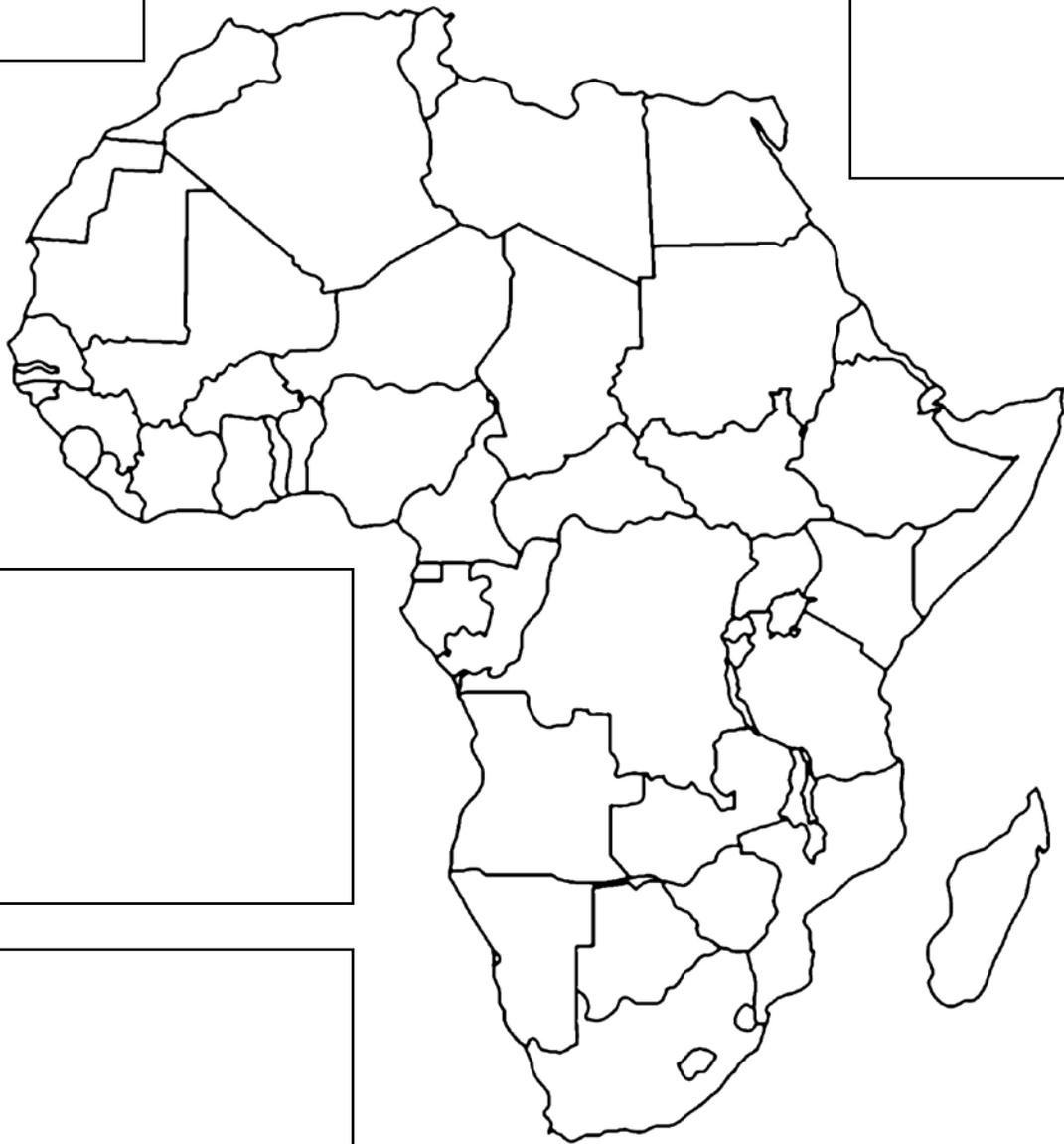
Give each student a copy of the **Africa Map Content Assessment Master**. In small groups, have students identify 20 countries in Africa. Then have groups conduct research to find four more facts about the physical or political traits of Africa. Have students summarize and illustrate each fact on their maps.

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 African geography.

CONTENT ASSESSMENT: Africa Map

Identify 20 countries in Africa. Write four new facts about Africa's physical or political characteristics. Draw a picture to illustrate each fact.



COMPREHENSION CHECK: Africa Map

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

1. What is the largest country in Africa?
Ⓐ Algeria
Ⓑ Seychelles
Ⓒ Libya

2. What is the Sahara?
Ⓐ a grassland
Ⓑ a desert
Ⓒ a mountain range

3. What type of landform covers most of Central Africa?
Ⓐ desert
Ⓑ mountains
Ⓒ rain forest

4. What is the most important industry in Africa?
Ⓐ agriculture
Ⓑ mining
Ⓒ music

5. Summarize one political fact and one physical fact you learned about Africa.

Tall Tales

Assess Vocabulary, page 7

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

conservationist: a person who works to protect animals and plants and promotes the careful use of natural resources

habitat: the place where a plant or animal lives

species: a group of animals or plants that are similar and can produce young animals or plants

Sketches should accurately reflect the meaning of each word. The larger picture should show how the words are connected. Students should label their representation of each word in the larger picture.

Assess Language Arts, page 8

Possible responses:

What: Different groups of giraffes live in different parts of Africa; Groups of giraffes lost contact with each other long ago and evolved; There are now four species of giraffes.

How: Scientists took tissue samples from each major group and compared them under a microscope. The samples were different, meaning the giraffes were from different species.

Students should write a short essay that includes facts from the article that support their opinions.

Assess Content, page 9

Masai giraffe: dark brown, jagged, leaf-shaped spots surrounded by creamy color; no spots on legs; live in southern Kenya, Tanzania, and Zambia

northern giraffe: chestnut brown spots surrounded by paler tan; no spots on legs; live in East and central Africa

reticulated giraffe: large orangey-brown spots surrounded by thin streaks of creamy white; pattern goes all the way down the legs; live in East Africa

southern giraffe: chestnut brown spots with jagged edges surrounded by paler tan; pattern goes down the legs; live in southern Africa

All: Answers may vary. Students will likely note a giraffe's size, its spots, any of the body parts mentioned in the diagram on pages 4-5, or that all giraffe species live in Africa

Comprehension Check, page 10

1. B; 2. C; 3. A; 4. C; 5: Possible response: There are fewer than 100,000 giraffes in Africa. That's not a lot for four species and makes them more likely to become extinct.

Show Me the Money!

Assess Vocabulary, page 15

Students should record the words and definitions from the Wordwise feature on page 15.

barter: the exchange of goods and services for other goods and services

commodity: any good that is used in trade

currency: money in any form that is actively used in trade

value: the worth of an object

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

Assess Language Arts, page 16

Sections that students identify for each type of text structure may vary. All choices should be supported with valid reasons. Students are most likely to identify chronology as the overall text structure because the text explains how trade progressed from bartering to digital transactions. If they select another option, they should provide a logical explanation for their choice.

Assess Content, page 17

Answers will vary, but students should write one sentence that accurately summarizes the content of each section. Timelines should include text and illustrations related to each section of the article.

Comprehension Check, page 18

1. B; 2. A; 3. C; 4. C; 5: Answers will vary, but students may note that using money means people don't have to trade actual goods and services, trades can be done over long distances, and people can trade for goods of different values.

In Search of Pristine Seas

Assess Vocabulary, page 23

Students' predictions and the sentences they write will vary. They should record the words and definitions from the Wordwise feature on page 23.

atoll: a ring-shaped reef, island, or chain of islands made of corals

ecosystem: a community of plants and animals that depend on the same environment

mutineer: a person, especially a soldier or sailor, who rebels or refuses to obey the orders of a person in authority

lagoon: a shallow body of water separated from the sea by a reef

pristine: unspoiled

Assess Language Arts, page 24

Students should record five explicit statements and five inferences. Inferences may vary but should be logical and directly relate to information in the text.

Assess Content, page 25

Objective: to find pristine seas and protect ocean ecosystems

Ducie: pristine atoll with healthy, thriving corals covering the ocean floor; many sharks and other fish

Henderson: flat green island that is untouched by humans; many sharks, Napoleon wrasses, and aggressive red snappers; amazing corals; healthy ecosystem; fishing gear near the east beach

Oeno: atoll with shallow lagoon; many giant clams; clear water; barracudas and other predators offshore; no sharks

Pitcairn: great corals; lots of fish; no sharks; population of about 50 people; reports of large fishing boats offshore at night

Proposed Solution: They wrote a proposal to create a marine reserve. It was passed, resulting in the world's largest marine protected area.

Prediction: Answer will vary.

Comprehension Check, page 26

1. B; 2. C; 3. A; 4. B; 5: Possible response: Illegal fishing removes animals that are needed for a stable ecosystem, such as sharks. Lost gear can pollute the waters and beaches.

Africa Map

Assess Content, page 28

Students should correctly label 20 countries in Africa. Facts will vary, but each should be accurate and include a relevant illustration.

Comprehension Check, page 29

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