Learning Activity:

Proportional Perspectives:
Recognizing Significant Values and Measurements

Activity Type	Evaluating Ratios and Statistics
Focus Area	Mathematics, Reading
Time Required	45–60 minutes

Overview

In science, we often see many numbers in the form of percentages, measurements, statistics, and calculations, but it can be challenging to put such numbers into context. How much is a billion? Is a 17% loss significant? In this activity, students will learn how to contextualize percentages and other statistics taken from World Wildlife Fund's global biodiversity assessment publication, *Living Planet Report 2022*. By establishing a better understanding of the significance behind the numbers, this activity will help learners evaluate the messaging in the report regarding the state of our planet and consider ways to communicate this information to others.

Objectives

After completing this activity, students will be able to

- use different strategies to visualize percentages, fractions, and ratios
- understand how to interpret mathematical values within a scientific context
- explain the significance of the values in the *Living Planet Report 2022* as they relate to the state of global biodiversity and the impact of human activity

Five lions drinking together, Ndutu, Tanzania

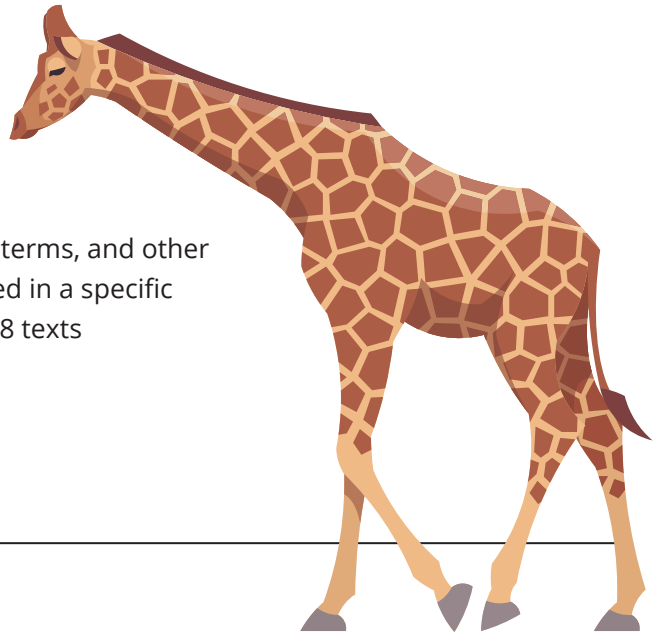
Standards

Common Core State Standards for Mathematics: Ratios and Proportional Relationships

- 6.RP: Understand ratio concepts and use ratio reasoning to solve problems.

Common Core State Standards for English Language Arts: Reading for Literacy in Science and Technical Subjects

- RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.



Materials Needed

- Writing utensils
- Calculator
- Computer access for every one to two participants
- Copies of the student handout (included) for each individual
- Access to electronic or printed copies of ***Living Planet Report 2022: Youth Edition*** for every one to two participants

Vocabulary

- **Biodiversity:** all the different kinds of life found in one area, including animals, plants, fungi, bacteria, and genetic material
- **Percentage:** a part of a whole expressed in hundredths
- **Ratio:** the relation, in quantity, amount, or size, between two or more things
- **Unit:** a defined quantity (e.g., length, time, value) used as a standard of measurement
- **Value:** a numerical quantity that is assigned or is found by calculation or measurement

Activity Procedure

Teacher Preparation

- A portion of this activity asks students to read through the ***Living Planet Report 2022: Youth Edition***. WWF's *Living Planet Report* is a comprehensive study of trends in global biodiversity and the health of the planet. Published every two years, it serves as a report card for Earth that examines the species and regions showing the most severe loss due to human activity and what can be done to reverse the declining trends. Based on the needs of your students, determine whether you'd prefer to have them read independently or in pairs and whether you'd prefer using printed or digital copies of the reading material.

Part 1: Engage

- Allow learners 10–15 minutes to familiarize themselves with the *Living Planet Report 2022: Youth Edition*. As they skim, readers should consider the following questions, to be discussed afterwards as a large group:
    - What is the report about?
    - What are the key messages that the authors are trying to convey?
    - What evidence (data) is included to help support the authors' messaging?

Part 2: Explore

- After calling for volunteers to share their answers to the initial questions, pose these follow-up questions to reflect on the statistics included in the report's youth edition and discuss as a class:
    - What kinds of mathematical values (e.g., percentages, decimals, fractions) did the authors use?
    - Were there any visuals used that helped put the values into perspective?

California sea lion resting in the canopy of a forest of giant kelp, Santa Barbara Island, California, US

Part 3: Explain

- Allow learners several minutes to discuss the following questions in pairs or small groups:
    - Do you think including these values and/or visuals helps the reader understand why the message is important?
    - Why or why not?
- In this activity, students will take a closer look at the numbers, units, and figures that scientists use when studying and evaluating biodiversity and will learn how to translate these values so that they are more easily grasped.

At the completion of the activity, learners should be able to answer the key question:

> **Key Question:** ***What determines the significance of values measured in scientific assessments?***

Part 4: Elaborate

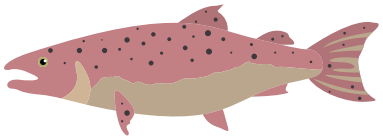
- Distribute copies of the included student handout to learners and instruct them regarding whether they are to work independently or in pairs. Participants will need computer access and possibly calculators to complete portions of the handout.

The questions on the student handout begin by challenging participants to put percentages and large numerical figures into perspective with basic visualizations and comparisons. Learners will then use these tactics to evaluate some of the numbers found within *Living Planet Report 2022: Youth Edition.*

A polar bear standing on an ice floe, Davis Strait, Canada

Part 5: Evaluate

- Upon completion of the student handout, conclude the activity with the following comprehension questions. You can choose to hold a class discussion, have learners discuss in pairs, or have them submit written answers independently.
    - Now that you've completed the student handout that challenged you to use comparisons to understand values, how do you feel when considering the authors' messaging regarding the current state of our planet's biodiversity?
    - In what ways is it important to use numbers to demonstrate change?
    - When are statistics helpful to include?
    - What other information might you need to make these values more meaningful?



Extended Learning Opportunities

- One of the measurements mentioned in the *Living Planet Report 2022: Youth Edition* is the Biodiversity Intactness Index (BII), which identifies how much biodiversity remains in a specific place compared to what once existed there. In the report, BII values are provided for Canada and the UK. Using the report and the internet for additional research, have students reflect on environmental threats affecting Canada and the UK that may have contributed to their respective BII scores.
- *Advanced Research Assignment:* Allow students to choose a species that they are interested in and research the population trends of that species over time. Students should compare the population counts and visually represent the values in a graph showing change over time. Challenge them to calculate a percentage for how the population has increased or decreased over a set number of years, and then put the percentage into perspective by comparing it to another measurement (as in the student handout). If time allows, students can research what caused the change in the population and present their findings.

Additional Resources

- Kahoot!: ***How has our planet changed? The Living Planet Report 2022***
- Recorded livestream: ***Earth's Report Card: The Status of Our Planet's Biodiversity***
- Video: ***Living Planet Report 2022***
- WWF webpage: ***Living Planet Report 2022***

Student Handout:

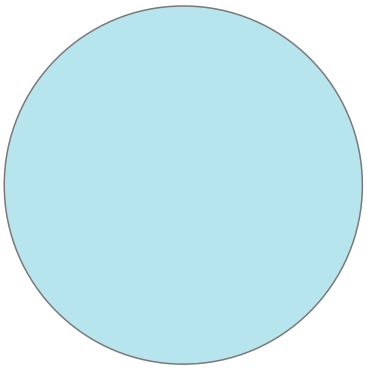
Proportional Perspectives:
Recognizing Significant Values and Measurements

Back to Basics: Visualizing Ratios

Visualizing percentages is not always straightforward, especially when they don't apply to situations that are familiar. It might be easy to picture 25% of a pizza, but what about 25% of a swimming pool? Or what if it were 14% of the pizza? As numbers and their contexts become more obscure, it can become challenging to estimate their proportions and understand their impacts.

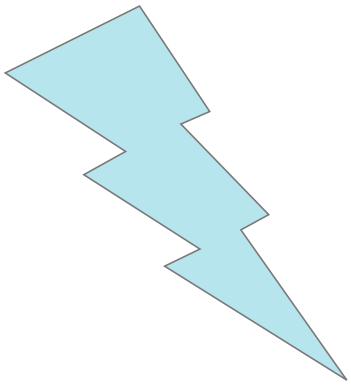
Shade in the percentages in the shapes below to practice estimating percent ratios.

1. Shade in 39%

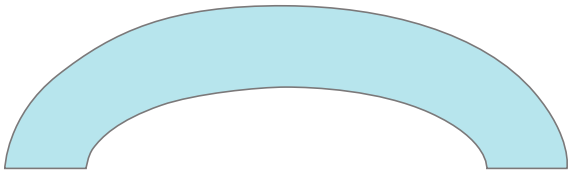


2. Shade in 78%

3. Shade in 93%



4. Shade in 7%



Back to Basics: Comprehending Large Digits

Is 1 billion really that much more than 1 million? Without concrete examples to use as a comparison scale, 1 billion might seem not that far off from 1 million, but it's actually a much larger numerical value. In fact, 1 billion is actually 1,000 millions. If you counted one number per second, it would take you around 11.6 days to count to 1 million, and it would take you about 31.7 years to count to 1 billion!

Using the internet for additional research, find real-world examples of the quantities listed in the chart below. See the examples provided and add your example in the blank space underneath.

Numerical Units	Examples of Units
100 **Your example ➔**	• There are 365 days in one year. • Humans have 206 bones. •
1,000 **Your example ➔**	• There are 3,600 seconds in one hour. • About 4,500 people visit the Metropolitan Museum of Art every day. •
10,000 **Your example ➔**	• The Earth's circumference is about 25,000 miles. • An African elephant can weigh up to 12,000 pounds. •
100,000 **Your example ➔**	• The human population of South Bend, Indiana, is 103,353. • Roughly 100,000 people are employed as pizza makers in Italy. •
1 million **Your example ➔**	• Netflix has over 230 million subscribers worldwide. • In the US alone, the production of food that is lost or wasted generates the same amount of greenhouse gas emissions as 32.6 million cars. •
1 billion **Your example ➔**	• Astronomers estimate that there are over 100 billion stars in the Milky Way galaxy. • There are almost 8 billion people on Earth. •
1 trillion **Your example ➔**	• Over 3 trillion pieces of chewing gum are produced each year. • A light year, the distance light travels in one Earth year, is about 6 trillion miles. •

Why Numbers Matter: Putting It in Perspective

In many cases, the defining factor that will impact the **significance** of a number is a comparison to something, as in a ratio. For instance, when you consider that Netflix has over 230 million subscribers worldwide, that may initially seem like a staggeringly large number. But when you add a comparative fact to put it into perspective, such as the fact that there are almost 8 billion people on Earth, does it change how significant 230 million is?

Review the statistics from the chart in the previous section and select one—either one that was provided or one that you researched. Then research a second, related statistic that will put the initial fact into perspective. Explain why you feel that including fact #2 with fact #1 could alter the significance of fact #1 and result in a different reaction upon reading.

Fact #1 (with units):

Additional fact (fact #2) to provide context:

How might fact #2 change people's understanding of the significance of fact #1?

Why Numbers Matter: Evaluating Biodiversity

Now that you've gotten a bit more familiar with putting different numerical ratios and values into perspective, apply your understanding to the topic of biodiversity loss as evaluated in the *Living Planet Report 2022* by answering the questions below.

1. One million species are threatened with extinction. Using similar methods to what was used to complete the chart in the previous section, can you show another way to describe this number to make it more relevant to your peers?

2. According to *Living Planet Report 2022*, in November 2018, a heat wave in Australia killed at least 23,000 flying fox bats in two days. If the heat wave reduced that population by one-third (or 33%), then how many flying fox bats existed prior to the heat wave? _____

   How many were still alive after the heat wave? _____

3. According to *Living Planet Report 2022*, our planet has warmed 1.2°C since preindustrial times. If our planet continues to warm beyond 1.5°C, then there could be severe effects on people and nature. Explain the significance of units, using these numerical values as examples.

   _____

   _____

   _____

4. The Amazon is home to at least 10% of all animal and plant species on the planet. How big of a number do you think that is? Make an estimate and, if time allows, research current global species estimates and then calculate how close you were!

   _____

   _____

   The trees in the Amazon release 20 billion tons of water into the atmosphere per day. Research to find another example of billions of tons so you can put this unit into perspective.

   _____

   _____

5. In 2020, it was reported that 68% of species populations had declined in the past 50 years; in 2022, this statistic increased, and it was reported that 69% of populations had declined in the past 50 years.

   Based on your work in this activity and your familiarity with the content in the *Living Planet Report 2022*, how significant is the 1% increase? Does this change warrant concern? How would you explain the significance to someone else?

   _____

   _____

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