

Teaching Notes
Lesson 2
Kenya
A Bottom-Layered Country

Overview:

Similar to Lesson 1, the problems in this lesson summarize data from the population pyramid graph, the population histogram, and the table. Students calculate decimals, percent, and ratios of various age groups and connect their calculations to the definition of a country's shape that is also defined in the lesson. The Modeling Continuum provides an overview of the rigor of the problems. In general, the problems are designed to address Levels 1 or 2 of the **Modeling Continuum**. The suggested classification of the problems is provided in the following table to help you assess students' work. Classification of the problems can be altered based on your implementation of the lesson with students. Consider assigning an **Exit Summary** after students complete the problems. If an **Exit Summary** is assigned, remind students to explain their answers using the **Exit Summary's** descriptors of the **Modeling Continuum**.

Modeling Continuum Classification

Level 1	Level 2	Level 3	Level 4
Problems: 1, 2, 13, 15	Problems: 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 17, 18, 19		

Primary tools students use in this lesson to answer the above problems are:

Arithmetic operations, proportions, percent, areas, ratios.

See the connection of these tools to high school standards in the **Overview of the Module**.

Resources needed for this lesson:

The data story, **Kristin and Raphine's Story – Chapter 2**, begins the lesson. This story introduces new characters who are important in understanding the population distribution of Kenya. Students need **Handout 2: Kenya – 2015** to solve the problems. This lesson would benefit with visuals that were also suggested in Lesson 1, namely a map of the world or a globe or a geographical app.

Launch:

Consider starting this lesson with a discussion of Kenya. Locate it on a map or globe. Highlight the geographical shape of the country, its location on the continent of Africa, and its distance from the United States or Japan (the next country they will study).

Direct students to read **Kristin and Raphine’s Story – Chapter 2**. This data story is included in the student edition for Lesson 2. After appropriate reading time, ask students to summarize some of the points of the story. For example:

- How old was Raphine at the start of 2015?
- What was Raphine’s job in Kenya?
- Why was Raphine interested in moving for a period of time to the United States?
- How was Kristin going to help Raphine?

Direct students to study the population pyramid graph and the histogram of Kenya. As you did in Lesson 1, ask general questions to determine if students understand the information summarized by the graphs.

- What is an estimate of the count of 0 – 4 years old from the histogram?
- What is an estimate of the count of 35 – 39 years old from the histogram?
- How do you think the counts summarized in the pyramid graph were obtained? This question is far more difficult to answer, however, for Kenya than for the United States. Allow students to suggest possible ideas. Point out, however, that unlike the United States, Kenya and most of the countries of the world do not have a constitution that directs a census every 10 years. The data reported by the International Data Base was obtained by actual counts of people, projection models similar to the models developed in this module, and sampling techniques.

Implementation Ideas:

As suggested in Lesson 1, consider assigning students to small groups. Several of the problems involve calculations that could be more efficiently derived through group work. In addition, the questions that ask students to share an idea are more interesting when discussed within small groups before discussed with the entire class.

The population graphs (both the pyramid graph and the histogram) have very different shapes than the graphs representing the United States. Students are instructed in the lesson to summarize the data using **Handout 2**. Comparing the counts and percent of various age groups can be derived using the table or the lengths of the bars or areas of the histogram. The greater counts of the younger age groups will also be highlighted in Lesson 4 as students estimate a mean age, median age, and spread for Kenya.

Kenya’s future shape will be discussed in Units 3 and 4. The projected shape for Kenya in 2050 is different than its current shape and its recent past shapes. Students will continue to work with the population data of Kenya and summarize how the estimated population counts might be revised in the future, resulting in noticeable changes on the pyramid graph. Highlight that the youngest age group in 2015 (the 0 – 4 years old) indicates fewer younger people than the 5 – 9 years old age group. This noticeable decrease will explain some changes in the shape of the country in the latter units of this module.

Student responses or descriptions

Lesson 2 - Problems

Handout needed to complete the following problems: Handout 2: Kenya – 2015

1. What 5-year age group has more people counted in it than any other age group?

The age group 5 - 9 years old has the most people.

2. In what age group was Raphine counted in the 2015 population pyramid graph or histogram? In what age groups were the students in his school counted at the start of 2015?

The 35 – 39 years old identifies the age group Raphine was counted in the beginning of 2015. (Note, Raphine is approximately the same age as Kristin. This age group is an important marker in looking back and looking forward.) The students in Raphine’s school are counted in the 5 – 9 and 10 – 14 years old age groups.

Review again the definitions that were presented in Lesson 1:

A population distribution is defined by the following *layers*:

- The **bottom-layer** refers to the counts of people in the 0 to 24 years old age groups.
- The **lower middle-layer** refers to the counts of people in the 25 to 49 years old age groups.
- The **upper middle-layer** refers to the count of people in the 50 to 74 years old age groups.
- The **top layer** refers to the count of people in the 75 to 100+ years old age groups.

Based on the summary of layers, a country’s shape is defined by the following terms:

- A country that has most of its people in the bottom-layer is identified as **Bottom-Layered Country**.
- A country that has most of its people in the lower middle-layer is identified as a **Lower Middle-Layered Country**.
- A country that has most of its people in the upper middle-layer is identified as an **Upper Middle-Layered Country**.
- A country that has most of its people counted in the top layer is identified as a **Top-Layered Country**.

3. Estimate what layer (bottom, lower middle, upper middle, top) you think will have the least number of people in Kenya? Explain how you made your estimate.

Top layer has the smallest area of the graph, representing the older people in the country.

4. Estimate what layer you think will have the greatest number of people? Explain how you made your estimate.
Bottom layer has the largest area of the graph, representing the youngest people in the country.

Mark on the **pyramid graph** and the **histogram** a designation indicating where each of the above layers begin and end.

5. Using the table of population counts on **Handout 2**, what is the percent of people 0 to 24 years old?
Total count of the 0 to 24 years old is 27,655,707 people using the table. This is approximately 60.2% of the Kenyan population.
6. In a similar way, what is the percent of the count of people 25 to 49 years old?
Total count of the 25 – 49 years old is 13,977,786 people. This is approximately 30.4%.
7. What is the percent of the count of people 50 to 74 years old?
Total count of the 50 to 74 years old is 3,871,954 people. This is approximately 8.4%.
8. What is the percent of the count of people 75 to 100+ years old?
Total count of the 75 to 100+ years old is 419,854 people, or approximately 0.9% or approximately 1%.
9. Identify two age groups in which the number of people in one age group is approximately double the count in the other age group.
Answers vary. Possible selections: the count of 45 – 49 years old is approximately double the 60 – 64 years old. Also, the count of 0 – 4 years old is a little more than double the count of 30 – 34 years old. Other answers should be considered.
10. Raphine’s data story indicates that he was unable to accept all of the kids who wanted to attend his school. In what way do the graphs indicate that finding a school for all of the young people might be one of Kenya’s challenges?
There are 12,709,028 people (or approximately 27.7% of the country) who are in the age groups 5 to 9 and 10 to 14 years old. This is a large percent of the country expecting educational services.
11. Identify one of the age groups from the table that has more than 10% of the total population of Kenya.
Age groups 0 – 4, 5 – 9, 10 – 14 years old each have more than 10% of the total population within the age group.

12. Estimate the count and percent of teenagers (13 to 19 years old). Explain how you derived your estimate. (Estimates will vary.)

Consider the count of 13- and 14-years old people to be $\frac{2}{5}$ of the people counted in the 10 – 14 age group plus all of the people estimated in the 15 -19 years old age group. Therefore, an estimate of the count of teenagers is: $(\frac{2}{5}) \times (5,950,852) + (4,494,168)$ or approximately 6,874,509 people or approximately 15% of the country's population.

13. What is the count of people who are under 10 years old?

The estimated count of 0 – 4 years old is 6,376,220 and the estimated count of 5 - 9 years old is 6,758,176. The total is 13,134,396 people.

14. What is the percent of the count of people who are under 10 years old?

Approximately 28.6%

15. What is the count of people who are 65 years old or older?

Count of age groups from 65 – 69 to 100+ is 1,309,451 people.

16. What is the percent of the count of people who are 65 years old or older?

Approximately 2.9%

17. Why is it important that the count and percent of people under 10 years old and 65 years old or older are given special attention?

The people in these age groups are likely to need the most care.

18. “Old” and “young” are subjective descriptions that in many cases are defined by several factors other than age (for example, health status, or income status). For this unit, however, consider the definition of “young” as people less than 10 years old, and the definition of “old” as people who are 65 years old or older. What is the ratio of “old” to “young” using the above definitions of young and old? Derive a decimal from this ratio and interpret it by describing the approximate count of “old people” to the count of “young people.” Express your answer to the nearest person.

The “old” population is 1,309,451 people and the “young” population is 13,134,396 people. The ratio is 1,309,451 to 13,134,396. The decimal value is approximately 0.10. To answer the question indicating the number of old to young people, work with students in multiplying $0.10/1$ by $10/10$. The result is 1 over 10 or 1 old person to 10 young people.

19. If there are approximately 500 students in a typical school for students who are 5 to 14 years old, estimate the number of schools needed to educate the students who are 5 to 14 years old.

Add the count of the 5- 9 years old and the count of the 10 – 14 years old, or:

$6,758,176 + 5,959,852 = 12,709,028$ people. The estimate of the number of schools would be:

$12,709,028 \text{ people} / 500 \text{ students per school}$ is approximately 25,418 schools.

Assessment Ideas

Assessment Task:

Consider the following assessment task to evaluate a student's understanding of the lesson. This task also provides an opportunity to evaluate whether or not the goals of this lesson are making sense to students.

Waldo, a small town of 1000 people, is located near a large city. Over the last 10 years, several people moved out of the city to Waldo to raise their children. Waldo has over 200 children in their elementary school and more than 100 students in their middle and high schools. The town is described as having a lower layered population distribution. Sketch a histogram of the people's ages in Waldo using the same design presented in this lesson. After you have made your sketch, answer the following:

1. Indicate why your sketch represents a lower middle-layered town.
2. Identify a 5-year age group in your sketch that you think will have the greatest percent of town's population. Explain your reasoning in selecting that age group.
3. Estimate the percent of students in Waldo's grade school and middle and high school?

Comments on the Assessment Task:

Evaluate students' work based on the definition of a lower layered population distribution. Given the counts of people in school, a sketch of the histogram of Waldo should represent most of the town in the younger age groups, or 0 – 4 years old, 5 – 9 years old, 10 – 14 years old, 15 – 19 years old, and 20 – 24 years old. As a lower layered population distribution, expect students to identify an age group in the lower layer to have the greatest percent of the town's population. Given the estimated counts of children in the elementary school (over 200 people), and the young people in the middle and high schools (over 100 people), students' estimate of the people in the 0 – 24 years old age groups would be at least 30% (or over 300 people in a town of 1000 people).

Additional Assessment Ideas:

Wrap up the discussion of this lesson by asking students or the small groups to identify at least one problem to summarize to the whole class. Ask each group to include in their summary why they think their answer is connected to the lower layer shape of Kenya. If time is limited and organizing a class discussion is not possible, direct students to write a couple of sentences explaining their summaries.

Wrap up the discussion with students by indicating that the age groups 30 – 34 years old and 35 – 39 years old are key groups of people in any country. People in this age group are making decisions about where to live, about whether or not to have children, and about how to make a living. Clearly, these questions need to be addressed by Raphine as he plans his future.