

Teaching Notes
Lesson 3
Japan
An Upper Middle-Layered Country

Overview:

Similar to Lessons 1 and 2, the problems in this lesson summarize data from tables or graphs. Students derive and interpret decimals, percent, and ratios. The suggested classification of the problems using the **Modeling Continuum** is included in the following table. Similar to the previous two lessons, the classification of these problems is subject to interpretation by students or teachers. This lesson primarily asks students to summarize data provided in **Handout 3**. Students are asked to compare their summaries in this lesson to similar summaries for the United States and Kenya that they previously derived. In this way, the problems are beginning to move students thinking to higher levels.

Modeling Continuum Classification

Level 1	Level 2	Level 3	Level 4
Problems: 1, 2, 13, 15, 17	Problems: 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 19, 20, 21		

Upon completion of the problems, consider directing students or small groups of students to identify one problem to discuss with the whole class, explaining to the class the solution to the problem and the steps used to solve the problem. Also consider assigning students to identify at least 2 problems to summarize on the **Exit Summary** handout. As previously stated, remind students to focus their classification of the selected problems using the descriptors of the **Modeling Continuum**.

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 Hana's Story – Chapter 3**, begins the lesson. This story introduces new characters who are also identified in the problems. Students need **Handout 3: Kenya – 2015** to complete the problems. This lesson, as was the case for the previous two lessons, would benefit with visuals that were also suggested in Lesson 1, namely a map of the world, a globe, or a geographical app of the world.

Launch:

Similar to Lessons 1 and 2, start this lesson by finding out what students know about Japan. Where is Japan located on a map or globe? Is it a big country?

Direct students to examine the population pyramid graph and the histogram included on **Handout 3 – Japan 2015**. The raggedness of this graph is something that stands out as different about Japan’s graphs. The special features of Japan’s graphs will be discussed in other lessons of this module.

After the initial review of the population graphs, provide time for students to read the data story, **Kristin and Hana’s Story – Chapter 3**. Anticipate at least 3 minutes of reading time. After they have read the story, discuss the following questions:

- What age group counted Hana at the beginning of 2015?
- What is one of Hana’s main concerns as she looks to the future?
- Does the population pyramid graph or population histogram provide any indication why Hana is concerned about caring for her mother and grandmother?

Identify the uneven population counts noticed in the population pyramid graph and the population histogram. Particularly point out to students the count of people 65 – 69 years old and the count of people 40 - 44 years old age. Highlight that these two age groups have similar counts of people. Also observe that the counts in these age counts are greater than the counts in other age groups of the country. Although this observation is also addressed in the problems, the counts in these age groups contribute to the unique shape of this country’s population graphs.

You might consider asking students to explain their thinking about these unusual counts, especially when comparing Japan to Kenya and to the United States. Also, students might ask why is the 0 - 4 years old age group so small. If time is available, encourage students to independently research these questions. To move this lesson along, however, explain that the primary explanations for these counts are a result of changes in the birth rates and events such as wars (both of these factors were a major part of Japan’s past).

Implementation Ideas:

Japan’s population pyramid graph is quite different than the pyramid graphs of the United States and Kenya. As students work through the problems, consider displaying the 3 population pyramid graphs or the population histograms of the countries side-by-side using the handouts. Compare the different counts for selected age groups. For example, Kenya’s pattern is larger counts for younger age groups and smaller counts for older age groups; the United States has a pattern of increasing, decreasing, increasing, and then decreasing counts of the age groups. Japan’s pattern has several of the older age groups increasing in counts. The age groups that stand out in Japan’s graph should also be compared to the people in the same age groups in Kenya and the United States. Consider comparing the percent of people in the age groups of 65

– 69 years old and 40 – 44 years old for each country. The differences in the percent of people in these age groups is part of the reason Japan’s population is summarized as an upper middle-layered country.

As suggested in Lessons 1 and 2, consider arranging your students in small groups. Several of the problems involve calculations that could be more efficiently derived by sharing the work among students. The questions that ask for students to explain their answers are more interesting when discussed within small groups before discussing them with the entire class.

Student responses or descriptions

Lesson 1 - Problems

Handout needed to complete the following problems: Handout 3: *Japan – 2015*

1. What 5-year age group records the greatest count of people?
Based on the table, the age group 65 – 69 years old have the most count of people.
2. Identify the age group that has the second highest count of people.
Based on the table, the age group 40 – 44 years old has the second most count of people.
3. Identify the age group of people younger than 80 years old with the least count of people.
Of the age groups less than 80 years old, the age group 0 – 4 has the least count of people.
4. The story indicated that Hana celebrated her 36th birthday in 2015. Identify on the population graph or the population histogram Hana’s age group in 2015.
 - a. What is the age group adjacent to Hana’s age group that is younger? Is that age group “less than” or “greater than” that the count in Hana’s age group?
Hana is counted in the 35 – 39 years old age group. The count of people 30 to 34 years old is less than the count of 35 to 39 years old by approximately 800,000 people.
 - b. What is the age group adjacent to Hana’s age group that is older? Is that age group “less than” or “greater than” that the count in Hana’s age group?
The age group just older than Hana’s age group is 40 – 44 years old. The count of people 40 to 44 years old is approximately 1.2 million greater than the count of 35 to 39 years old.
 - c. Is the above summary of the age groups younger and older than Hana different than the summary of these same age groups in the United States? If yes, describe the difference. (See **Handout 1** to review the count of people in these age groups in the United States.)

In the United States the count of people 30 to 34 years old is greater than the count of 35 to 39 years old. Also, the count of people 40 to 44 years old was slightly less than the count of people 35 to 39 years old. The comparisons are not the same when comparing countries.

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

The top layer as it has a sharp narrowing decline in the counts as the age groups get older.

6. Estimate what layer you think will have the greatest count of people? Explain how you made your estimate.

Simply based on the graphs, it is not clear what layer of the two middle layers (lower middle-layer or upper middle-layer) has the greatest count of people. The sum of the counts is needed to determine which layer has the most count of people.

7. Use **Handout 3** to derive an estimate of the percent of the count of people who are 0 to 24 years old in Japan. (Round your answer to the nearest 10th of a percent.)

28,918,110/126,919,659 is equal to 0.228 or 22.8%.

8. In a similar way, what is the percent of the count of people 25 to 49 years old?

40,240,247/126,919,659 is equal to 0.317 or 31.7%.

9. What is the percent of the count of people 50 to 74 years old?

41,396,600/126,919,659 is approximately equal to 0.326 or 32.6%.

10. What is the percent of the count of people 75 to 100+ years old

16,364,699/126,919,659 is approximately equal to 0.129 or 12.9%.

11. Based on the above definitions of a country's shape, what is the description of the shape of Japan's population graphs?

*This country would be classified as an **upper middle-layered country** as the layer representing the count of people 50 – 75 years old has the greatest percent of the population.*

12. Identify two age groups in which the count of people in one age group is approximately double the count in the other age group.

Answers vary. There are 6,151,388 people who are 15-19 years old. This is nearly double the count of people who are 85 – 89 years old. Also consider that there are

6,260,248 people in the age group 75 – 79 years old. This is nearly double the 3,171,849 people who are 85 – 89 years old.

13. Hana's data story indicates that she was concerned about her parent's future. In what way do the graphs indicate why she might be concerned about their future?

Hana's parents age group, or age groups 65 – 69 or older, have a large count of people. People in these age groups may require special home or health care services in the future. Hana is unclear if there will be a sufficient number of people or resources to provide that help to a large percent of the country, especially given that the age groups who would be taking care of this group of people are a smaller percent of the country's populations.

14. Identify at least one age group that has approximately 1 million more females than males.

Answers vary. The female count of the 80 – 84 years old age group has close to 1 million more females than males. Also, the 85 – 89 age group has approximately 1 million more females than males. There are other examples for this question.

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

Let the count of teenagers 13 and 14 years old be estimated as $\frac{2}{5}$ of the people who are 10 – 14 years old. Therefore, an estimate of the count of teenagers is: $(\frac{2}{5}) \times (5,749,262) + 6,151,388$ people or approximately 8,451,093 teenagers.

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

0 – 4 years old are 5,272,998 people and 5 – 9 years old are 5,612,088 people for a total of 10,885,086 people.

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

$10,885,086/126,919,659$ is approximately equal to 0.086 or 8.6%.

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

Using the table, the count of 65 to 100+ years old is 33,750,203 people.

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

$33,750,203/126,919,659$ is approximately equal to 0.266 or 26.6%.

20. 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.

21. “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 one “young person.” Express your answer to the nearest person.

33,750,203 to 10,885,086 is the ratio. As a decimal, this is 3.10. This indicates a slightly more than 3 old people to 1 young person.

22. If there are approximately 500 people in a typical special care facility designed for people 90 years old or older, how many facilities were possibly needed in 2015?

There are 1,452,801 people 90 – 94 years old plus 441,584 people 95 – 99 years old plus 91,338 people 100+ years old for a total of 1,985,723 people. Divide this total by 500 people per special care facility. The results are approximately 3,971 facilities.

Assessment Ideas:

Assessment Task:

Consider the following assessment task to evaluate a student’s understanding of this lesson. This task also provides an opportunity to evaluate whether or not the problems completed by your students result in an understanding of an upper middle-layered country.

Consider the following scenario. Your teacher described the population of a small town she or he visited as an upper middle-layered town. Answer the following questions:

1. Your teacher decided to have lunch in a restaurant of this upper middle-layered town. What age groups of people would you expect your teacher encountered the most and why?
2. Your teacher heard that the town's leadership team was holding talks about what they plan to do to help their residents. What issues do you think the residents mentioned the most in these talks?
3. If the population pyramid graph of this town looks very similar the population pyramid graph of Japan, would you expect to see people older than 90 years old in this town? Why
4. Do you think this town has a large percent of elementary school students (or students who would be in kindergarten to 5th grade)? Explain your answer.

Comments on the Assessment Task:

This task highlights the distinctive features of a population in which the older age groups have the greater counts of people. If the people eating at a restaurant are similar to the population distribution of Japan, you would expect most of the people in the restaurant are 65 – 69 years old, or 40 – 44 years old. It is anticipated that most students would summarize these people as “old”. This summary is very different than what you would expect in Kenya or the United States.

Students might indicate that the most important topic the residents of the town want to discuss is related to the care or life style of older people. Whatever topic students identify, their reasoning should be connected to the distribution of the older age groups.

The counts of people 90 years old or older is noticeable in the population pyramid graph of Japan (approximately 2 million people are 90 years old or older out of approximately 127 million people, or approximately 1.5%). Although a small percent of the total population, people in these age groups are more noticeable in the graphs of an upper middle-layered country than in the graphs of the United States or Kenya.

Students assessment of whether or not the town has a large number of elementary students is subjective (what is large?). What is important is that students would highlight that if it was similar to Japan’s shape, you would expect less than 10% of the population in the age groups of 0 – 4 years old and 5 – 9 years old. This is a smaller percent than what they noted for Kenya or the United States or countries with similar shapes to the United States or Kenya.

Additional Assessment Ideas:

After students complete the problems, consider asking students to discuss selected problems from the lesson. Several problems could be identified for discussion that indicate if students understood the lesson, and specifically how Japan is different than the United States or Kenya. Problem 20 returns to the question of what is the ratio of “old” to “young”. Review with students that the same ratio represented approximately 1 older person to 10 younger people in Kenya, and approximately 1 older person to 1 younger person in the United States. The ratio in Japan is approximately 3 older people to 1 younger person. This ratio is an important summary of the population of Japan. Also consider using problems 13, 14, and 21 in assessing students understanding of the unique counts of Japan’s age groups.