Power of the Pyramids

Student Activity

Method:

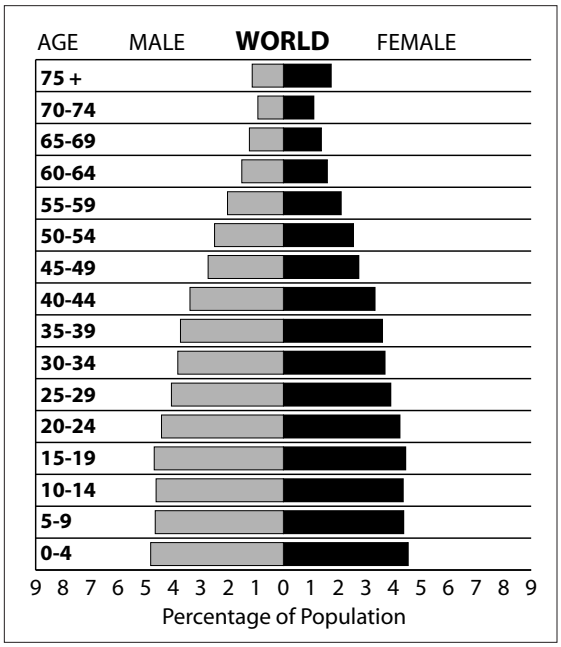
Students construct and interpret population pyramids and discuss differences in population growth rates among several different countries.

Introduction:

To help them make population projections for different countries, **demographers** (who study population) look at the profile of the countries' residents. What are the ages of the people? How many are men? How many are women? Taking this information, they construct **population pyramids** like the ones students will create in this activity. These graphs depict the configuration of a country's population as impacted by 70 to 80 years of economic, political, and natural events. These graphs can also help predict future population trends.

Procedure:

1. Display the world population pyramid and explain that this is a kind of graph used by demographers to study the distribution of people across age and gender categories.



2. Explain to the students that the graph represents the entire world population sorted by age and gender, with the youngest at the bottom and the oldest at the top. Each age level grouping is called a **cohort**.

3. Assign each student or group of students one of the six countries, and distribute graph paper and a copy of the student worksheet for that country.

4. The figures on the worksheet represent the population (in thousands) of each age group within each gender for each particular country. In order to construct the country's pyramid, students must first calculate the percentage of the population of each gender in each age group.

Example: According to the worksheet, the United States' total population in 2007 was 301,139,947. The population of males ages 0-4 was 10,635,491.

$$\frac{10{,}635{,}000}{301{,}140{,}000} = .035 \text{ or } 3.5\%$$

Students should complete these calculations for each cohort.

4. Using graph paper, students can construct a population pyramid as in the example. A line drawn down the middle of the graph separates the male and female populations. The percentages of the population will be plotted along the X-axis with females to the right of the center line, males to the left. The age groups will be running up the Y-axis with the youngest at the bottom, oldest at the top. (See "World Population Pyramid" for an example.)

5. Have students graph the percentage data for their assigned country.

6. Have students hold up their finished graphs for all to see while going through the follow-up questions in class.

Concept:

The age and gender distribution of a regional or national population affects its growth rate and provides information on its past, present, and future growth patterns.

Objectives:

Students will be able to:

- Calculate percentages using raw numbers for each age/gender group in a given population.
- Construct a population age/gender distribution graph for one of six different countries.
- Make correlations between the shapes of the graphs and the growth patterns of different countries.

Subjects:

Mathematics, biology, social studies, environmental science

Skills:

Calculating, graphing, analyzing and interpreting data

Materials:

Copies of student worksheet
Power of the Pyramids graph paper
Colored pencils
Rulers
Calculators

Key Terms: **cohort, demographers, population pyramid**

Discussion Questions:

1. Where are you represented on the tables and on the graphs?

If you live in the United States and were between 10 and 15 years old in 2007, you are represented on line 3 in the U.S. data under either male or female. On the graph, you and your cohort made up the percentage presented by the third bar from the bottom, males on the left, females on the right.

2. Can you tell from the data if there are more male or female babies in each country?

Yes, there are more male babies. There is a slightly greater probability of giving birth to male children. For every 100 girls born, there are about 105 boys born.

3. Are there more elderly women or men? Why might that be the case?

There are more elderly women. Throughout the world, life expectancy for women is higher than for men. This is due to a number of genetic and social factors. In general, men are more predisposed to certain health risks than women. Also, men make up the vast majority of the military and are more likely to die during wars.

4. Can you tell from the graphs which country has the most people?

No. The graphs represent 100 percent of the population of each country broken down by age groups. Demographers use the percentage data instead of the raw data so that each graph fits on the same size paper and can be compared to the graphs of other countries.

5. Which country has the most people? How can you tell?

From the TOTAL line on the data sheet you can tell that China has more people than any other country.

6. Of the six graphs, which two look most like pyramids? What does that indicate about their population growth rates? What factors would change the shape of the pyramids in the future?

The graphs for Nigeria and India look most like pyramids. This indicates a high growth rate. Population growth occurs when the segment of the population currently in its childbearing years (ages 15-44; bars 4-9 on the graphs) has produced a generation larger than itself (bars 1-3). If the birth rate goes down, this would change the shape of the graph over time from a pyramid to more of a rectangle, indicating a more stable population.

7. Looking at the pyramids, which country appears to have the slowest rate of population growth? How can you tell?

France. The graph is closer to a rectangle than a pyramid, showing more uniform population size across the age groups. France has a birth rate and death rate that are roughly equal, which demographers call zero population growth.

8. Which are the largest age groups in the U.S.?

People aged 40-49 (in 2007) made up the biggest portion of the United States, with babies a close second. The people who were born between 1946 to 1964 are called "Baby Boomers." This "boom" began shortly after World War II, when many husbands and wives were reunited and the country experienced greater economic prosperity than it did during the years of the Great Depression and the war. Couples felt confident of the ability to support families, and the birth rate soared as a result. The children of Baby Boomers comprise a cohort sometimes called a "Baby Boomlet" or an "Echo Boom."

9. In which country do children make up the largest percentage of the population?

You can see on the graph that the bottom of the Nigerian and the Indian pyramids go out the farthest, representing the largest percentage. The percentages that you calculated show that Nigerian babies (males and females combined) make up about 16 percent (8 + 8) of the population, and the older children also make up a big percentage.

10. Some cultures have traditionally favored boy children over girl children (as can be seen in the pyramids for India and China). Why might couples prefer to have boys rather than girls in these countries? What are some consequences that may arise if a generation has a gender imbalance?

Parents may favor boys over girls in order to carry on an ancestral line, to avoid the high costs of a daughter's dowry, or from the traditional belief that boys are more valuable. In developing countries, boys are expected to take care of their parents in old age, as girls will marry and live with their husbands' families. As a generation matures, a shortage of girls leads to a shortage of women for men to marry. This condition can cause instability and result in kidnappings and violence towards women, massive migration of men seeking mates, the sale of women for marriage, etc.

11. If you had a business and wanted to capitalize on your information about the population age distribution for the U.S., what would you sell?

Answers might include any products for people of the Baby Boom generation or their children.

12. If you had a business in Nigeria and wanted to capitalize on your information about the Nigerian population, what would you sell?

Answers might include any products for children and infants.

13. How would you expect the Mexican pyramid to look if you graphed it 40 years from now?

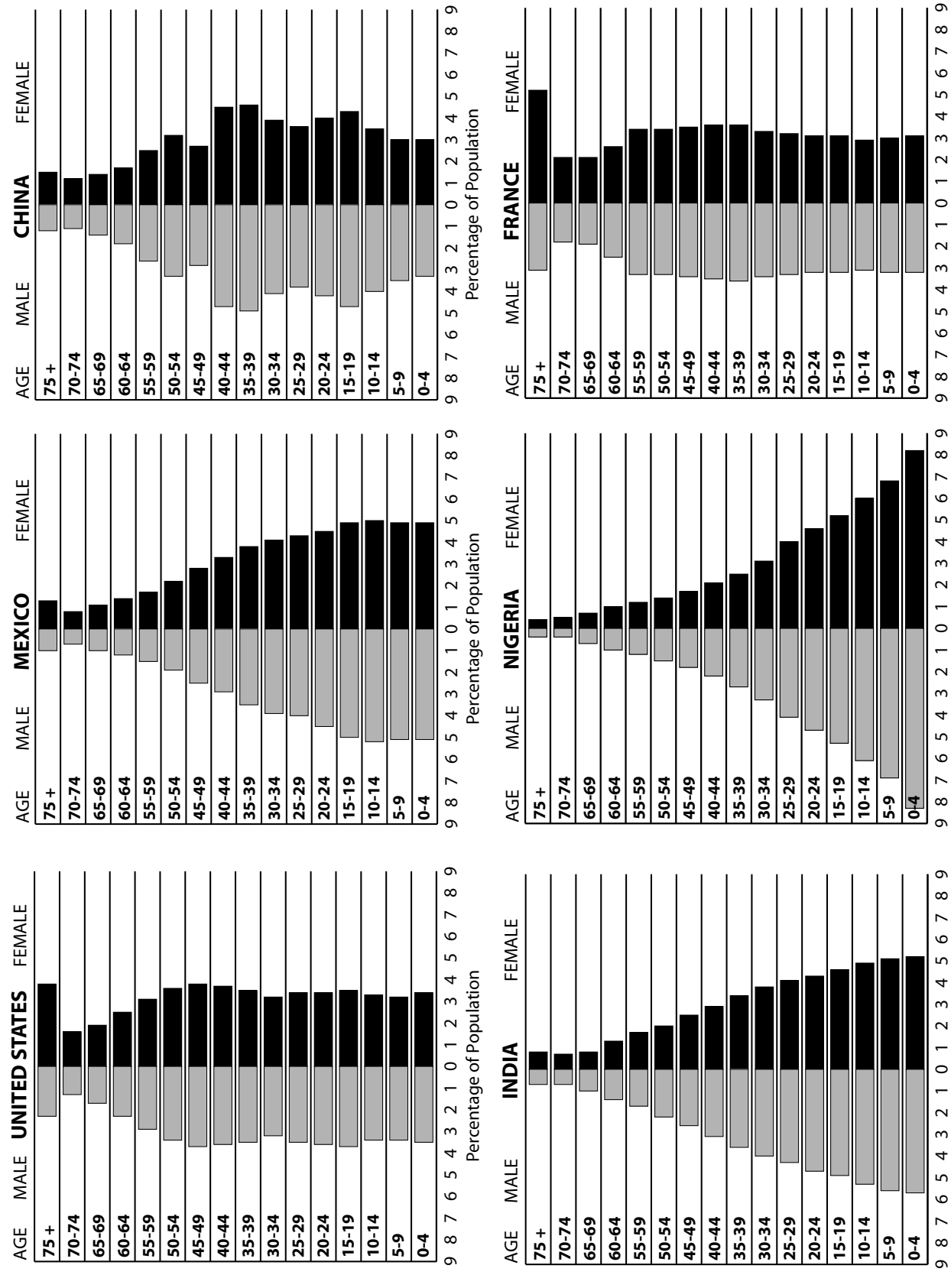
The graph shows that the Mexican population was growing rapidly about 30 years ago, when the rate of growth slowed. If this trend continues unchanged, the Mexican "pyramid" will gradually become more rectangular.

Assessment Idea:

Provide students with a population pyramid for a fictitious (or unlabeled) country. Population pyramids can be accessed and printed from the "Pyramids" section of the International Data Base at the U.S. Census website, www.census.gov. Have them explain what the pyramid shows, what sort of growth patterns they expect in the future, and what sort of concerns the government might have based on the population information.

Power of the Pyramids

Student Activity



Power of the Pyramids

Student Worksheet 1

Population in Thousands (2007)												
	United States				Mexico				China			
Age Group	M	%	F	%	M	%	F	%	M	%	F	%
0-4	10,635		10,181		5,532		5,293		44,095		39,021	
5-9	10,156		9,717		5,553		5,324		46,723		40,692	
10-14	10,360		9,880		5,612		5,394		52,708		46,894	
15-19	11,115		10,551		5,419		5,293		62,136		56,703	
20-24	10,794		10,241		4,857		4,945		55,406		52,237	
25-29	10,570		10,242		4,393		4,652		50,075		47,347	
30-34	9,786		9,596		4,252		4,468		53,965		51,894	
35-39	10,558		10,491		3,770		4,077		64,679		61,198	
40-44	10,878		11,003		3,148		3,574		62,035		59,138	
45-49	11,280		11,567		2,692		3,088		37,202		35,083	
50-54	10,272		10,721		2,426		2,426		43,977		42,011	
55-59	8,855		9,424		1,872		1,872		33,974		32,403	
60-64	6,889		7,531		1,532		1,532		22,630		22,581	
65-69	5,027		5,758		1,219		1,219		18,972		18,413	
70-74	3,857		4,727		770		914		15,022		15,695	
75+	6,975		11,506		1,392		1,392		15,690		20,249	
Total	148,007		153,136		54,439		55,463		679,289		641,559	
Total	301,143				109,902				1,320,848			

Source: U.S. Census Bureau, International Database, www.census.gov.

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Power of the Pyramids

Student Worksheet 2

Population in Thousands (2007)												
	India				Nigeria				France			
Age Group	M	%	F	%	M	%	F	%	M	%	F	%
0-4	64,688		58,527		11,216		11,055		2,069		1,972	
5-9	63,127		57,522		9,325		9,191		2,032		1,934	
10-14	60,393		55,307		8,185		8,056		1,963		1,870	
15-19	55,876		51,428		7,200		7,077		2,047		1,955	
20-24	52,609		48,813		6,342		6,213		2,054		1,972	
25-29	48,940		45,973		5,598		5,412		2,097		2,021	
30-34	45,242		42,945		4,506		4,212		2,153		2,083	
35-39	40,707		38,845		3,616		3,334		2,316		2,282	
40-44	34,734		33,003		2,957		2,798		2,242		2,272	
45-49	29,309		27,769		2,422		2,320		2,160		2,221	
50-54	24,298		23,054		1,986		1,926		2,083		2,164	
55-59	19,686		18,866		1,624		1,650		2,078		2,149	
60-64	15,577		15,338		1,292		1,336		1,570		1,645	
65-69	11,653		11,955		916		974		1,197		1,325	
70-74	7,942		8,605		583		648		1,116		1,369	
75+	7,663		9,471		488		573		1,963		3,344	
Total	582,444		547,421		68,256		66,775		31,140		32,578	
Total	1,129,865				135,031				63,718			

Source: U.S. Census Bureau, International Database, www.census.gov

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Answers to Student Worksheet 1

Population in Thousands (2007)												
	United States				Mexico				China			
Age Group	M	%	F	%	M	%	F	%	M	%	F	%
0-4	10,635	3.5	10,181	3.4	5,532	5.1	5,293	4.9	44,095	3.3	39,021	3.1
5-9	10,156	3.4	9,717	3.2	5,553	5.1	5,324	4.9	46,723	3.5	40,692	3.0
10-14	10,360	3.4	9,880	3.3	5,612	5.2	5,394	5.0	52,708	4.0	46,894	3.5
15-19	11,115	3.7	10,551	3.5	5,419	5.0	5,293	4.9	62,136	4.7	56,703	4.3
20-24	10,794	3.6	10,241	3.4	4,857	4.5	4,945	4.5	55,406	4.2	52,237	4.0
25-29	10,570	3.5	10,242	3.4	4,393	4.0	4,652	4.3	50,075	3.8	47,347	3.6
30-34	9,786	3.2	9,596	3.2	4,252	3.9	4,468	4.1	53,965	4.1	51,894	3.9
35-39	10,558	3.5	10,491	3.5	3,770	3.5	4,077	3.8	64,679	4.9	61,198	4.6
40-44	10,878	3.6	11,003	3.7	3,148	2.9	3,574	3.3	62,035	4.7	59,138	4.5
45-49	11,280	3.7	11,567	3.8	2,692	2.5	3,088	2.8	37,202	2.8	35,083	2.7
50-54	10,272	3.4	10,721	3.6	2,426	1.9	2,426	2.2	43,977	3.3	42,011	3.2
55-59	8,855	2.9	9,424	3.1	1,872	1.5	1,872	1.7	33,974	2.6	32,403	2.5
60-64	6,889	2.3	7,531	2.5	1,532	1.2	1,532	1.4	22,630	1.8	22,581	1.7
65-69	5,027	1.7	5,758	1.9	1,219	1.0	1,219	1.1	18,972	1.4	18,413	1.4
70-74	3,857	1.3	4,727	1.6	770	0.7	914	0.8	15,022	1.1	15,695	1.2
75+	6,975	2.3	11,506	3.8	1,392	1.0	1,392	1.3	15,690	1.2	20,249	1.5
Total	148,007	49	153,136	50.9	54,439	49	55,463	51	679,289	51.4	641,559	48.6
Total	301,143				109,902				1,320,848			

Source: U.S. Census Bureau, International Database, www.census.gov

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Answers to Student Worksheet 2

Population in Thousands (2007)

Age Group	India				Nigeria				France			
	M	%	F	%	M	%	F	%	M	%	F	%
0-4	64,688	5.7	58,527	5.2	11,216	8.3	11,055	8.2	2,069	3.2	1,972	3.1
5-9	63,127	5.6	57,522	5.1	9,325	6.9	9,191	6.8	2,032	3.2	1,934	3.0
10-14	60,393	5.3	55,307	4.9	8,185	6.1	8,056	6.0	1,963	3.1	1,870	2.9
15-19	55,876	4.9	51,428	4.6	7,200	5.3	7,077	5.2	2,047	3.2	1,955	3.1
20-24	52,609	4.7	48,813	4.3	6,342	4.7	6,213	4.6	2,054	3.2	1,972	3.1
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35-39	40,707	3.6	38,845	3.4	3,616	2.7	3,334	2.5	2,316	3.6	2,282	3.6
40-44	34,734	3.1	33,003	2.9	2,957	2.2	2,798	2.1	2,242	3.5	2,272	3.6
45-49	29,309	2.6	27,769	2.5	2,422	1.8	2,320	1.7	2,160	3.4	2,221	3.5
50-54	24,298	2.2	23,054	2.0	1,986	1.5	1,926	1.4	2,083	3.3	2,164	3.4
55-59	19,686	1.7	18,866	1.7	1,624	1.2	1,650	1.2	2,078	3.3	2,149	3.4
60-64	15,577	1.4	15,338	1.3	1,292	1.0	1,336	1.0	1,590	2.5	1,645	2.6
65-69	11,653	1.0	11,955	0.8	916	0.7	974	0.7	1,197	1.9	1,325	2.1
70-74	7,942	0.7	8,605	0.7	583	0.4	648	0.5	1,116	1.8	1,369	2.1
75+	7,663	0.7	9,471	0.8	488	0.4	573	0.4	1,963	3.1	3,344	5.2
Total	582,444	51.5	547,421	48.5	68,256	50.6	66,775	49.4	31,140	49	32,578	51
Total	1,129,865				135,031				63,718			

Source: U.S. Census Bureau, International Database, www.census.gov