

Power Of The Pyramids

Introduction:

To help them make population projections for different countries, demographers 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.

Materials:

Student Worksheets (one per student)
Graph paper
Colored pencils
Ruler
Calculator (optional)

Procedure:

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

Ask the students:

Why do you think this type of graph is called a population pyramid?

(Because of its shape.)

What is the largest age cohort?

(0-4 year olds.)

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 total population of the United States in 2008 was 304,062,000. The population of males aged 0-4 was 10,748,000 of the United States.

Example Problem: $\frac{10,748,000}{304,062,000} = .035$ or 3.5%

Students should complete these calculations for each cohort (age group).



Understanding
Population Dynamics

Concepts:

The age and gender distribution of a regional or national population affects its growth rate.

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 countries' different growth patterns.

Subjects:

Math, Science, Social Studies, Geography, History

Skills:

Calculating percentages, graphing, analyzing and interpreting data

Method:

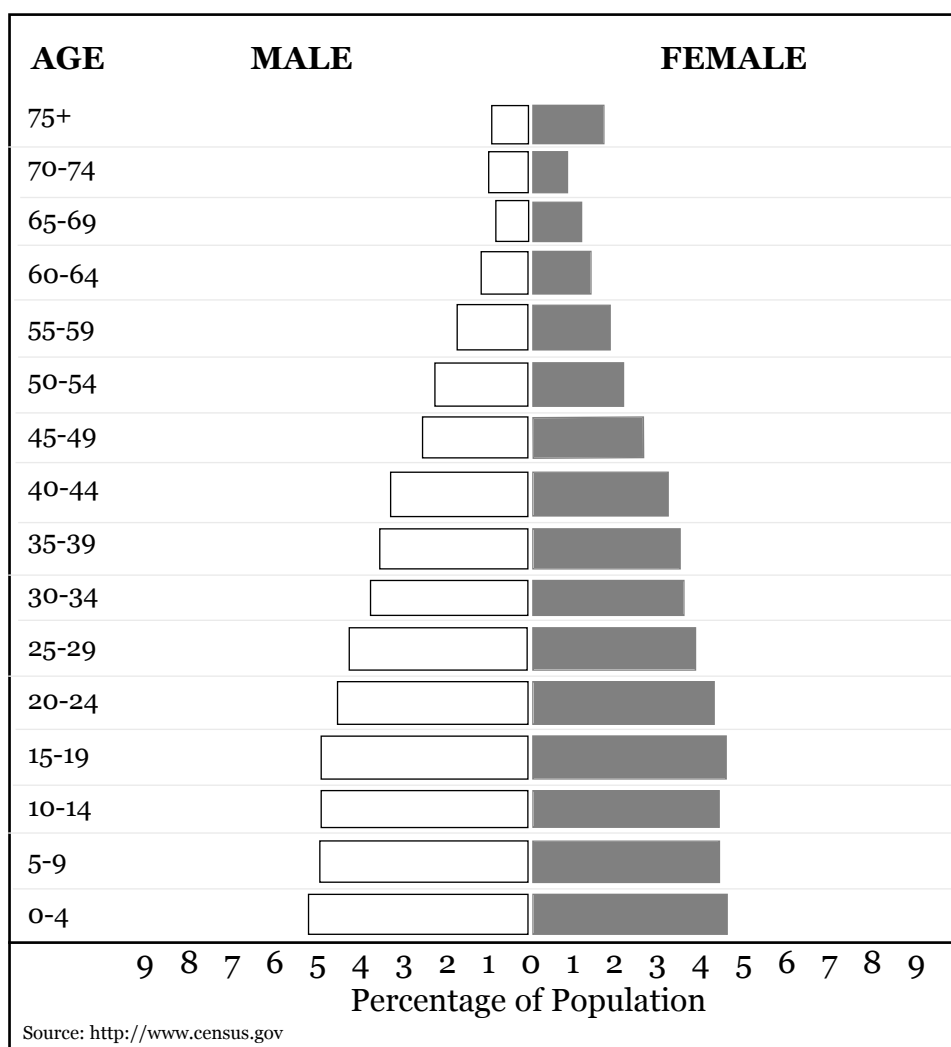
Students construct and interpret population pyramids and discuss differences in population growth rates among several different countries.





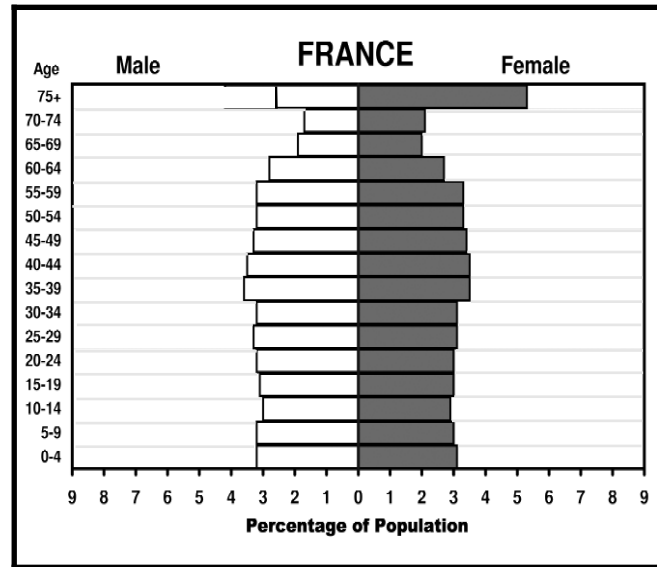
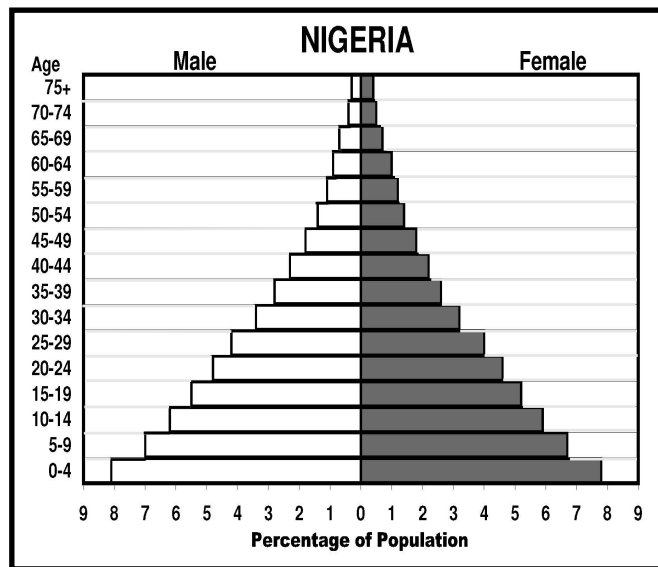
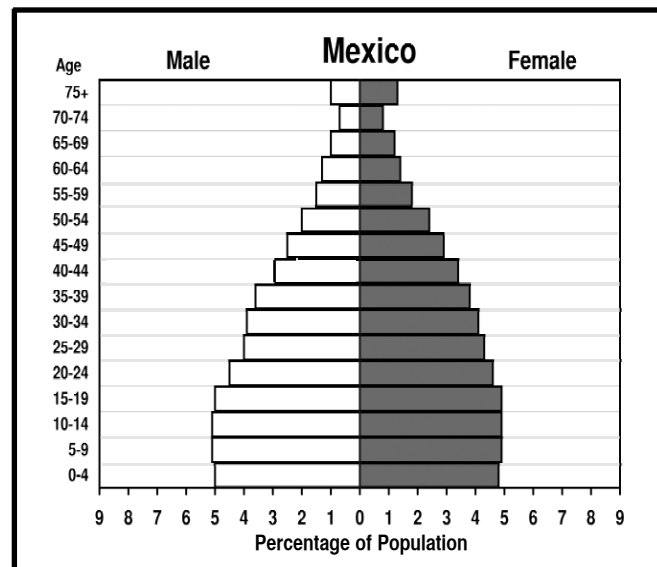
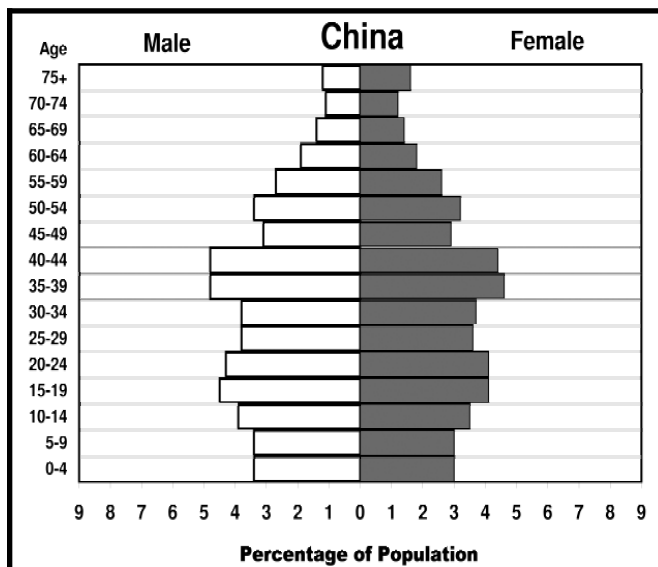
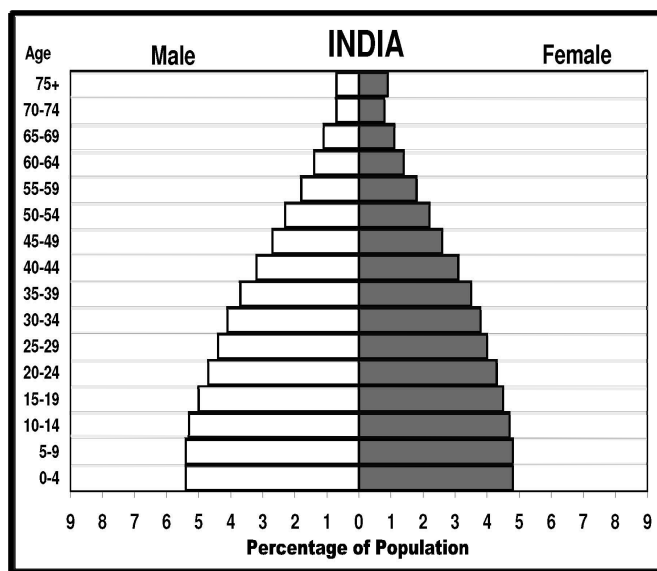
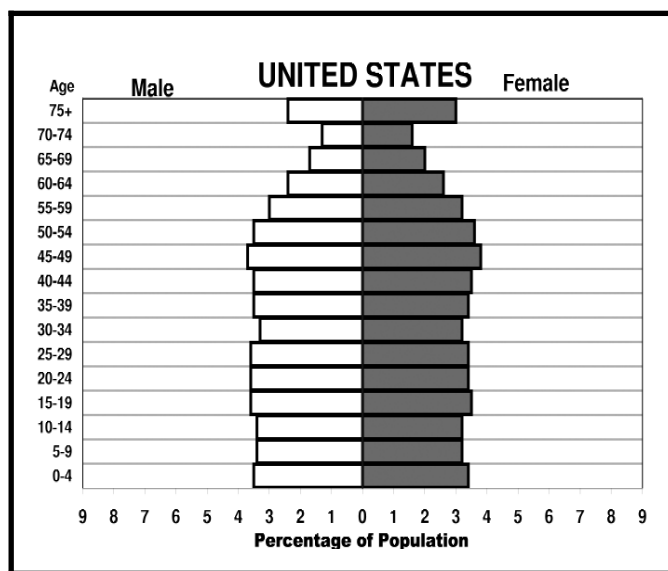
5. On the graph paper, students can construct a population pyramid as in the example. The line drawn down the middle of the graph separates the male and female populations. The percentages of the population will be plotted along the X-axis with females to the right, males to the left of the center line. The age groups will be running up the Y-axis with the youngest at the bottom, oldest at the top. (See “World Population Pyramid” sample.)
6. Students graph the percentage data for their assigned country. Using colored pencils, they can shade in the two sides of their graphs.
7. Students hold up their finished graphs for all to see while going through the discussion questions in class.

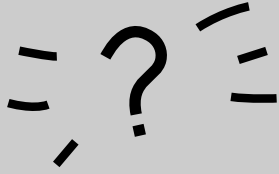
World Population Pyramid



POWER OF THE PYRAMIDS

Sample Pyramids





Discussion Questions:

1. Where are you represented on the Student Worksheet table and on the graphs?

If you live in the United States and are between 10 and 15 years old you are represented on line 3 in the U.S. data under either male or female.

On the graph, you and your cohorts make up the percentage presented by the third bar from the bottom, boys on the left, girls on the right.

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

Yes, there are more boy 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, 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. (Note that in several countries the 75+ cohort is larger than the 70-74 cohort because the 75+ cohort includes individuals age 75 until death. If that group was broken down into 5-year cohorts, we could expect that each successive cohort would be smaller.)

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

No. The graphs represent 100% 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 Student Worksheets, you can tell that China has more people than any other country.

6. Of the six graphs, which 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, India and Mexico 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 4-10 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 countries appear to have the slowest rates of population growth? How can you tell?

France has the slowest population growth. 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. What are the biggest age groups in the United States?

People aged 45-54 make up the biggest portion of the United States. The people who were born between 1946 and 1964 are called "baby boomers," and were born shortly after World War II, when many husbands and wives were reunited. The country experienced greater economic prosperity than it did during the years of the Great Depression and the war so couples felt confident of their ability to support families, and the birth rate soared as a result.

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

You can see on the graph that the bottom of the Nigerian, Mexican and 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 15.9% ($8.1 + 7.8$) of the population and the older children also make up a large percentage.

10. Some cultures have traditionally favored boy children over girl children (as can be seen as in the pyramids for India and China). Why might it be advantageous 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 due to the traditional belief that boys are more valuable. In developing countries, boys are expected to take care of their parents in old age, while girls will marry and live with the husband's family. As a generation matures, a shortage of girls leads to a shortage of women 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 United States, what would you sell?

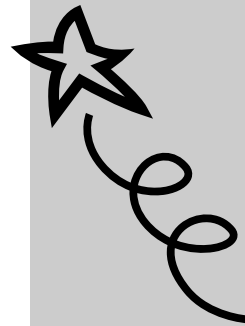
Answers might include any products for people of the baby boomer generation or their children.

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 until about 30 years ago, when the rate of growth slowed. If this trend continues unchanged, the Mexican "pyramid" will gradually become more rectangular.



Name: _____ Date: _____

Power of the Pyramids -Student Worksheet #1

Population in Thousands (2008)												
	United States				Mexico				China			
Age Group	M	%	F	%	M	%	F	%	M	%	F	%
0-4	10,748		10,258		5,505		5,268		44,760		39,794	
5-9	10,259		9,806		5,526		5,298		45,125		39,297	
10-14	10,262		9,792		5,589		5,371		52,201		46,209	
15-19	11,027		10,487		5,438		5,307		59,877		54,303	
20-24	10,845		10,214		4,917		4,987		57,735		54,189	
25-29	10,941		10,393		4,407		4,666		50,910		48,236	
30-34	9,959		9,639		4,252		4,495		51,075		49,089	
35-39	10,569		10,425		3,876		4,160		64,233		61,110	
40-44	10,746		10,762		3,240		3,664		60,820		57,990	
45-49	11,314		11,566		2,759		3,174		40,988		38,958	
50-54	10,539		10,954		2,228		2,563		44,961		42,632	
55-59	9,015		9,569		1,688		1,938		36,055		34,669	
60-64	7,236		7,867		1,373		1,577		24,860		23,844	
65-69	5,306		6,042		1,092		1,261		18,956		18,509	
70-74	3,959		4,816		800		949		15,221		15,826	
75+	7,200		11,547		1,131		1,456		16,466		21,137	
Total	149,925		154,137		53,821		56,134		684,253		645,792	
Total	304,062				109,995				1,330,045			
Source: U.S. Census Bureau, International Database, www.census.gov . Estimates based on rounding to the nearest thousandth.												

Name: _____ Date: _____

Power of the Pyramids -Student Worksheet #2

Population in Thousands (2008)												
	France				Nigeria				India			
Age Group	M	%	F	%	M	%	F	%	M	%	F	%
0-4	2,080		1,982		11,862		11,344		63,069		55,862	
5-9	2,045		1,948		10,255		9,813		62,669		55,179	
10-14	1,967		1,873		9,055		8,649		61,107		54,016	
15-19	2,033		1,940		8,009		7,624		56,960		51,142	
20-24	2,053		1,972		7,001		6,660		53,441		49,029	
25-29	2,110		2,033		6,099		5,784		49,970		46,370	
30-34	2,088		2,020		5,045		4,735		46,307		43,447	
35-39	2,341		2,295		4,081		3,835		42,075		39,990	
40-44	2,246		2,267		3,310		3,183		36,020		34,355	
45-49	2,170		2,230		2,625		2,596		30,415		29,099	
50-54	2,084		2,170		2,047		2,080		25,279		24,273	
55-59	2,063		2,145		1,667		1,726		20,409		19,770	
60-64	1,697		1,779		1,360		1,388		16,005		15,880	
65-69	1,208		1,326		980		1,001		11,952		12,289	
70-74	1,110		1,350		629		660		8,135		8,804	
75+	2,081		3,416		544		610		7,773		9,286	
Total	31,313		32,746		74,569		71,688		591,586		548,791	
Total	64,059				146,257				1,140,377			
Source: U.S. Census Bureau's International Database, www.census.gov. Estimates based on rounding to the nearest thousandth.												

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Power of the Pyramids - Answers to Student Worksheet #1

Population in Thousands (2008)												
United States					Mexico				China			
Age Group	M	%	F	%	M	%	F	%	M	%	F	%
0-4	10,748	3.5	10,258	3.4	5,505	5.0	5,268	4.8	44,760	3.4	39,794	3.0
5-9	10,259	3.4	9,806	3.2	5,526	5.0	5,298	4.8	45,125	3.4	39,297	3.0
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65-69	5,306	1.7	6,042	2.0	1,092	1.0	1,261	1.1	18,956	1.4	18,509	1.4
70-74	3,959	1.3	4,816	1.6	800	0.7	949	0.9	15,221	1.1	15,826	1.2
75+	7,200	2.4	11,547	3.8	1,131	1.0	1,456	1.3	16,466	1.2	21,137	1.6
Total	149,925	49.4	154,137	50.6	53,821	48.7	56,134	50.9	684,253	51.5	645,792	48.7
Total	304,062				109,995				1,330,045			

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10-14	1,967	3.0	1,873	2.9	9,055	6.2	8,649	5.9	61,107	5.4	54,016	4.7
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25-29	2,110	3.3	2,033	3.2	6,099	4.2	5,784	4.0	49,970	4.4	46,370	4.1
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65-69	1,208	1.9	1,326	2.1	980	0.7	1,001	0.7	11,952	1.0	12,289	1.1
70-74	1,110	1.7	1,350	2.1	629	0.4	660	0.5	8,135	0.7	8,804	0.8
75+	2,081	3.2	3,416	5.3	544	0.4	610	0.4	7,773	0.7	9,286	0.8
Total	31,313	48.9	32,746	51.1	74,569	51	71,688	49.2	591,586	52	548,791	48
	64,059				146,257				1,140,377			

Data source: United States Census International Database, www.census.gov

Follow-Up Activity

To give your students more practice analyzing age-sex distribution graphs, share with them the three examples below and lead a discussion using the following questions.

1. What are the dominant religions of Brazil and Iran? What effect would you expect these religions to have on those countries' birthrates? Looking at the graphs, what appear to be the current birthrate trends?

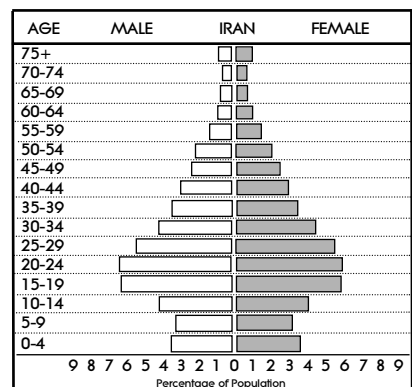
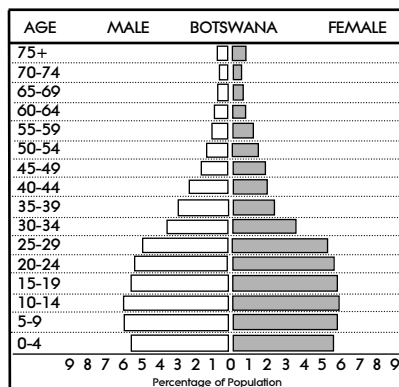
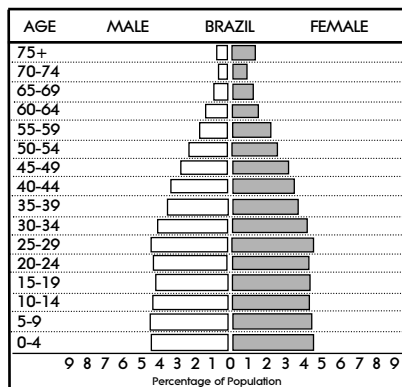
The population of Brazil is largely Catholic, while Iran's majority practices Islam. Historically, religious teachings in those countries would have discouraged modern family planning and encouraged large family size. Interestingly enough, the birth rates have been dropping in both countries in recent years, due in large part to more reproductive options available to women and men.

2. Almost forty percent of Botswana's population ages 15-49 is infected with HIV/AIDS. How would a reduced number of people in these cohorts affect a community?

Any community relies heavily on its people ages 15-49 for its workforce in important industries like education, healthcare and agriculture. If this workforce is missing, not only do these industries suffer, but so do the people that rely on these industries. A lack of growth in industry can also stunt economic and political growth for a community as a whole. A high mortality in parents also produces a high number of orphans and without adequate parental care, governments or charities may have to see to the needs of the community's youth. In many cases this is impossible due to other stresses on funding. It is important to note on the Botswana graph that the youngest age cohort is smaller than the three above it. This could be due to a reduction in the number of people having children or high infant mortality rates due to infected mothers passing HIV/AIDS to children during pregnancy.

3. Brazil's pyramid looks different than the other pyramids. What is the difference and how can you explain it?

Brazil went through a period of rapid population growth, with high birth and death rates, evidenced by the definitive pyramid shape of the upper part of the graph. The growth is slowing, as seen in the lower three cohorts, which are slightly smaller and indicate a shift towards a stabilizing population in the future.

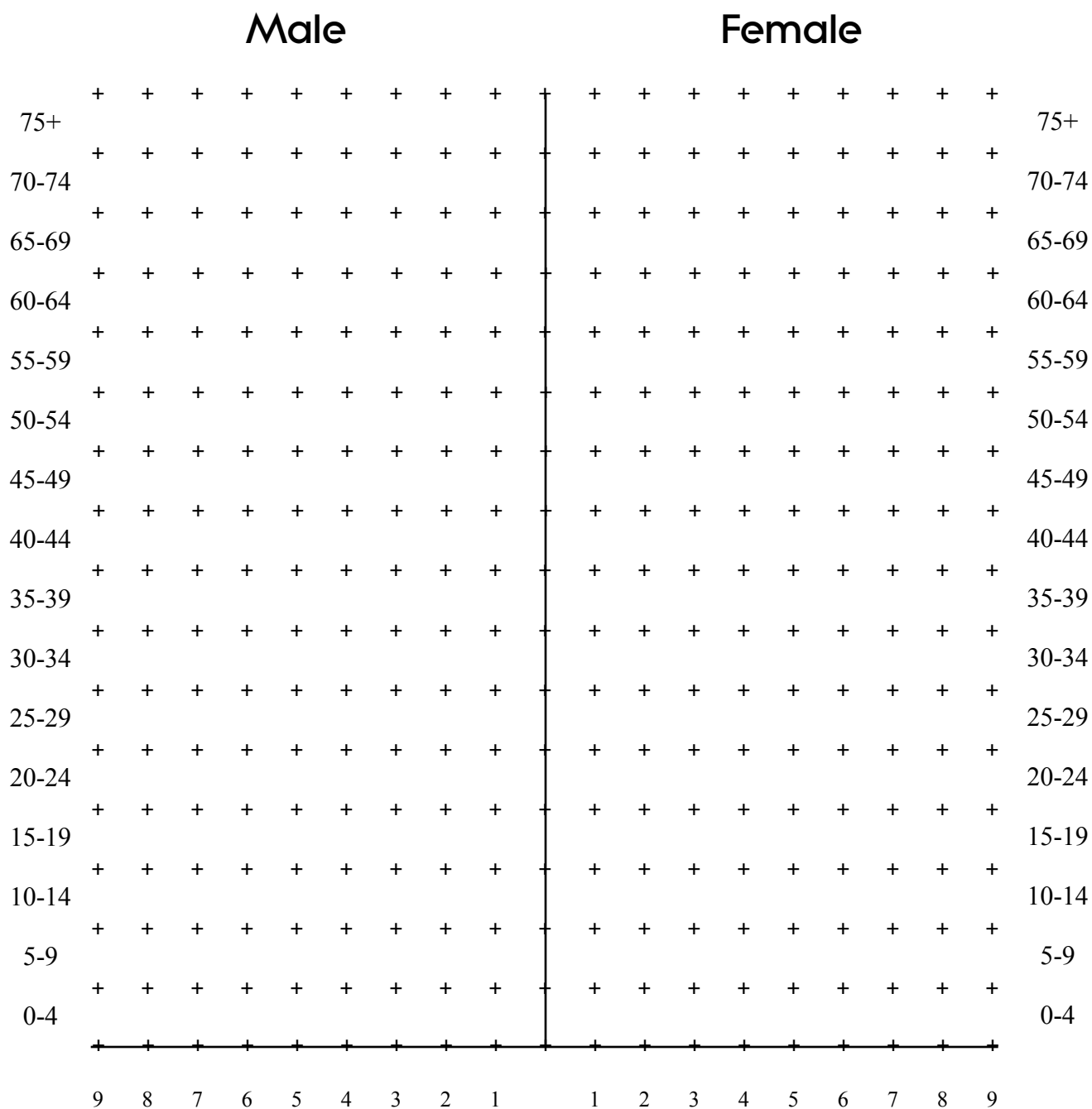


Name: _____

Date: _____

Power of the Pyramids Graph Paper

Country: _____



Percentage of Population