

Power of the Pyramids

Student Activity

Method:

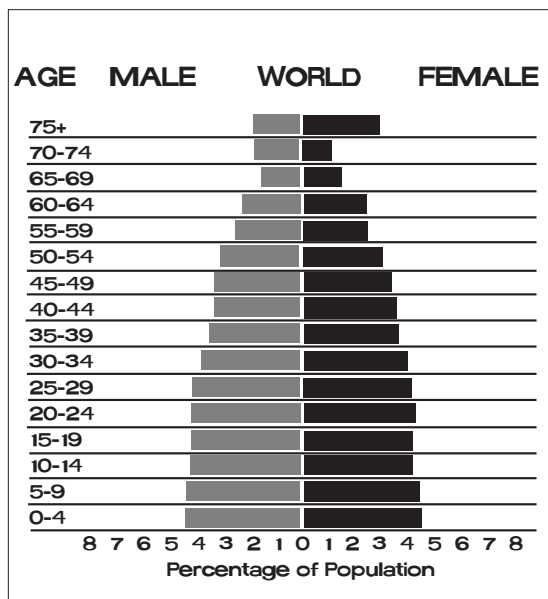
Students construct and interpret population pyramids and discuss differences in population growth rates among several different countries.

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.



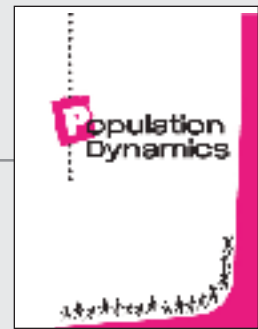
4. The figures on the worksheet represent the population (in thousands) of each age group within each gender for each particular country. In order to construct the country's pyramid, students must first calculate the percentage of the population of each gender in each age group.

Example: According to the worksheet, the United States' total population in 2012 was 313,847,465. The population of males ages 0-4 was 10,842,904.

$$\frac{10,842,904}{313,847,465} = .035 \text{ or } 3.5\%$$

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 2012, 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 50-54 (in 2012) 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?

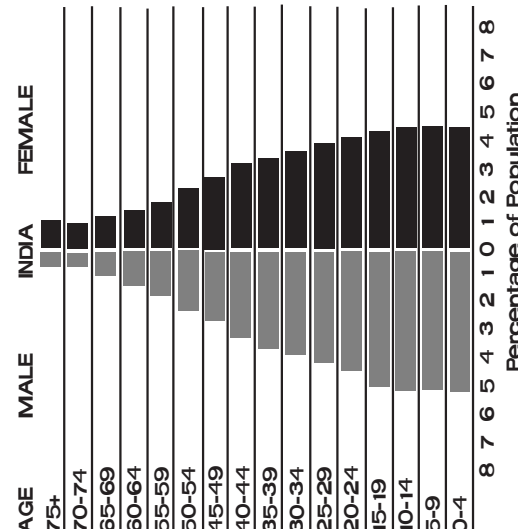
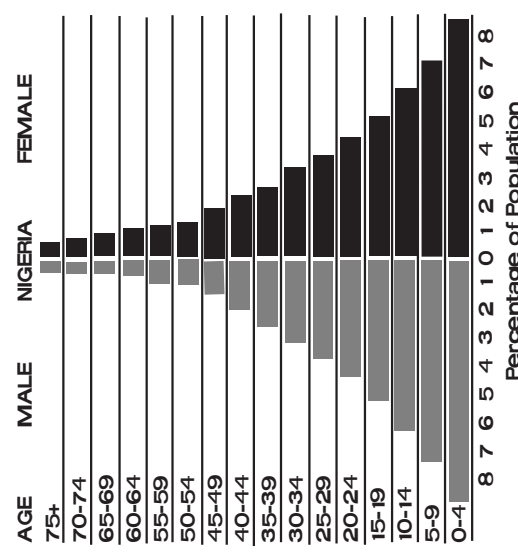
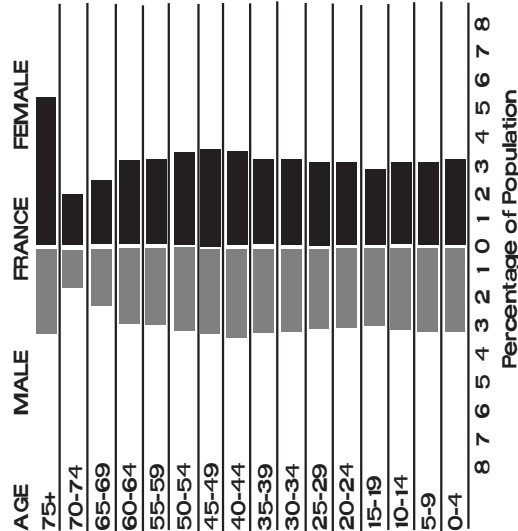
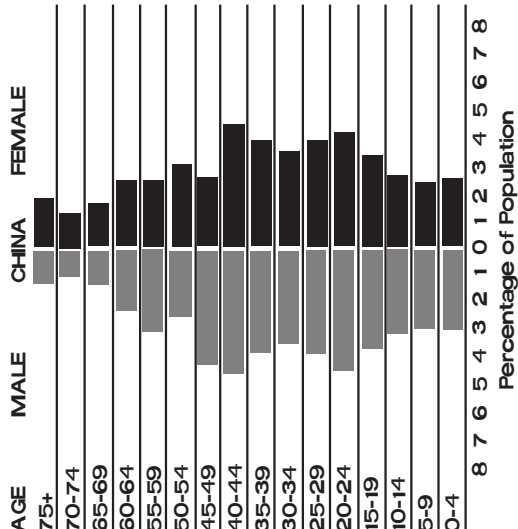
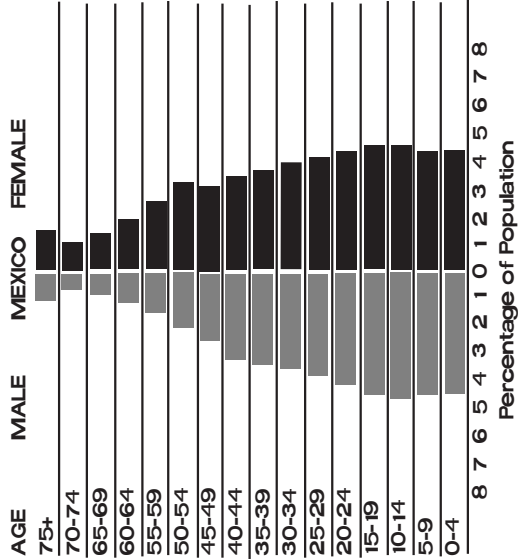
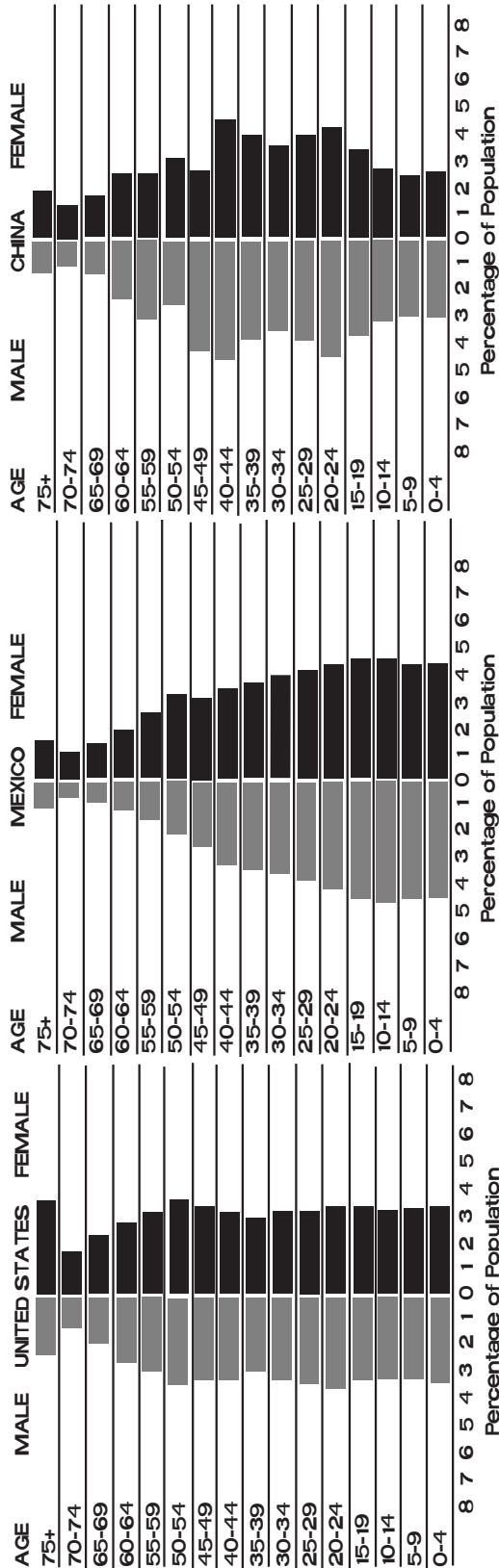
The graph shows that the Mexican population was growing rapidly about 30 years ago, when the rate of growth slowed. If this trend continues unchanged, the Mexican “pyramid” will gradually become more rectangular.

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 (2012)												
Age Group	United States				Mexico				China			
	M	%	F	%	M	%	F	%	M	%	F	%
0-4	10,843		10,379		5,427		5,192		42,016		36,682	
5-9	10,687		10,255		5,424		5,196		40,069		34,023	
10-14	10,520		10,085		5,479		5,261		43,444		36,963	
15-19	10,826		10,313		5,444		5,295		51,805		45,715	
20-24	11,286		10,861		5,108		5,125		61,699		56,570	
25-29	10,832		10,488		4,616		4,804		54,828		52,017	
30-34	10,719		10,479		4,230		4,559		49,788		47,274	
35-39	9,871		9,712		4,128		4,403		53,704		51,813	
40-44	10,553		10,513		3,665		4,019		64,074		60,943	
45-49	10,740		10,935		3,053		3,517		61,032		58,698	
50-54	10,999		11,429		2,595		3,021		36,284		34,634	
55-59	9,912		10,539		2,017		2,351		42,363		41,136	
60-64	8,419		9,172		1,528		1,787		32,085		31,316	
65-69	6,393		7,195		1,216		1,430		21,566		21,288	
70-74	4,481		5,332		919		1,099		16,300		16,642	
75+	7,552		11,525		1,325		1,742		20,812		25,656	
Total	154,632		159,215		56,175		58,801		691,869		651,371	
Total	313,847				114,976				1,343,240			

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

Power of the Pyramids

Student Worksheet 2

Population in Thousands (2012)												
Age Group	India				Nigeria				France			
	M	%	F	%	M	%	F	%	M	%	F	%
0-4	62,667		55,531		14,754		14,066		2,133		2,040	
5-9	62,400		54,937		12,701		12,121		2,093		1,999	
10-14	62,319		54,877		10,778		10,296		2,059		1,961	
15-19	60,223		53,294		9,013		8,607		1,981		1,889	
20-24	55,796		50,366		7,744		7,412		2,045		1,961	
25-29	52,377		48,194		6,655		6,425		2,039		1,967	
30-34	48,784		45,437		5,673		5,590		2,078		2,009	
35-39	45,019		42,511		4,513		4,632		2,134		2,070	
40-44	40,313		38,578		3,461		3,767		2,297		2,274	
45-49	34,113		32,805		2,703		3,025		2,221		2,267	
50-54	29,411		27,516		2,119		2,457		2,128		2,215	
55-59	23,053		22,540		1,656		1,952		2,031		2,155	
60-64	17,988		17,910		1,325		1,568		2,002		2,128	
65-69	13,460		13,901		1,022		1,189		1,491		1,617	
70-74	9,279		10,063		681		791		1,111		1,288	
75+	9,155		11,262		622		755		2,255		3,692	
Total	625,351		579,723		85,420		84,704		32,097		33,534	
Total	1,205,074				170,124				65,631			

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

Power of the Pyramids

Answers to Student Worksheet 1

Population in Thousands (2012)												
Age Group	United States			Mexico			China					
	M	%	F	M	%	F	M	%	F	M	%	F
0-4	10,843	3.5	10,379	3.3	5,427	4.7	5,192	4.5	42,016	3.1	36,682	2.7
5-9	10,687	3.4	10,255	3.3	5,424	4.7	5,196	4.5	40,069	3.0	34,023	2.5
10-14	10,520	3.4	10,085	3.2	5,479	4.8	5,261	4.6	43,444	3.2	36,963	2.8
15-19	10,826	3.4	10,313	3.3	5,444	4.7	5,295	4.6	51,805	3.9	45,715	3.4
20-24	11,286	3.6	10,861	3.5	5,108	4.4	5,125	4.5	61,699	4.6	56,570	4.2
25-29	10,832	3.5	10,488	3.3	4,616	4.0	4,804	4.2	54,828	4.1	52,017	3.9
30-34	10,719	3.4	10,479	3.3	4,230	3.7	4,559	4.0	49,788	3.7	47,274	3.5
35-39	9,871	3.1	9,712	3.1	4,128	3.6	4,403	3.8	53,704	4.0	51,813	3.9
40-44	10,553	3.4	10,513	3.3	3,665	3.2	4,019	3.5	64,074	4.8	60,943	4.5
45-49	10,740	3.4	10,935	3.5	3,053	2.7	3,517	3.1	61,032	4.5	58,698	4.4
50-54	10,999	3.5	11,429	3.6	2,595	2.3	3,021	2.6	36,284	2.7	34,634	2.6
55-59	9,912	3.2	10,539	3.4	2,017	1.8	2,351	2.0	42,363	3.2	41,136	3.1
60-64	8,419	2.7	9,172	2.9	1,528	1.3	1,787	1.6	32,085	2.4	31,316	2.3
65-69	6,393	2.0	7,195	2.3	1,216	1.1	1,430	1.2	21,566	1.6	21,288	1.6
70-74	4,481	1.4	5,332	1.7	919	0.8	1,099	1.0	16,300	1.2	16,642	1.2
75+	7,552	2.4	11,525	3.7	1,325	1.2	1,742	1.5	20,812	1.5	25,656	1.9
Total	154,632	49.3	159,215	50.7	56,175	48.9	58,801	51.1	691,869	51.5	651,371	48.5
	313,847			114,976			1,343,240					

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

Power of the Pyramids

Answers to Student Worksheet 2

Population in Thousands (2012)												
Age Group	India				Nigeria				France			
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0-4	62,667	5.2	55,531	4.6	14,754	8.7	14,066	8.3	2,133	3.2	2,040	3.1
5-9	62,400	5.2	54,937	4.6	12,701	7.5	12,121	7.1	2,093	3.2	1,999	3.0
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55-59	23,053	1.9	22,540	1.9	1,656	1.0	1,952	1.1	2,031	3.1	2,155	3.3
60-64	17,988	1.5	17,910	1.5	1,325	0.8	1,568	0.9	2,002	3.1	2,128	3.2
65-69	13,460	1.1	13,901	1.2	1,022	0.6	1,189	0.7	1,491	2.3	1,617	2.5
70-74	9,279	0.8	10,063	0.8	681	0.4	791	0.5	1,111	1.7	1,288	2.0
75+	9,155	0.8	11,262	0.9	622	0.4	755	0.4	2,255	3.4	3,692	5.6
Total	625,351	51.9	579,723	48.1	85,420	50.2	84,704	49.8	32,097	48.9	33,534	51.1
Total	1,205,074				170,124				65,631			

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

Name: _____

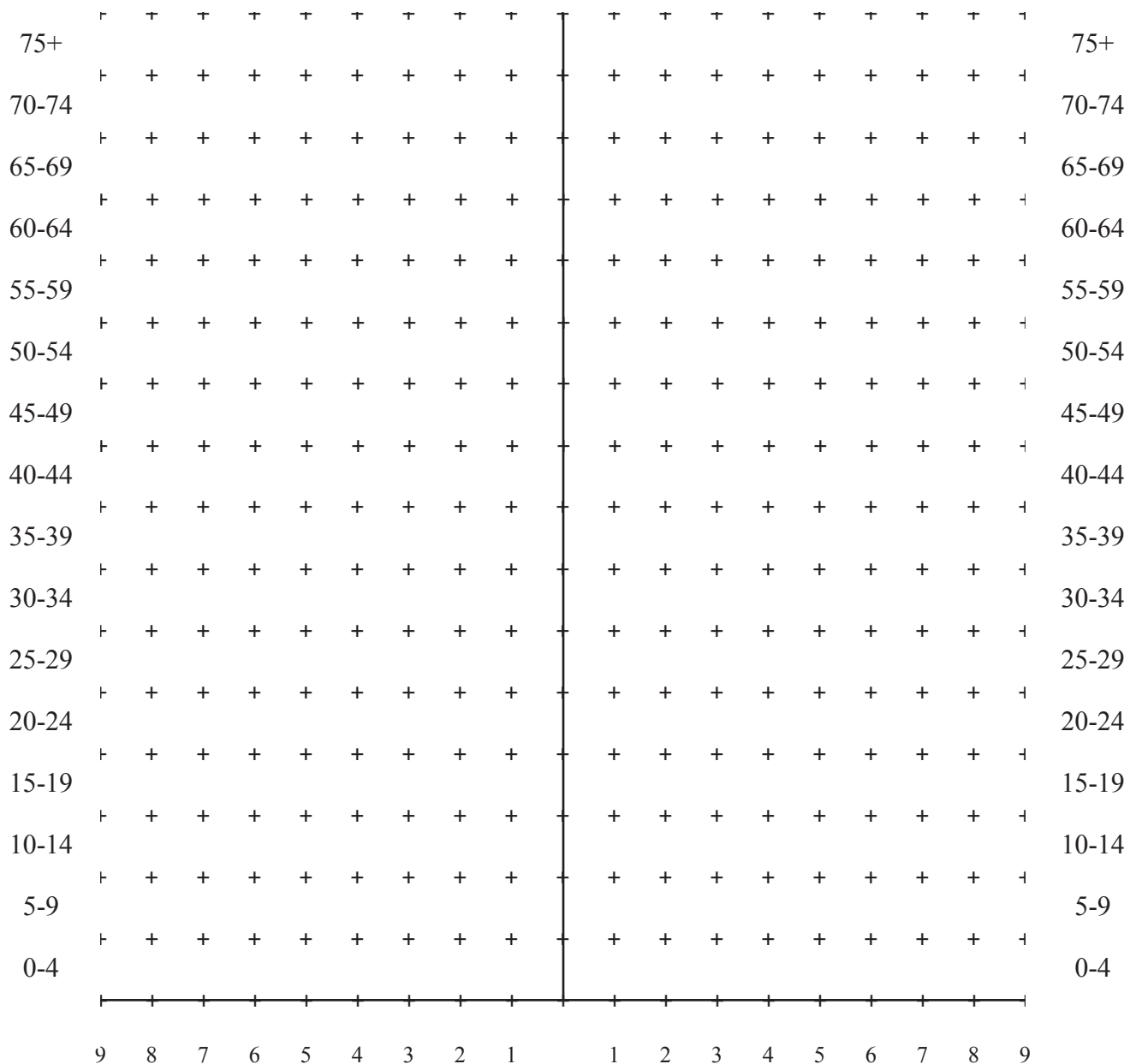
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Power of the Pyramids Graph Paper

Country: _____

Male

Female



Percentage of Population