Name: ______________________ Instructor: ______________________

Take Me Out to the Ball Game: Market Areas and the Urban Hierarchy

ACTIVITY 1: THRESHOLD OF A FUNCTION

Each central place function has a threshold, or minimum market size, needed to support the profitable sale of that particular good or service. Thresholds can be measured in numbers of people or, in areas of uniform population density, as a minimum area or radius. A good's threshold must be distinguished from its range, the maximum distance a consumer is willing to travel to purchase it. Threshold is from the seller's point of view; range is from the buyer's. For this reason, reliable estimates of a threshold would be very valuable information for a small-business owner or franchisee looking to open, say, a new pizza restaurant (Figure 9.16).

In Activity 1, you will estimate the threshold of a pizza restaurant based on its frequency in 10 central places spanning various levels of the urban hierarchy. You will relate the size of a city to the number of pizza restaurants found there and establish the minimum population size (threshold) needed to support a profitable pizza restaurant. You will find this information in a very familiar source—an online *Yellow Pages*-type of telephone directory.

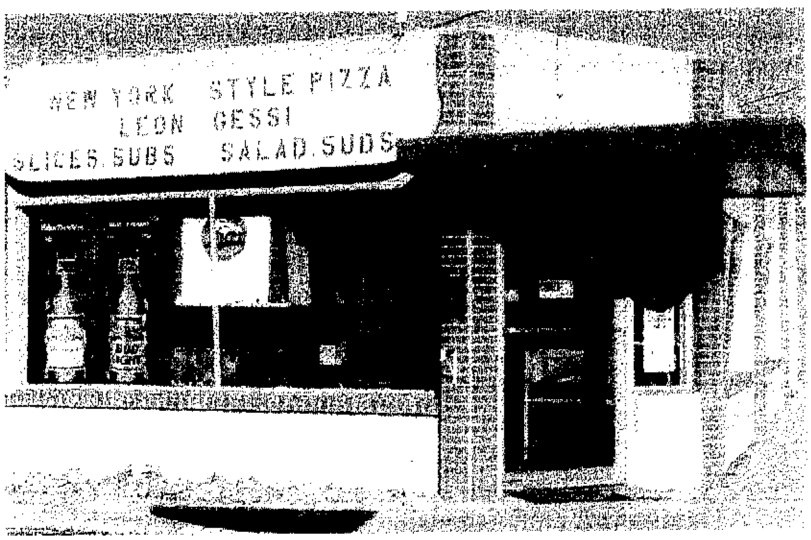


Figure 9.16 Pizza restaurants are a fairly low-order central place function that can thrive even in small towns.

A. Pick one city in your state that represents each of these population ranges. You will need 10 in all. If your state has no cities in some of the population categories, simply leave that category out and report your results for fewer cities.

1. 500–2,000	6. 50,000–100,000
2. 2,000–5,000	7. 100,000–250,000
3. 5,000–10,000	8. 250,000–500,000
4. 10,000–25,000	9. 500,000–1,000,000
5. 25,000–50,000	10. more than 1,000,000

City populations can be found in U.S. Census Bureau and StatsCanada publications and in the index of most atlases. Alternatively, find city populations on the Internet: www.census.gov/popest/cities/ or factfinder.census.gov (select *population for a city or town* for your state) for the United States. For Canadian cities and towns, go to www.statcan.gc.ca and click on *Community Profiles*.

Write the city or town name in Table 9.1, or leave it blank if there is no city within that range. Also write the population of the city or town in Table 9.1. Use only city or municipal populations. Don't combine cities into metropolitan areas.

B. Go to any of the online Internet telephone directories, such as, www.switchboard.com, yp.yahoo.com, or yellowpages.msn.com and search for "pizza" for the same towns you selected in Question 1.1.

For your pizza data to be consistent with your population data, be sure you search for individual cities or towns, not metropolitan areas.

1.1. Count the number of different listings. Check the address of each pizza restaurant carefully to allocate it to the correct city and beware of repeat ads for one location. Be careful to include all outlets in a chain. Complete Table 9.1 with the number of pizza restaurants per city.

TABLE 9.1 City Populations and Pizza Restaurants

City	Population	Pizza Restaurants	City	Population	Pizza Restaurants
1.			6.		
2.			7.		
3.			8.		
4.			9.		
5.			10.		

C. Use the graph provided in Question 1.2 for making a scatter diagram. A scatter diagram depicts the relationship between two variables. One variable is measured on the x-axis (horizontal), and another is measured on the y-axis (vertical). You first locate the value of the x-axis variable and follow it straight up, then find the y-axis value for the second variable, follow that straight across, and place a dot where they intersect. The scatter diagram therefore is a "scatter" of these dots. It shows groupings or trends in the relationship between the two variables.

You will plot *population* on the *x-axis* (horizontal) and the *number of pizza restaurants on the y-axis* (vertical). A problem arises, however, if you plot the numbers using an ordinary graph. The difference in population for the smaller towns and the largest city is so great that you would need a very large graph to fit them both on a scale. It also would be difficult to accurately plot the dots for your smallest towns because they would tend to cluster in the lower left corner. We are therefore using a lognormal graph, which has the effect of "squeezing in" large numbers according to its logarithmic transformation.

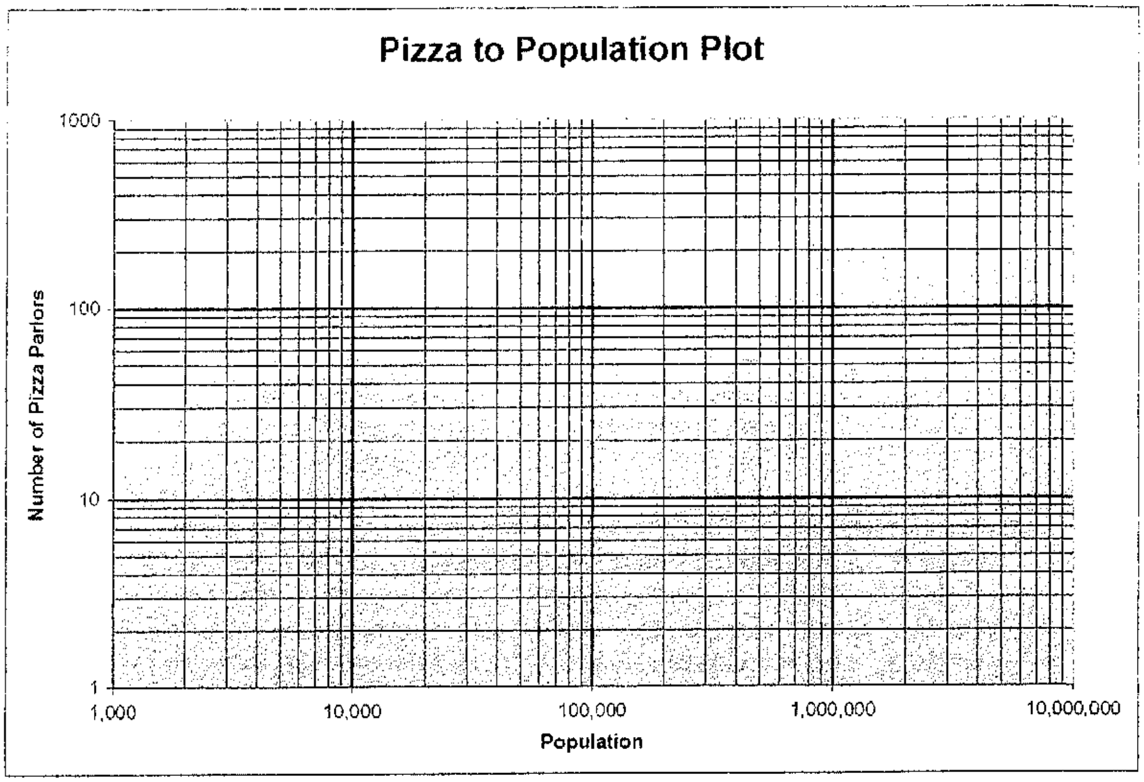
A logarithm is a mathematical calculation in which the difference between 1 and 10 on a logarithmic scale is the same as the difference between 10 and 100, between 100 and 1,000, between 1,000 and 10,000, and so on. The log of a number is the exponent to which 10 must be raised in order to equal that number. For instance:

$\log 10 = 1$,	because $10^1 = 10$
$\log 100 = 2$,	because $10^2 = 100$
$\log 1{,}000 = 3$,	because $10^3 = 1{,}000$
$\log 5 = 0.699$,	because $10^{0.699} = 5$
$\log 1 = 0$,	because $10^0 = 1$

You can see this relationship on the lognormal graph provided (Figure 9.17). The *y-axis* starts at 1 and has tick marks at all integers up to 10. The distance between each tick mark gets progressively smaller until you reach 10. The next tick after 10 is 20, then 30, 40, and so on, up to 100. The patterning of tick marks between 10 and 100 looks the same as between 1 and 10, but each tick represents 10 rather than 1. After 100, each interval would be 100 rather than 10.

On the *x-axis*, the same pattern occurs, only the graph starts at 1,000. The second tick is 2,000, then 3,000, 4,000, and so on, up to 10,000. The first tick after 10,000 is 20,000, then 30,000, 40,000, and so on, up to 100,000. Make sure you understand how to read the graph and keep in mind that there is a "squeezing" effect for large numbers.

1.2. Make a scatter diagram depicting the relationship between the urban population and the number of pizza restaurants.



1.3. Draw the line that best fits the set of points in your scatter diagram. The line should be straight and need not (in fact, *cannot*) go through every dot. It is a line that best describes the trend in the relationship (caution: *do not simply connect the dots*). See Figure 9.17 for an example of a scatter diagram and the line of best fit.

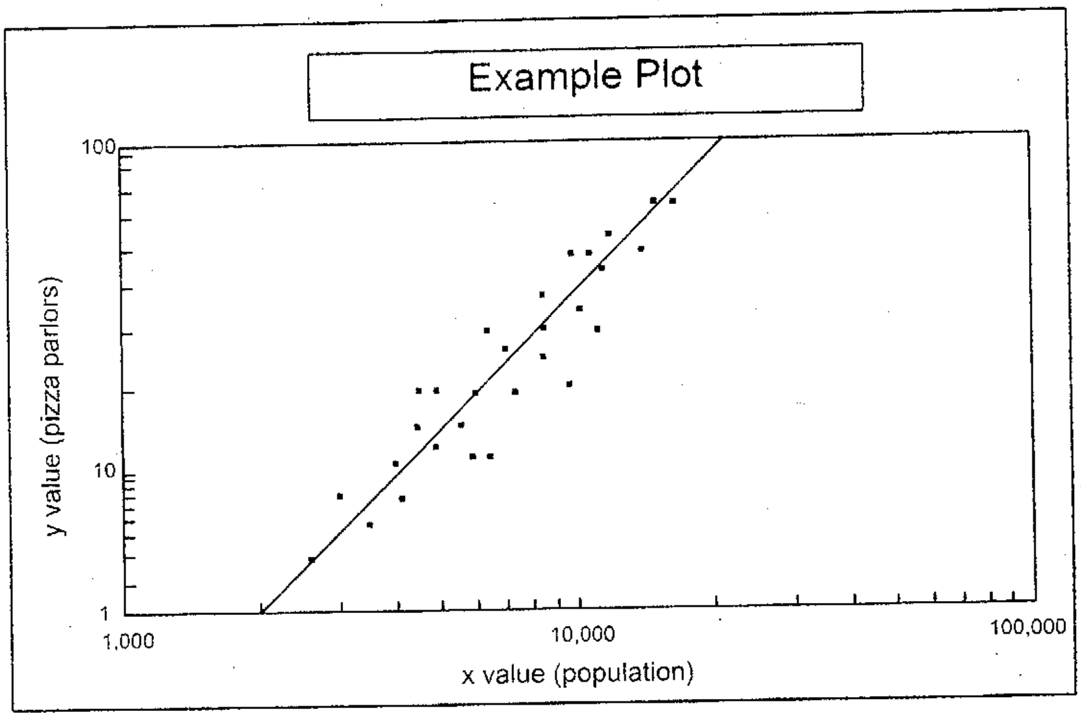


Figure 9.17 Example of a line of best fit through a scatter of points.

The line of best fit tells you, on average, how many pizza restaurants a given population size should be able to support. The x value at which your line hits the $y = 1$ level is the population at which exactly one pizza restaurant could remain in business. Any town with a population below this value could not support a pizza place. The value is the *threshold* necessary to support a pizza business.

1.4. At approximately what population value does your best-fitting line cross the $y = 1$ level? (That is, where does your line cross the *x-axis*?)________________.

1.5. What does it mean in terms of population per pizza restaurant when a city falls below (rather than above or exactly on) the best-fit line?

1.6. Suppose you were the site selection manager for a new chain of pizzerias in charge of expanding into your state. Write a short summary to the company president, interpreting the graph you made on page 272, to assess the potential to add profitable pizza restaurants in your study cities, given the level of competition in each city. For the *top 3 or 4 cities* with the most market potential, be sure to list the expected number of pizza restaurants, the actual number of pizza restaurants, and local place characteristics or any other insights you can glean from the graph data that might affect market potential.