

## Population Density

Population density is an average measure of how many neighbors live within a standard sized area. Population density is always expressed as a ratio of creatures/area. You can measure the population density of bacteria living on the surface of your skin. In that case, the population density would equal the number of bacteria per square inch or per square centimeter of skin. You could measure the population density of rodents per square mile in Boston. You could also measure the human population density, that is the number of people per square mile or people per square kilometer. For example, the tiny country of Monaco in Europe has a population density of 16,487 people per square kilometer. Monaco is the most densely populated (crowded) country in the world. The least densely populated country is Mongolia with only 1.7 people per square kilometer.

### *Example 1:*

Middlesex County and Suffolk County are the two most populous counties in Massachusetts. 1,465,400 people live in Middlesex and 689,800 people live in Suffolk County. However, because Suffolk County is only 59 square miles in size, while Middlesex County is 824 square miles, Middlesex turns out to be much less crowded than Suffolk County.

Middlesex Population density =  $1,465,400 \text{ people} / 824 \text{ square miles} = 1,778 \text{ people per Square mile}$

Suffolk Population density =  $689,800 \text{ people} / 59 \text{ square miles} = 11,692 \text{ people per Square mile}$

We can make ratios to compare the populations, areas and population densities of these two Massachusetts counties:

Middlesex Population/ Suffolk Population =  $1,465,400 \text{ people} / 689,800 \text{ people} = 2.12/1$   
or Middlesex is slightly more than twice (two-times) as populated as Suffolk County

Middlesex Area/ Suffolk Area =  $824 \text{ square miles} / 59 \text{ square miles} = 13.97/1$   
Middlesex is about fourteen times larger in area than Suffolk County.

Middlesex Population Density/ Suffolk Population Density =  $1,778 \text{ people per Sq. mi.} / 11,692 \text{ people per sq. mi.} = 0.152$  or the density of Middlesex is only 15/100 or 15% the density of Suffolk county.

For this last measure it may be easier to compare the densities of the two counties if we put the more crowded one in the numerator:

Suffolk Population Density/ Middlesex Population Density =  $6.6/1$  or Suffolk is more than six and a half times as densely populated as Middlesex County.



*Problems:*

1. Berkshire County (Pittsfield is the county seat) has an area of 931 square miles and 135,000 people live inside its boundary. How densely populated is Berkshire County?
2. The area of Nantucket County is 124 square kilometers. And its population is 9500 people.
  - a. What is its population density (people per sq. km).
  - b. If 1 square mile = 2.59 square kilometers, find Nantucket's population density in people per square mile.
3. Franklin County (Greenfield is the county seat) has the lowest population density in Massachusetts at 102 people per square mile. If the size of Franklin County is 702 square miles, how many people live there?
4. Dukes County (Edgartown is the county seat) is the second least crowded county with 144 people per square mile. If there are 15,000 people living in the county, what is its size?
5. Berkshire County (Pittsfield is the county seat) has an area of 931 square miles and 135,000 people live inside its boundary. How densely populated is Berkshire County?
6. An article in the September, 2003 Boston *Metro* stated that the town of Kassel, Germany was being overrun by raccoons. Conservationists estimated there were 100 raccoons per square mile in the town --10 times more than in the neighboring forest. Half of the raccoons make their homes in attics and lofts. One couple said they had ousted 43 raccoons from their attic in the last year.
  - a. If the town of Kassel is 4.3 square miles in size, how many raccoons are living in the town?
  - b. Calculate how many raccoons live in the neighboring forests?
  - c. If the house with the 43 raccoons is located in a neighborhood known as the "Old Town" which is 0.78 square miles in size. Can you estimate how many raccoons are living in all the other houses in this neighborhood?

