

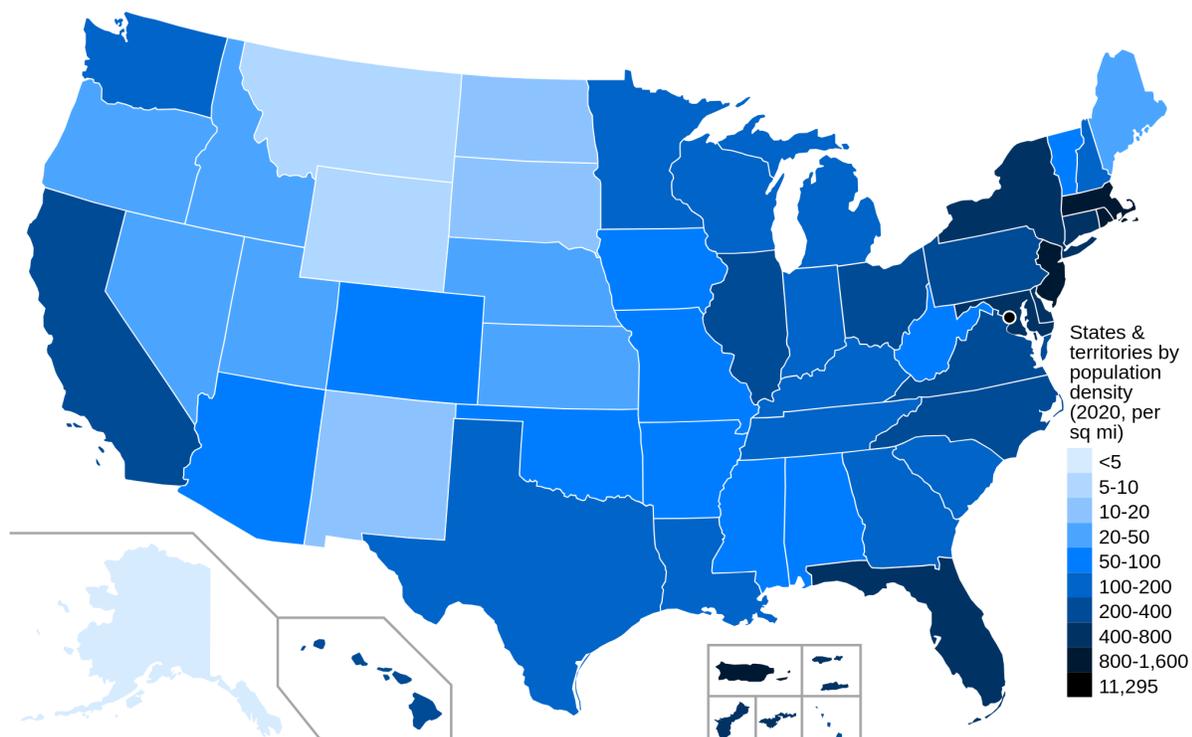
## M100: Quantitative Reasoning Pre-Badge Task

### New Badge Alert!

This task will provide a preview of what we will be learning during the M100 - Quantitative Reasoning Badge. You already know so much math, so use this task to share any understanding that you have before we start our learning. You will have a chance to do the same task at the end of the badge to see how your thinking has evolved.

### The Task

One definition of a “rural” county is one that has a population density of fewer than 500 people per square mile. Use the population density data below to answer the questions in this task.



### QUESTION 1

If you were going to classify *states* as rural using the county definition, which states would meet the definition of “fewer than 500 people per square mile”? Label 10 state names (abbreviations) on the map that would meet this definition.

**QUESTION 2** The data on the map are from 2020. The 2023 population of Montana is 1,132,812 and the state has an area of 147,040 square miles.

Based on the 2023 data, would Montana still be classified the same way (be the same color)? Explain your reasoning.



**QUESTION 3**

Look up some information on your own state to help you answer the questions below.



State Name: \_\_\_\_\_

Current Population: \_\_\_\_\_

By what percent do you think your state will grow each year for the next 5 years? Explain.

Based on the growth/decay rate you predicted, what will the population be in your state each year for the next 5 years? Complete the table.

Year	Predicted Population

**QUESTION 4** Let's explore some additional quantities about states. According to data, Massachusetts (MA) has the worst drivers in the country with 61.1 incidents per 1,000 drivers from Nov. 5, 2023 through Nov. 4, 2024. Conversely, Arkansas (AR) has the best drivers in the U.S. with 14.7 incidents per 1,000 drivers during the same time period.

- (a) What do you think an "incident" is in this context?
- (b) Complete the table to show the expected number of incidents in each state for the given number of drivers.
- (c) Create a double line graph (on paper or using technology) to show the data in the table.
- (d) Write an equation for each graph. Explain what your variables represent.



(a)

(b)

Number of Drivers	Expected Number of Driving Incidents in AR	Expected Number of Driving Incidents in MA
1,000		
10,000		
50,000		

(c) [Attach or import image]

(d)

### QUESTION 5

- (a) What do you notice about the population density of Massachusetts vs. Arkansas? Do you think that population density is related to the rate of driving incidents per state? Why or why not?
- (b) The state of Massachusetts has approximately 2.4 million licensed drivers. Based on this number, how many total driving incidents do Massachusetts drivers likely have during a one year period?
- (c) The state of Arkansas has approximately 2.3 million licensed drivers. Based on this number, how many total driving incidents do Arkansas drivers likely have during a one year period?



**QUESTION 6** Look up some additional data about the “best” and “worst” drivers. Do these additional data support or refute your thinking about the relationship between population density and driving quality?



