

1. The bar to the right represents 200 million people (about two thirds the size of the population of the United States.) Suppose it measures 10 inches tall.

(1) a. How tall is a bar that represents 1 billion ( $10^9$ ) people, if on the same scale?  
Hint: Since  $10^9 = 10^{\square}10^6$ , then  $10^9 =$  \_\_\_\_\_ million.

The bar would be \_\_\_\_\_ inches = \_\_\_\_\_ feet tall.

(1) b. How tall is a bar that represents 10 billion people, if on the same scale?

Hint:  $10 \text{ billion} = 10 \cdot 10^9 = 10^{\square} = 10^{\square}10^6 =$  \_\_\_\_\_ million.

The bar would be \_\_\_\_\_ inches = \_\_\_\_\_ feet tall.

2. The graph on the following page is from the United Nations Population Division published in 1999, which is the year the world population first hit 6 billion. The width of each bar represents a time span of 10 years. For example, the first light gray bar is the interval from 1750 to 1760. All darkly shaded bars are **predicted** increments, not actual.

(1) a. Look up the word "increment." Copy below a definition relevant here.

(1) b. There are six darkly shaded bars.  
What time interval is represented by the sixth gray bar? From \_\_\_\_\_ to \_\_\_\_\_.

(1) 3. Why does the graph of population size continue to increase even though the darkly shaded bars decrease?

(1) 4. Mark on the graph of the population size when changes its concavity.

(2) 5. In which years is the graph concave up? From \_\_\_\_\_ to \_\_\_\_\_.

When is the above graph concave down? From \_\_\_\_\_ to \_\_\_\_\_.

(2) 6. On a separate sheet of paper, (**typed!**), please write a paragraph which answers the following. How are the *heights of the bars* of the population increment related to the *concavity of the graph of the population size*? (Check that this is consistent with your answer to Questions 4 and 5.) Why does the graph of population size continue to increase even though the darkly shaded bars decrease? Use this model to find what the UN predicts will be the population in 2050. The UN is making an assumption by the predicting the darkly shaded bars as shown on the next page. What is this assumption, and, do you believe it is a correct assumption?

Millions

Billions

