

Population and Food Supply

The population of a country is initially 2 million people and is increasing at 4% per year. The country's annual food supply is initially adequate for 4 million people and is increasing at a constant rate adequate for an additional 0.5 million people per year.

Write an equation to represent the population of the country.

Write an equation to represent the food supply of the country.

Graph your equations on graph paper. Use different colors to distinguish the equations.

Based on these assumptions, in approximately what year will this country first experience shortages of food?

If the country doubled its initial food supply and maintained a constant rate of increase in the supply adequate for an additional 0.5 million people per year, what would this equation look like? Graph this on your coordinate plane using yet another different color. Would shortages still occur? In approximately which year?

If the country doubled the rate at which its food supply increases, in addition to doubling its initial food supply, what would this equation be? Graph this on your coordinate plane using yet *another* different color. Would shortages still occur? In approximately what year?

Standards Addressed

MGSE9-12.A.REI.11 Using graphs, tables, or successive approximations, show that the solution to the equation $f(x) = g(x)$ is the x -value where the y -values of $f(x)$ and $g(x)$ are the same.

MGSE9-12.F.BF.1 Write a function that describes a relationship between two quantities

MGSE9-12.F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions

MGSE9-12.F.LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

MGSE9-12.F.LE.5 Interpret the parameters in a linear ($f(x) = mx + b$) and exponential ($f(x) = a \cdot dx$) function in terms of context.



