

Population Density and Growth Rate Questions. SHOW ALL WORK IN COMPUTING THE PROBLEMS

KEY

1.) In 2001, the population of deer in Strongsville's metroparks was 285 deer. That same year the birthrate was 56 and the death rate was 46. It was also observed that 35 immigrated and 20 emigrated.

- What was the deer population at the end of the year?
- What is the growth rate?
- What is the per capita growth rate?

a] 310

c] $cgr = \frac{\Delta N}{N} = \frac{25 \text{ deer}}{285 \text{ deer}} = 0.088 \text{ deer/deer}$

b] $gr = \frac{\Delta N}{\Delta t} = \frac{25 \text{ deer}}{1 \text{ a}} = 25 \text{ deer/a}$

2.) A population of walleye increased from 1200 to 3700 from 2004 to 2006.

- What is the growth rate?
- What is the per capita growth rate for the time period

a] $gr = \frac{2500 \text{ walleye}}{2 \text{ a}} = 1250 \text{ walleye/a}$

b] $cgr = \frac{2500}{1200} = 2.08$

3.) A population of bunnies was studied for a period of three years. The first year there were 3 bunnies. The population tripled each year.

- What was the population after the third year?
- What is the growth rate?

a] 81 bunnies

b] $\frac{78 \text{ bunnies}}{3 \text{ a}} = 26 \text{ bunnies/a}$

4.) On a 4m by 3m picnic blanket at 3pm, I counted 45 ants. At 5pm there were 85 ants.

- What was the population density at 3 pm?
- What was the population density at 5pm?
- At what rate is the population density increasing?

a] $D = \frac{45 \text{ ants}}{12 \text{ m}^2} = 3.75 \text{ ants/m}^2$

b] $D = \frac{85 \text{ ants}}{12 \text{ m}^2} = 7.08 \text{ ants/m}^2$

c] $\frac{7.08 - 3.75}{2 \text{ h}} = 1.67 \frac{\text{ants/m}^2}{\text{h}}$

5.) A team of biologists studied a population of box turtles in an Ohio woodlot for a period of ten years. They determined birthrate to be 40 per year, death rate to be 30 per year, immigration to be 3 per year and emigration to be 8 per year.

- Was the population increasing or decreasing?
- By how much?
- If the population started out at 150 box turtles and the area was 5 square kilometers, what was the population density?
- What was the population density after 1 year?
- What was the population density after five years?
- What was the population density after the ten years of observations?

a] increasing

$$e] D = \frac{175 \text{ turtles}}{5 \text{ km}^2} = 35 \text{ turtles/km}^2$$

b] 5 turtles/a

$$f] D = \frac{200}{5} = 40 \text{ turtles/km}^2$$

$$c] D = \frac{150 \text{ turtles}}{5 \text{ km}^2} = 30 \text{ turtles/km}^2$$

$$d] D = \frac{155 \text{ turtles}}{5 \text{ km}^2} = 31 \text{ turtles/km}^2$$

6.) In 1990, the estimated population of grasshoppers is 926 on a 15 acre farm. The birthrate is measured at 315 grasshoppers per year and the death rate is 208 per year.

- What is the growth rate?
- If the population continues to grow in this same manner, what will be the population size in the year 2000?
- Compare the population density of the grasshoppers in 1990 to the density in 2000.

$$a] gr = \frac{107 \text{ hoppers}}{1 \text{ a}} = 107 \text{ hoppers/a}$$

$$b] gr = \frac{\Delta N}{t} \quad 107 \text{ hoppers/a} = \frac{\Delta N}{10} \quad \Delta N = 1070 \text{ hoppers}$$

$$N_{2000} = 926 + 1070 = 1996 \text{ hoppers}$$

$$c] D_{1990} = \frac{926 \text{ hoppers}}{15 \text{ ac}} = 61.7 \frac{\text{hoppers}}{\text{ac}}$$

$$D_{2000} = \frac{1996 \text{ hoppers}}{15 \text{ ac}} = 133 \text{ hoppers/ac}$$