

# Population Problems

Name Key

Period \_\_\_\_\_

Answer the following questions. Show your work in the space provided.

1. If 300 blue jays are found in a 20 hectare plot, what is the density in blue jays/hectare in that plot? Round to the nearest whole number.

$$\frac{300 \text{ blue jays}}{20 \text{ hectare}} = \boxed{15 \text{ blue jays/hectare}}$$

2. If 3400 maple trees are counted on a 3km x 4km rectangular patch of land, what is the density of maple trees per square kilometer? Round to the nearest tenth.

$$\frac{3400 \text{ maple trees}}{12 \text{ km}^2} = \boxed{283.3 \text{ maple trees/km}^2}$$

3. Suppose the population density of a sample of deer is 50 per square kilometer. Assuming that the population is uniformly distributed what would the population size be if the deer encompassed an area that was 20km x 20km? Round to the nearest whole number.

$$\left( \frac{50 \text{ deer}}{\text{km}^2} \right) (20 \text{ km} \times 20 \text{ km}) = \boxed{20,000 \text{ deer/km}^2}$$

4. There are 252 deer in a population. There is no net immigration or emigration. If 47 deer die and 32 deer are born in one month, what is the population size at the end of the month? Round to the nearest whole number.

$$252 - 47 + 32 = \boxed{237 \text{ deer}}$$

5. In a population of 600 squirrels, the per capita birth rate in a particular period is 0.06 and the per capita death rate is 0.12.

- a. What is the per capita growth rate of the population? Round to the nearest hundredth.

$$r = b - d = .06 - .12 = \boxed{-.06}$$

- b. What is the actual number of squirrels that die during this particular period? Round to the nearest whole number.

$$\text{Deaths} = (600)(.12) = \boxed{72 \text{ deaths}}$$

- c. What is the actual number of squirrels that are born during this period? Round to the nearest whole number.

$$\text{Births} = (600)(.06) = \boxed{36 \text{ births}}$$

6. In a population of 750 fish, 25 die on a particular day while 12 were born.

- a. What is the per capita death rate for the day? Round to the nearest thousandth.

$$\text{death rate} = \frac{25 \text{ die}}{750 \text{ total}} = \boxed{.033}$$

- b. What is the per capita birth rate for the day? Round to the nearest thousandth.

$$\text{birth rate} = \frac{12 \text{ born}}{750 \text{ total}} = \boxed{.016}$$

- c. What is the per capita rate of increase for the day? Round to the nearest thousandth.

$$r = b - d = 0.016 - 0.033 = \boxed{-0.017}$$

7. There are 2,000 mice living in a field. If 1,000 mice are born each month and 200 mice die each month, what is the per capita growth rate of mice over a month? Round to the nearest tenth.

$$b = \frac{1000}{2000} = \boxed{.5} \quad d = \frac{200}{2000} = \boxed{.1} \quad r = b - d = .5 - .1 = \boxed{.4}$$

8. You and your friends have monitored two populations of wild lupine for one entire reproductive cycle (June year 1 to June year 2). By carefully mapping, tagging, and taking a census of the plants throughout this period, you obtain the data listed in the chart.

Parameter	Population A	Population B
Initial # of plants	500	300
Number of new seedlings established	100	30
Number of initial plants that die	20	100

a. Calculate the following parameters for each population. Round each to whole number or hundredth where applicable and record your answers here (no grids provided.)

Parameter	Population A	Population B
$B$ (births during time interval)	100	30
$D$ (deaths during time interval)	20	100
$b$ (per capita birth rate)	$100/500 = .2$	$30/300 = .1$
$d$ (per capita death rate)	$20/500 = .04$	$100/300 = .33$
$r$ (per capita rate of increase)	$.2 - .04 = .16$	$.1 - .33 = -.23$

b. Given the initial population size of **Population A** and assuming that the population is experiencing growth at the growth rate  $r$  (calculated above), what will the number of plants be in each of the next 5 years? (Use the initial population size as time 0.) Round each to the nearest whole number and record your answers here (no grids provided).

Time (year)	Population Size
0	500
1	580
2	673
3	780
4	905
5	1050

9. A population of 265 swans was introduced to Circle Lake. The population's birth rate is 0.341 swans/year per capita, and the death rate is 0.296 swans/year per capita. What is the rate of population growth per capita, and is it increasing or decreasing? Round to the nearest thousandth.

$$r = b - d = .341 - .296 = \boxed{.045} \text{ increasing}$$