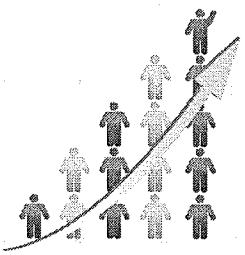
ECOLOGY POPULATION GROWTH RATE QUESTIONS



1. A certain population of beetles is experiencing exponential growth.
   Population size = 70
   Births = 15
   Deaths = 6

   a) $r = \frac{B-D}{N} = \frac{15-6}{70} = \frac{9}{70} = 0.129$

   a) Calculate the individual growth rate (r). This is also known as the per capita reproduction rate.
   b) Calculate the population growth rate. (Individuals added to the population in one generation.)

   b) $\frac{\Delta N}{\Delta t} = rN = 0.129 \times 70 = 9$

2. The following population pill bugs is experiencing logistic growth.
   Population size = 70
   Use the same growth rate as in problem #1.
   Carrying capacity = 550

   $\frac{\Delta N}{\Delta t} = rN\left[\frac{K-N}{K}\right]$
   $= 0.129 \times 70\left[\frac{550-70}{550}\right]$
   $= 9.03[0.873] = 7.88$

   a) Calculate the population growth rate. (Individuals added to the population in one generation.)

3. The following population of caterpillars has no limits on food resources or space:
   Population size = 600
   Births = 275
   Deaths = 120

   a) $r = \frac{B-D}{N} = \frac{275-120}{600} = 0.25$

   b) $\frac{dN}{dt} = rN = 0.25(600) = 150 \rightarrow 600+150 = 750$

   c) $\frac{dN}{dt} = rN = 0.25(750) = 187.5 \rightarrow 187.5+750 = 937.5$

   a) Calculate the r for this population if it is experiencing exponential growth.
   b) How many individuals will be in the population at the start of the second generation?
   c) How many individuals will be in the population at the start of the third generation?

4. Now consider population D, in which food resources are limited and it is experiencing a logistic growth pattern.
   Population size = 500
   rmax= the same for the previous problem
   Carrying Capacity = 1,000

   $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right) = 0.25 \times 500\left(\frac{1000-500}{1000}\right) = 62.5$
   Total $\rightarrow 62.5+500 = 562.5$

   b) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right) = 0.25 \times 562.5\left(\frac{1000-562.5}{1000}\right) = 61.5$
   $\rightarrow 61.5+562.5 = 624.02$

   a) How many individuals would be in the population at the start of the second generation.
   b) How many individuals would be in the population at the start of the third generation.

POPULATION DENSITY PROBLEMS

5) $\frac{300 \text{ birds}}{20 \text{ hectares}} = 15 \text{ birds/hectare}$

5. 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.

6. 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 200km? Round your answer to the nearest whole number.

$A = 20 \times 200 = 4000 Km^2$

$50 \text{ deer}/Km^2 \times 4000 Km^2$

$= 200\,000 \text{ deer}$