

Formulas:

<u>Rate</u>	<u>Population Growth</u>	<u>Exponential Growth</u>	<u>Logistic Growth</u>
$dY/dt$	$dN/dt = B - D$	$\frac{dN}{dt} = r_{\max} N$	$\frac{dN}{dt} = r_{\max} N \left( \frac{K - N}{K} \right)$
$dY$ = amount of change		$dt$ = change in time	
$B$ = birth rate		$D$ = death rate	
$N$ = population size		$K$ = carrying capacity	
$r_{\max}$ = maximum per capita growth rate of population			

1. There are 2,000 mice living in a field. 1,000 mice are born each month and 200 mice die each month. For 1 month, what is the net population growth? What is the per capita growth rate of mice over a month?
2. For the same population, what would be the per capita growth rate if there were 1200 mice dead each month instead of 200?
3. For a population of 40,000 Elephants living in South Africa, the per capita growth rate ( $r_{\max}$ ) = - 0.05. How many elephants will be present in South Africa next year?
4. In 2009, the US had a population of about 300 million people. If there were 14,000 births and 8,000 deaths per million people, what was the country's net population growth that year?

5. For the above problem, what was the country's per capita growth rate that year?
  
6. A population of land snails is estimated to be at 1400 snails for a section of forest in southern Great Britain. The population is undergoing exponential growth, and its per capita growth rate is 0.05 per year. What will be the new population in a year?
  
7. Brunswick, GA had a population of 49,000 in the year 2013. The infrastructure of the city allows for a carrying capacity of 60,000 people. The  $r_{\max} = .9$  for Brunswick. What will be the population growth for 2013? What will be the population size at the start of 2014?
  
8. The population of paramecium in a test tube is at 300. The test tube has a carrying capacity of 500. If the paramecia have an  $r_{\max} = .45$  per week, what will be the population growth for 1 week? What will be the new paramecium population after the week?
  
9. A population of mussels in logistic growth went from 600 to 670 in a year, and the carrying capacity was 700. What was the  $r_{\max}$  for the mussel population?
  
10. A population of deer live in a forest where the carrying capacity is 1500. If the population is 1550 and the  $r = 0.5$  per year, what will be the population of the deer next year?

Answers:

1. + 800, 0.4
2. - 200, -0.1
3. 38,000
4. 1,800,000
5. 0.006 or 0.6%
6. 1470
7. +8085 people; 57,085
8. +54, 354
9. 0.82
10. 1524