Vocab:

* Survivorship Curve -
* Exponential Growth Curve -
* J Curve -
* Limiting Factor –
* Logistic Growth Curve –
* S Curve –
* Carrying Capacity –

**Population Dynamics**

1. Most people agree that house cats are cute. However, the statistics on cats are quite surprising. Take a look at the statistics on cats and see if you can answer the math problem below.

* A pair of cats will generally have four kittens in a litter.
* Cats generally have the same number of male and female kittens.
* Cats can have around two litters per year.
* Cats are generally mature after around 6 months

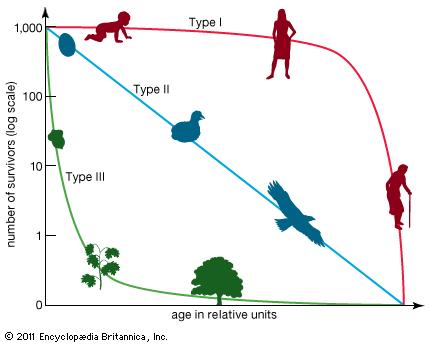
Let’s say you started with one male and one female cat. Assuming that all of the cats followed the rules that are listed above, how many cats would you have after 4 years?

**Work Space**

As you see there would be a very large number of cats after a very brief period of time. List four major reasons why the United States is not overrun with billions of cats.

1. A **survivorship curve** is a basic graph that shows the proportion of a population surviving to a particular age. This is important to know because many different species have many different survival strategies.

Look at the survivorship curve below. Identify how the lives of the following species will be different.



The three different organisms, tree, bird and human, have large differences in the amount of organisms that survive to maturity. Identify two different types of species below that relate to each of the curves above.

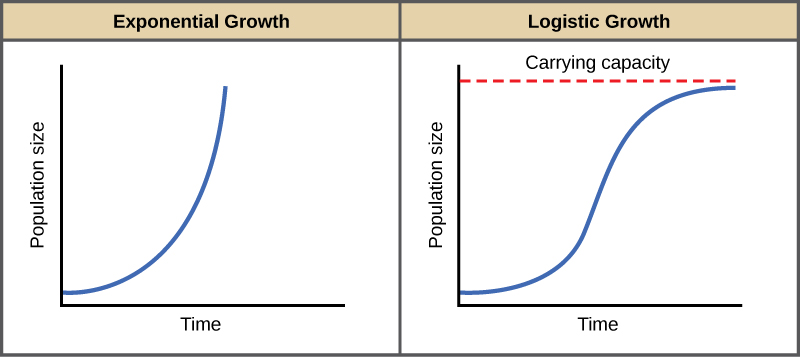
Organisms that relate to the tree (Type III)–

Organisms that relate to the bird (Type II)–

Organisms that relate to the human (Type I)-

1. Based on how populations grow over time, they can have different types of growth. One method of growth is **exponential growth**. This is when a population grows very rapidly. It is normally seen when a population discovered a new ecosystem that has few predators and a large (or even unlimited) amount of resources. Bacteria that discover a new habitat often show exponential growth.

The graph for exponential growth is often called a **J – Curve** and can be seen below.



Use the information below to graph your own exponential growth curve of human population growth

|  |  |
| --- | --- |
| Year A.D. | Number of Humans (in billions) |
| 1650 | 0.5 |
| 1750 | 0.7 |
| 1850 | 1.0 |
| 1925 | 2.0 |
| 1956 | 2.4 |
| 1966 | 3.2 |
| 1970 | 3.5 |
| 1976 | 4.0 |
| 1980 | 4.4 |
| 1986 | 4.9 |
| 1991 | 5.5 |
| 2000 | 6.0 |
| 2010 | 6.8 |
| 2016 | 7.4 |

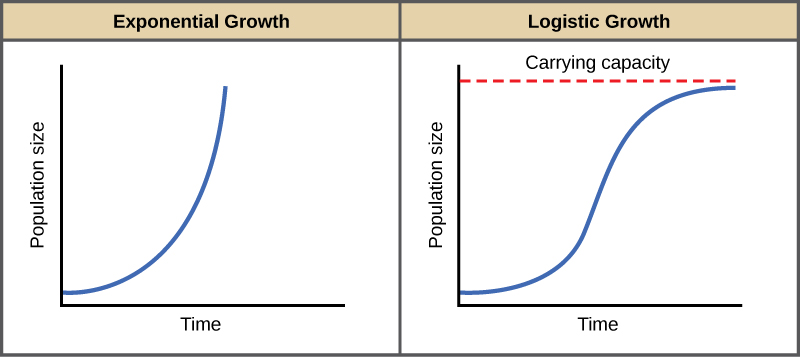


Looking at the above graph, answer the following questions about human population.

1. What type of growth are humans currently following? Why?
2. What does this graph tell us about the resources (currently) available to humans?
3. If you were to predict human population in the year 2050, how many humans would you expect to find on earth? How did you come to that conclusion?
4. Another method of growth is **logarithmic growth**. This is when a population grows very rapidly, however it caps off. It is normally seen when a population is limited by an outside factor. An example of this would be the number of wild foxes in New Jersey. Their population has remained relatively stable for several years.

The graph for exponential growth is often called an **S – Curve** and can be seen below.

The point of an S-Curve where a population levels off is called the **carrying capacity**. This is the number of organisms that an environment can support. The carrying capacity is normally limited by several **limiting factors**. Limiting factors such as disease, lack of food, predators and old age will keep a population from expanding beyond a certain size.



Use the sample of data below to create your own logarithmic growth curve.

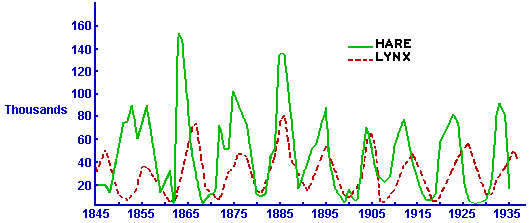
|  |  |
| --- | --- |
| Years | Number of Moose |
| 0 | 10 |
| 50 | 50 |
| 100 | 150 |
| 150 | 300 |
| 200 | 350 |
| 250 | 325 |
| 300 | 315 |
| 350 | 325 |
| 400 | 320 |



Looking at the above graph, answer the following questions about this example’s moose population.

1. What is the carrying capacity of the moose population?
2. Is carrying capacity rigid at one number? Can it change from year to year? Why might it change from year to year?
3. What are two different biotic factors that may limit the moose population?
4. What are two different abiotic factors that may limit the moose population?
5. Populations do not always grow or decline by themselves. Often populations chance with the ecosystem.

One situation that helps us understand the basics of dynamic populations is the situation of the snow shoe hair and the lynx. These are two organisms that live in relative isolation in the northern parts of Canada. Take a look at a graph of their populations below.



Use the space below to describe three different patterns that you see from the graph above.

1)

2)

3)

With your observations, write a paragraph that describes why the populations of the snowshoe hair and the lynx are intertwined. Be sure to highlight now the two population’s success or failure are linked.