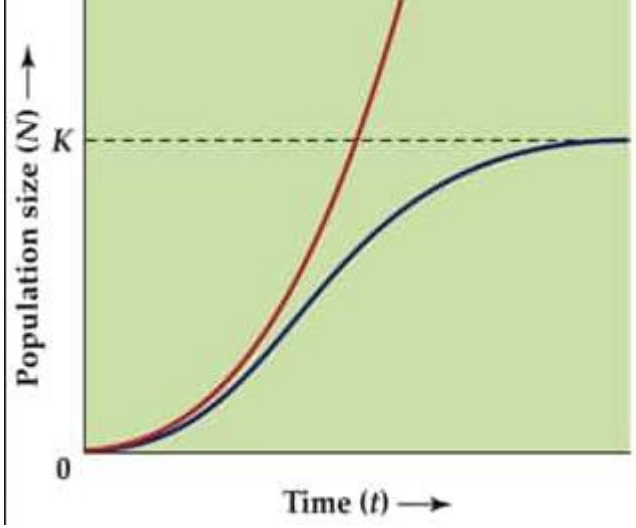
UNIT 9 - ECOLOGY

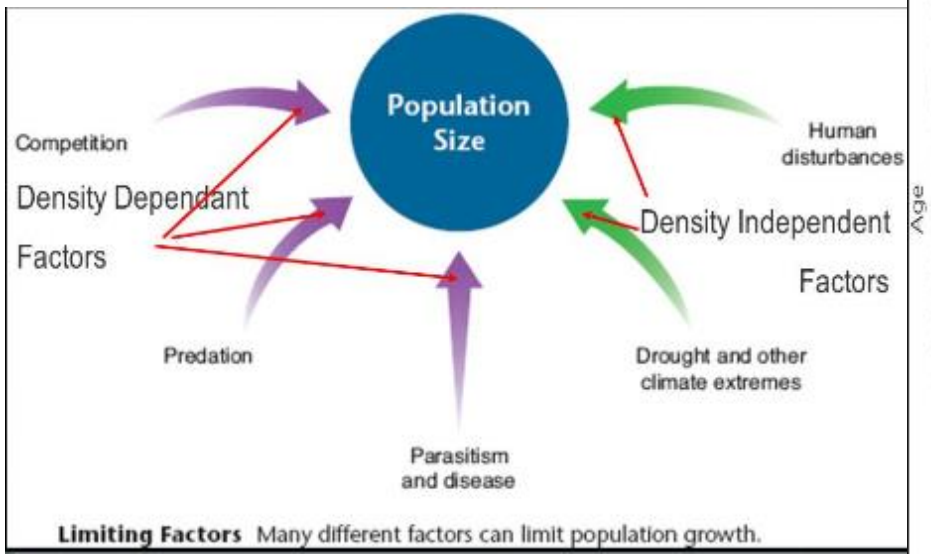
Topic 1 – Ecology Basics
Topic 2 – Population Ecology
Topic 3 – Community Ecology
Topic 4 – Energy Transfer and Nutrient Cycles

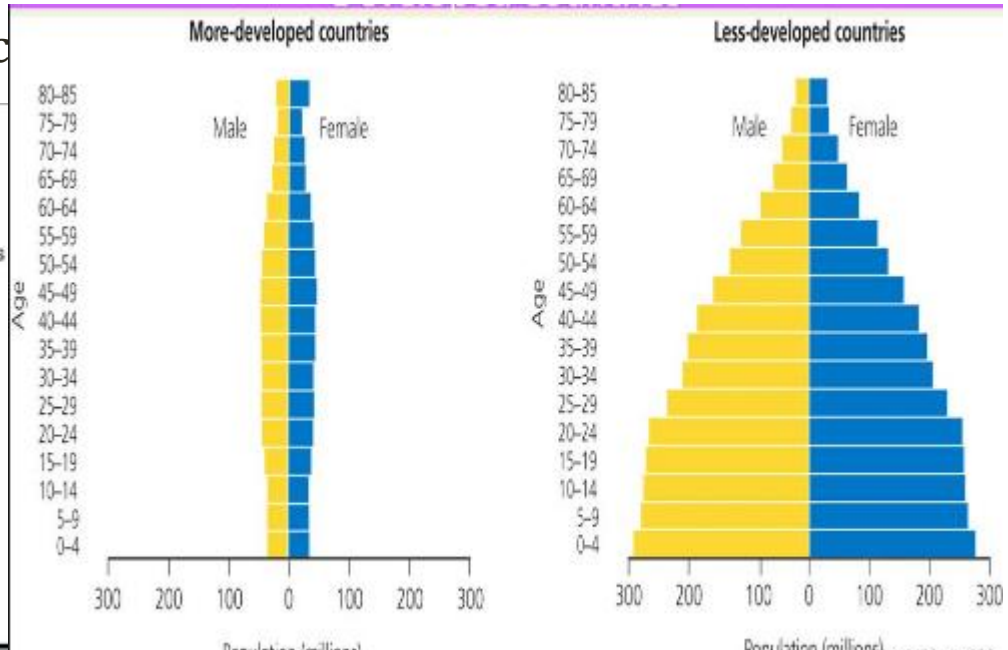
TOPIC 2: POPULATION ECOLOGY

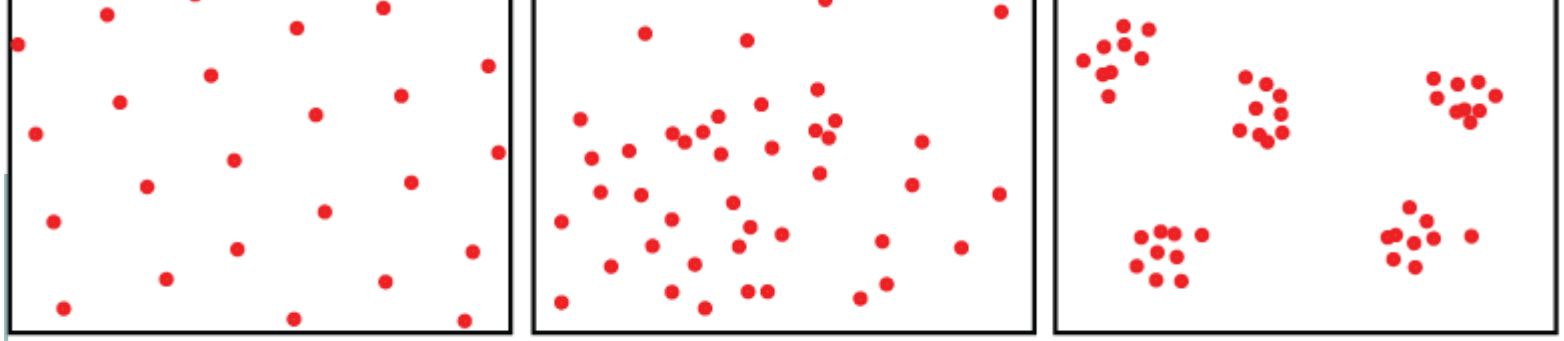


By the end of this topic, you should be able to…

- Compare and contrast exponential and logistic growth
- Compare and contrast density dependent and density independent limiting factors
- Analyze and interpret age struc

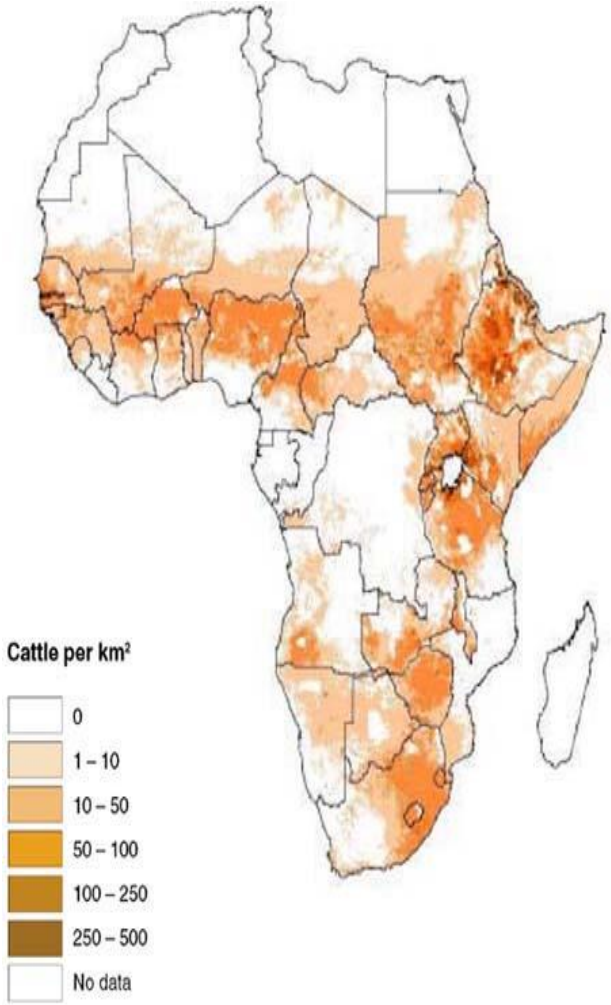






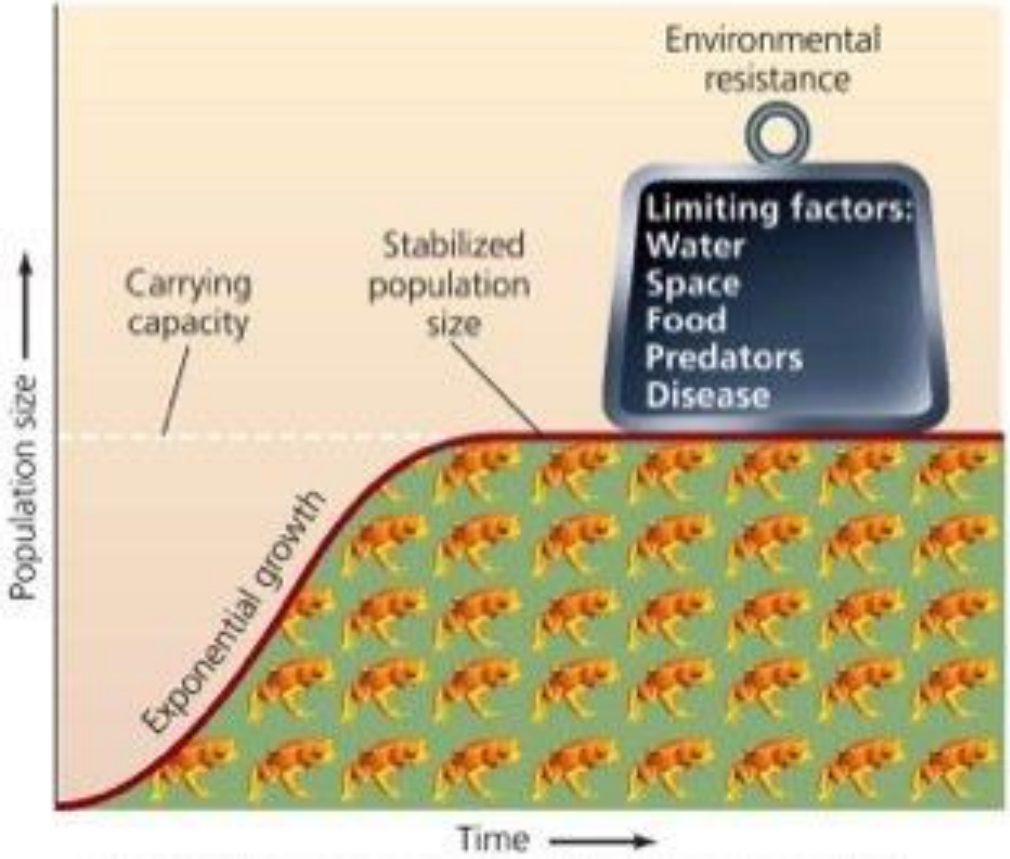
Uniform dispersion Random dispersion Clumped dispersion

Population = a group of organisms of the same species that live in a particular area



Population Growth = (increasing the density of a population) usually cannot continue forever. When a population can no longer grow it has reached its carrying capacity.

Things that affect population growth can be either biotic (living) or abiotic (non-living), and can depend on how big the population already is

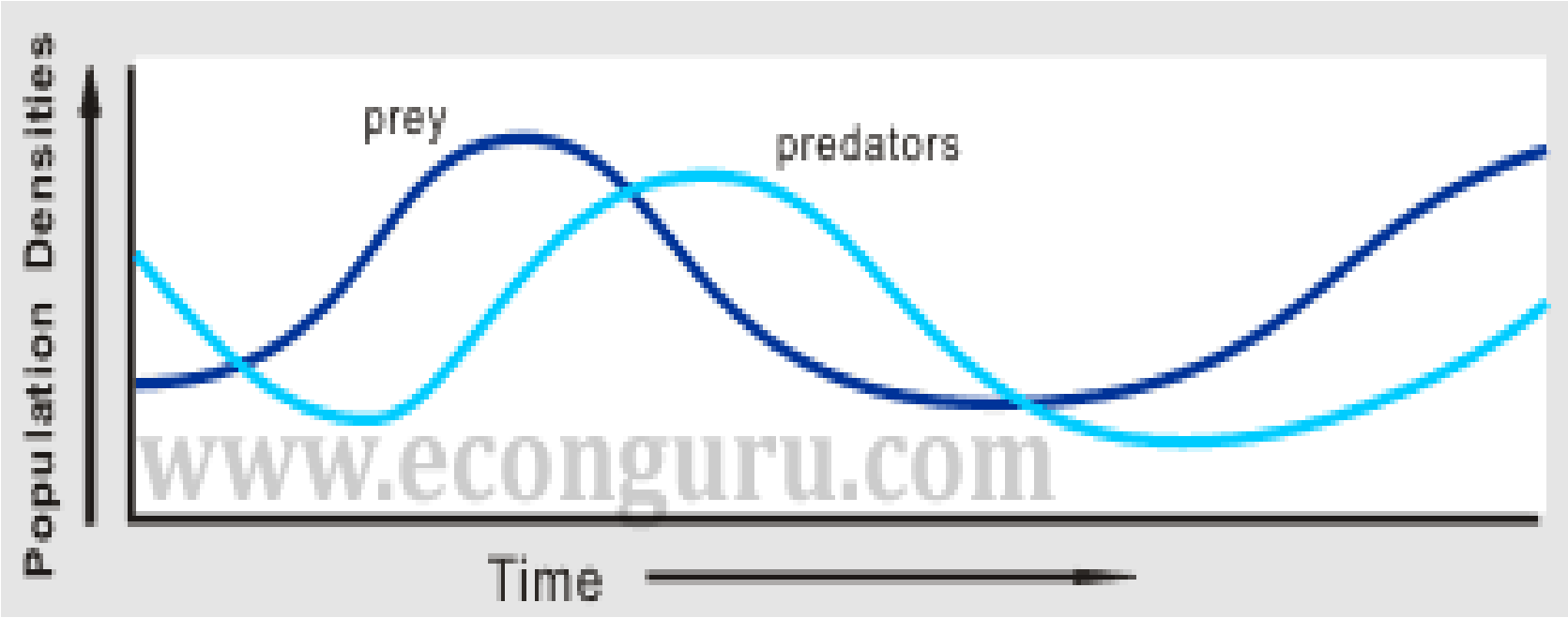


Limiting Factors = components of the environment that limit the growth of a population

Types of Limiting Factors

1) Density Dependent = limits the size of a population when the population reaches a certain density (number of organism per area)

Examples: disease/parasitism, predation, competition



Types of Limiting Factors

2) Density Independent = limits the size of a population no matter what the density is

Examples: natural disasters (tornadoes, hurricanes, forest fires etc.)

Study the table below. Gypsy moth caterpillars can destroy trees by eating too many leaves and making them susceptible to disease or drought. Which student has correctly identified the density-dependent and density-independent limiting factors associated with an invasion of gypsy moth caterpillars?

Forest Ecosystem Factors

Student	Population of Gypsy Moth Caterpillars	Disease	Drought
1	density-independent	density-dependent	density-dependent
2	density-dependent	density-independent	density-independent
3	density-independent	density-independent	density-dependent
4	density-dependent	density-dependent	density-independent

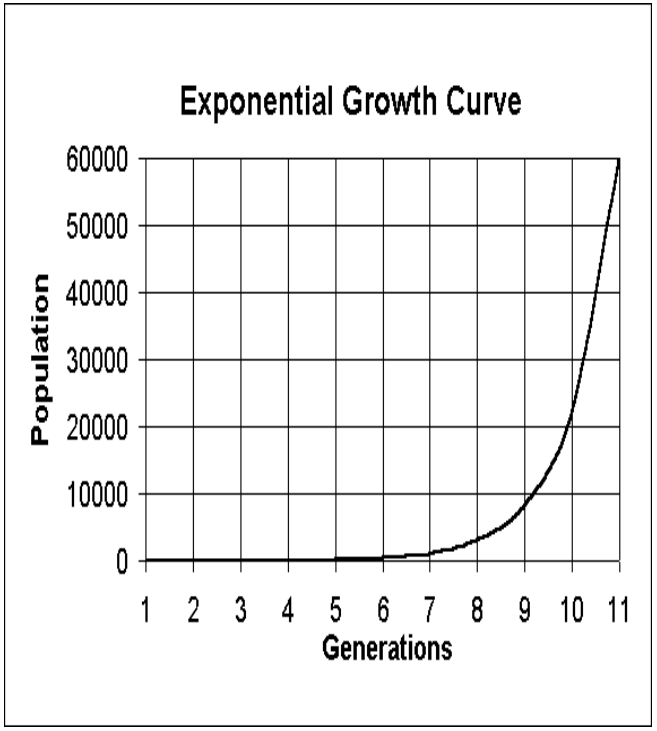
TYPES OF POPULATION GROWTH

1) **Exponential Growth =** population increases quickly in size (can only happen for short periods of time when there are no limiting factors)

We call the graph pictured to the right a J-curve

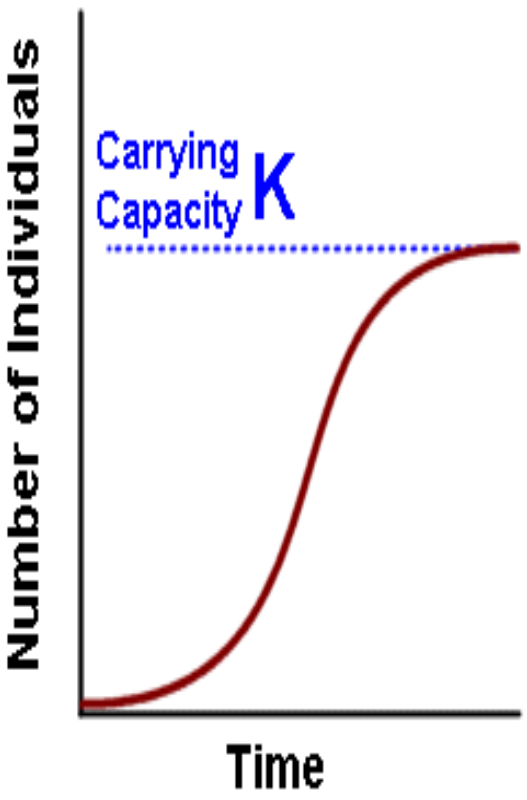
sketch this on your graph in any color of your choosing

Example in Nature: rapid bacteria growth in a new host (body)



TYPES OF POPULATION GROWTH

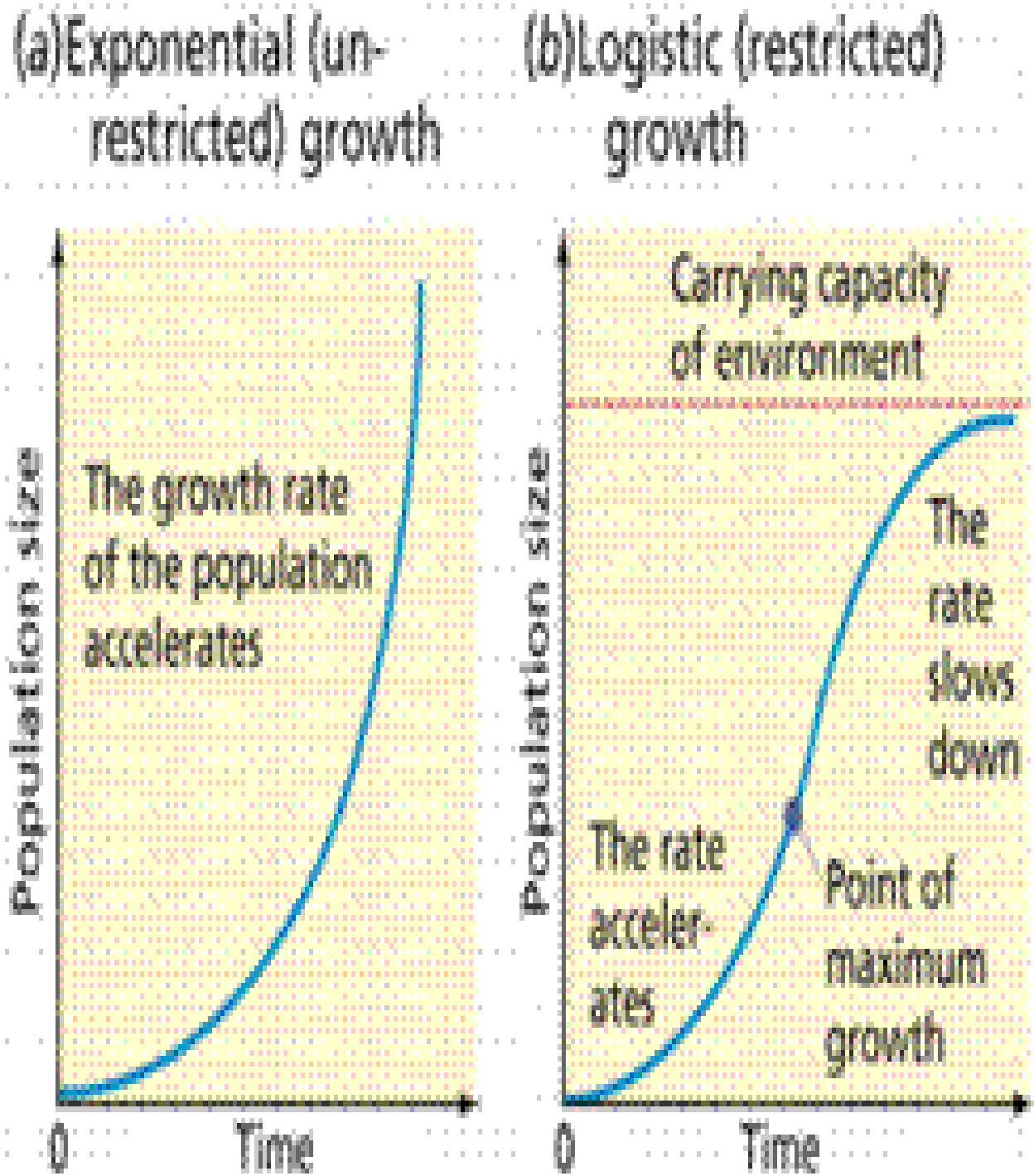
2) **Logistic Growth =** population grows quickly for some time and then stops growing once it reaches its carrying capacity, the total number of individuals the environment can support



We call the graph pictured to the right an S-curve

sketch this on your graph in any color of your choosing, as long as it is different than your J-curve

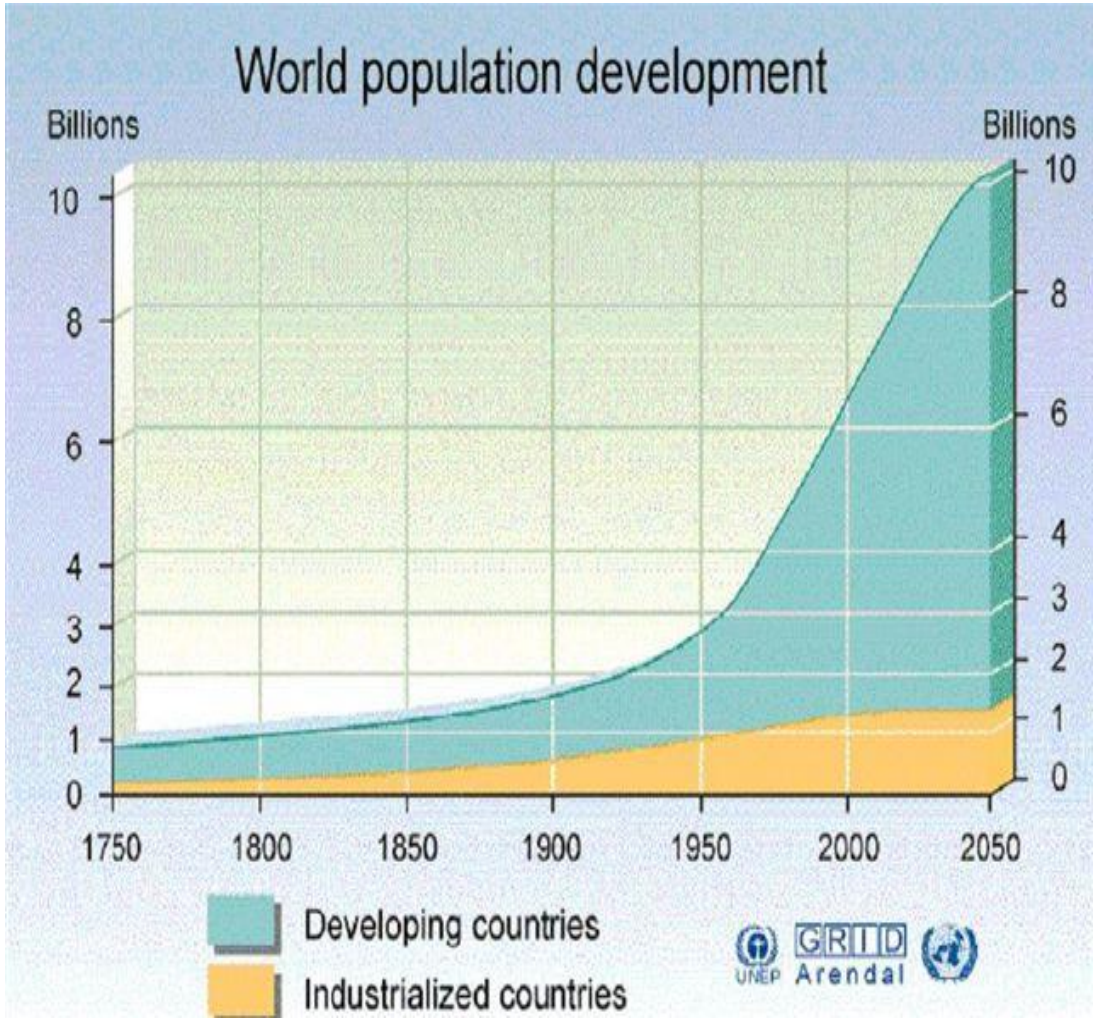
Example in Nature: grizzly bear population (limited by territory size)


(a)Exponential (un-restricted) growth
(b)Logistic (restricted) growth
Population size
The growth rate of the population accelerates
0
Time
Population size
Carrying capacity of environment
The rate slows down
The rate acceler-ates
Point of maximum growth
0
Time

HUMAN POPULATION GROWTH

Useful Measurements = birth rate*, death rate (AKA mortality rate), life expectancy, age structure

*aka natality rate

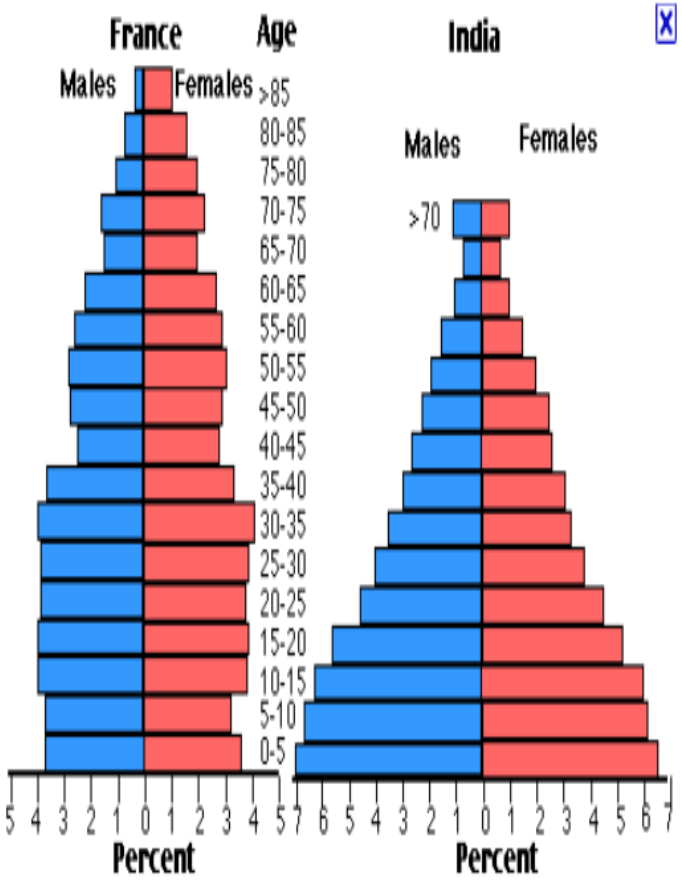


AGE STRUCTURE PYRAMIDS

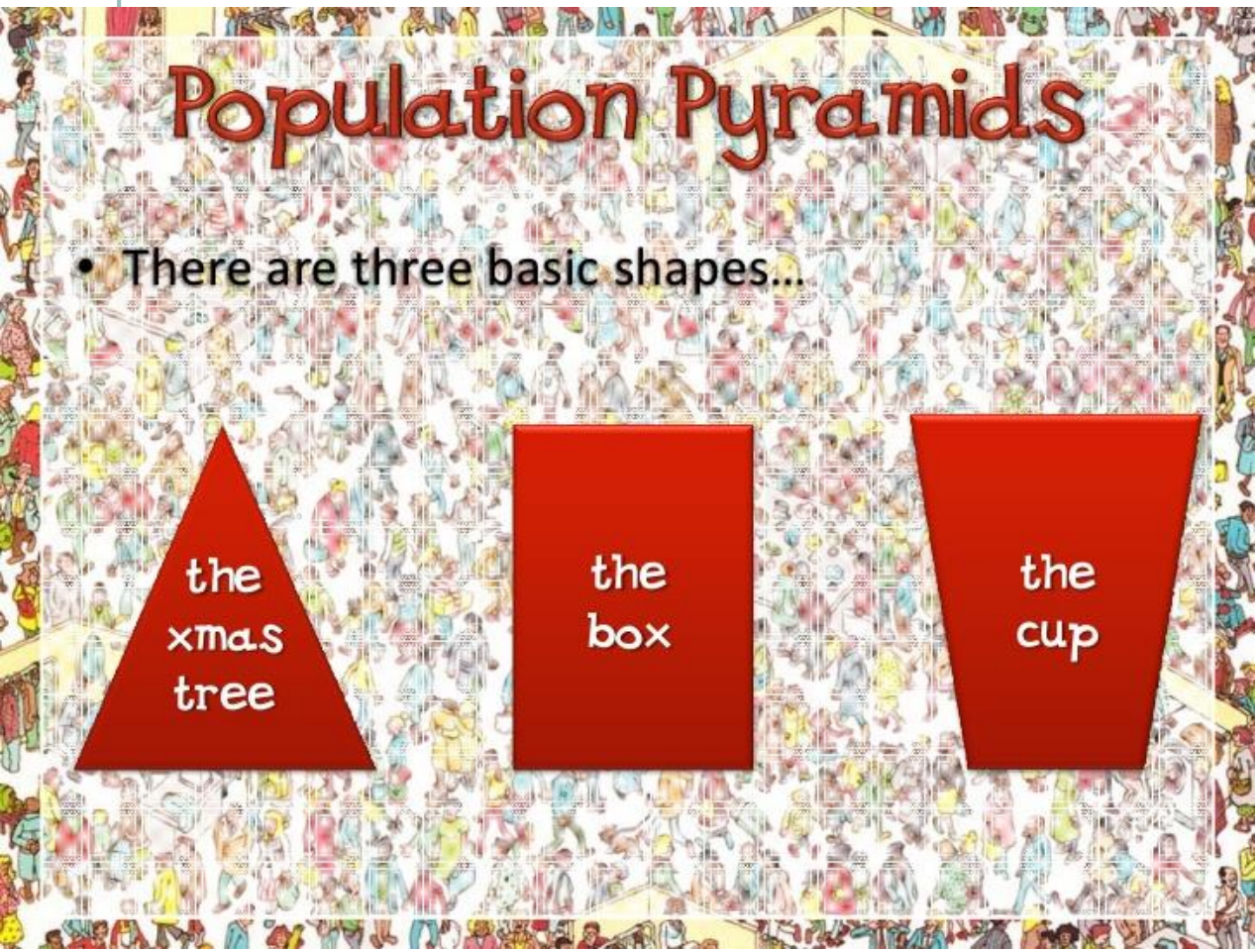
What is different about these two pyramids?

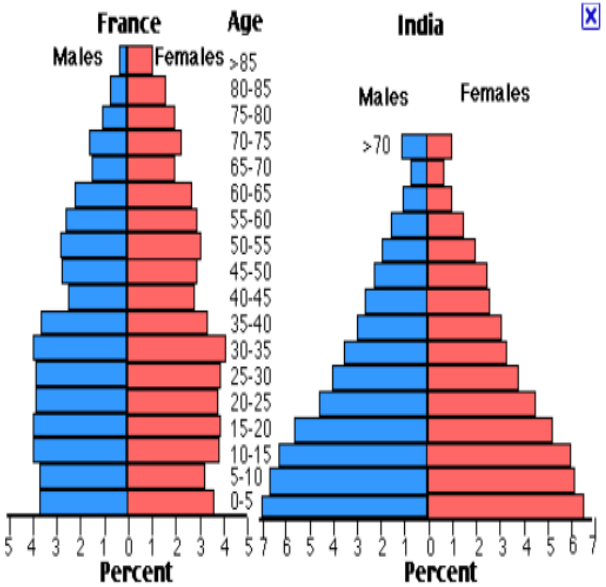
Which country/population seems to be growing more?

List several reasons why a **developed country** like France might have a different age structure than a **developing country** like India.



TYPES OF PYRAMIDS





TYPES OF PYRAMIDS

What it Means...

the christmas tree
(developing nation)

- growth rates are slow
- high birth rate
- short life expectancy

Like?
Namibia
Bangladesh

the box
(developed nation; slow growth)

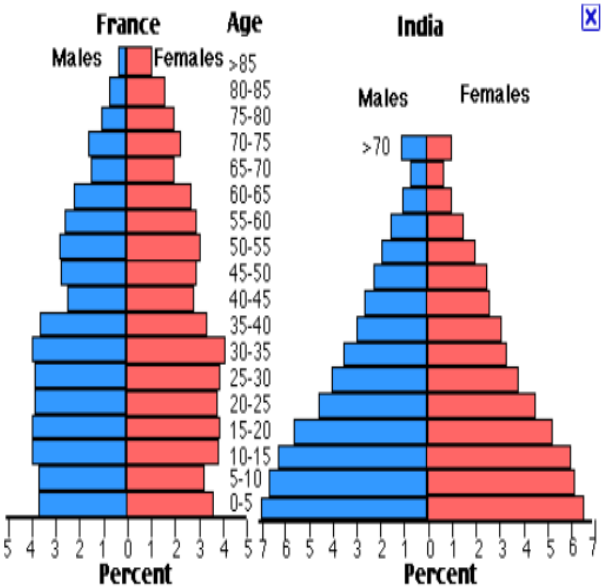
- low infant mortality
- slow population growth
- long life expectancy

Like?
Sweden
USA

the cup
(developed nation; negative growth)

- low birth rate
- shrinking population
- long life expectancy

Like?
Italy
Japan



The **growth rate** is determined by: birth, death, immigration, and emigration

Immigration = the movement of organisms into a population

Emigration = the movement of organisms out of a population

LIMITING FACTORS FOR HUMAN POPULATIONS

What are some **density-dependent** factors that could affect human population growth?

What are some **density-independent** factors that could affect human population growth?