Population Biology Activity

Name:_____

Purpose

Population growth is defined as the change in the size or density of a population over time. There are many ways for scientist to study population density. One way is to sample a population using a method called mark and recapture. In this method population density is estimated mathematically by comparing the number of individuals originally caught to organisms previously caught. Overall, the goal is to obtain information about how an organism's population is changing within the limits of its environment.

Procedure

Using information obtained and information from your text, answer the following questions.

Define or explain the following:

1. Logistic growth(explain and show the curve)
2. Exponential growth(explain and show the curve)
3. Lag Period
4. Exponential growth period
5. Equilibrium growth period
6. Carrying capacity
7. Population density
8. Population Density depends on…
9. What are density dependent limits on population?
10. Give examples of density dependent limits.
11. What are density independent limits on population?
12. Give example of density independent limits.
13. Describe the r selected reproductive strategy.
14. Describe the k selected reproductive strategy.
15. Emigration
16. Immigration
17. Age structure
18. Demographics

19. The number of organisms in a population changes over time because of the following: births, deaths, immigration, and emigration. Of course, births and immigration increase the size of the population; whereas, deaths and emigration decrease the size. The increase in the number of organisms in a population is referred to as population growth. Write a simple equation that relates the previous factors to population growth.

20. Bacterial growth is cell replication. Most species of bacteria replicate by binary fission, where one cell divides into 2 cells, the 2 cells into 4, the 4 into 8, etc. If this cell division occurs at a steady rate – such as when the cells have adequate nutrients and compatible growing conditions – we can plot numbers of cells vs. time. Use the Data table to create a graph of the bacterial growth of *E. coli*. Make sure you label the x and y axis with the units as well as give the graph a title.

Time (hours)	Number of Bacteria
0	1
1	4
2	5
3	8
4	15
5	32
6	65
7	87

21. Now it is your turn to simulate bacteria growth. For this exercise, to simulate bacteria growth in a Petri dish you will start by drawing a draw a small circle in the imaginary Petri dish below. This will be the start of your colony. You will model the population growth of bacteria by simulating binary fission. This is done by for every one circle (bacterial cell) you get 2. Therefore, if you have 2, you get 4 and so on. Remember the bacteria can not leave the Petri dish.

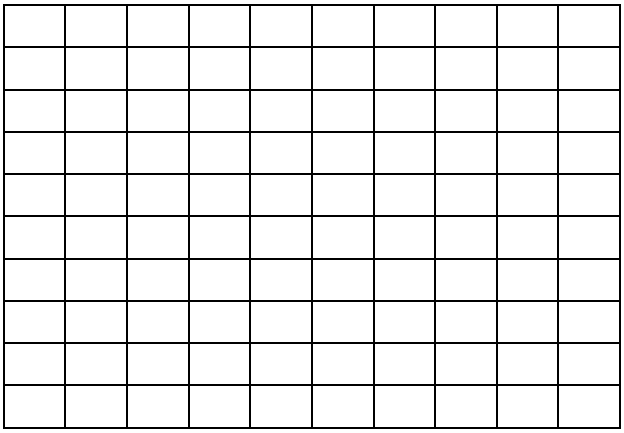
22. What type of population growth does the bacterium first undergo?

23. List factors that are limiting the bacteria population growth.

24. What was the carrying capacity for your bacteria colony?

25. What do you think will happen to the bacteria over a long period of time?

26. Draw a general graph (approximate time and numbers) for the generalization you made above in the graph provided. Label the x and y axis, and give the graph a title.



27. Fill in the chart below that describe the reproductive strategies of k and r selected species and three species for each reproductive strategy.

28. Draw a generalized j curve (with labels).

29. Draw a generalized S curve (with labels).

Graph 1; Rabbits vs. Time

21. The graph shows a _____ growth curve.

22. The carrying capacity for rabbits is _____

23. During which month were the rabbits in exponential growth?

24. List factors that would be keeping the rabbit population at it's carrying capacity

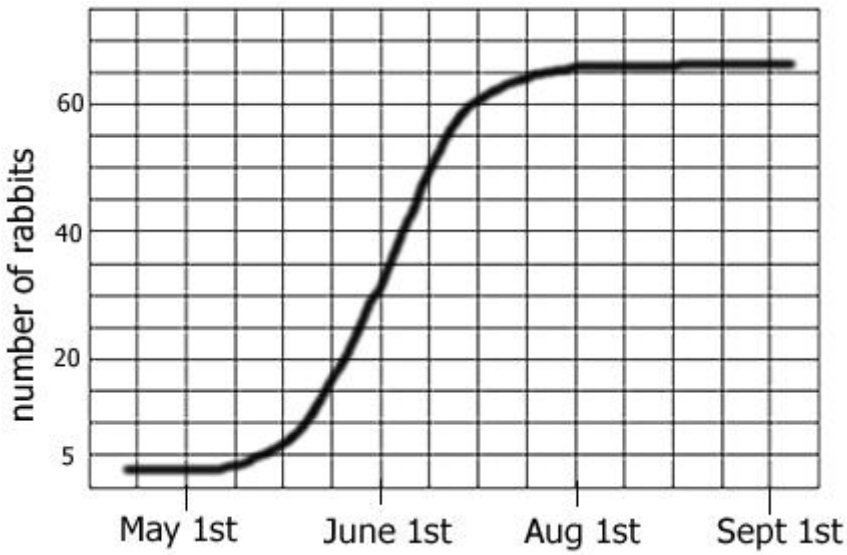


Chart 4: Trapping Geese

In order to estimate the population of geese in Northern Wisconsin, ecologists marked 10 geese and then released them back into the population. Over a 6 year period, geese were trapped and their numbers recorded.

Year	Geese Trapped	Number with Mark
1980	10	1
1981	15	1
1982	12	1
1983	8	0
1984	5	2
1985	10	1

24. Use the formula to calculate the estimated number of geese in the area studied?

    _____

    This technique is called _____ & _____

$$\frac{\text{(Total number captured) x (number marked)}}{\text{(total number recaptured with mark)}}$$

25. Supposing more of the geese found in the trap had the mark, would the estimated number of geese in the area be greater or lesser? _____

Chart 6: Snakes & Mice

The data shows populations of snake and mice found in an experimental field.

Year	Snakes	Mice born	Mice died
1960	2	1000	200
1970	10	800	300
1980	30	400	500
1990	15	600	550
2000	14	620	600
2001	15	640	580

26. Use the data from above to create a graph below. You will have to use a X Y Y graph. That means that you will graph 2 independent variables on the Y axis, one on each side. Make sure to label your X and Y axis and give the graph a title.

27. Using the equation from problem 19, during which year was the mouse population at zero population growth? _____

28. What is the carrying capacity for snakes ? _____

29. What is the carrying capacity for mice? _____

30. Using the graph, during which year(s) did the mice experience a high rate of growth?

31. Using the graph, during which year(s) did the snakes experience a high rate of growth?

32. Does this data show density dependent or density independent limits on population growth?