

Turkey Trouble

Growth rates can be characterized by two different growth curves: linear and exponential.

Linear growth occurs at a constant rate. Many increases or decreases occur at linear rates. An example of this would be having your salary increase by \$1000 per year.

Exponential growth occurs at an increasing rate through time. An example would be having your salary increase (or decrease) at a rate of 5% per year.

Since all populations have the reproductive potential to increase at an exponential rate, it is difficult to

comprehend the gravity of problems associated with population growth. Population is limited by many factors, including availability and quality of water, food, shelter and territory, as well as natural and human-made changes in habitat.

As an example, in 1935, Wyoming had no Merriam's turkeys within its borders. A decision was made to plant 46 turkeys in a mountainous area of the state. This activity will provide students with the opportunity to compute the possible growth of the turkey population during its first five years after the planting.

Procedure

Task 1

Compute the size of the population of Merriam's turkeys in Wyoming for five years, using the following assumptions. Complete the data table (See Appendix A).

Assumptions:

1. None of the turkeys left the general area during the five years.
2. There was no disease or shortage of habitat that limited the population.
3. There were an equal number of males and females in each hatch.
4. All sexually mature females successfully hatched a clutch of ten eggs each year.
5. No turkeys reproduced until after they had completed more than one full year of life.
6. All turkeys died during the winter after their fifth year of life (after hatching their fourth clutch.)
7. All of the turkeys introduced were one year old and sexually mature.
8. There were an equal number of males and females in the original number of 46 turkeys that were planted.

Task 2

Plot the population against the five years on a graph as indicated by the diagram below. Use a full sheet of paper for the graph, making it as large as the paper will allow.

Task 3

Compute the size of the population of Merriam's turkeys in Wyoming using a linear growth model for five years based on the following assumptions. Complete the data table (See Appendix B).

Assumptions:

1. The turkey population each year produced 230 offspring.
2. None of the turkeys left the area.
3. There was no disease or shortage of habitat that limited the population.

Task 4

Plot the data from Task 3 on the same graph used in Task 2.

Task 5

1. In the examples give, which growth patterns appear to be increasing at a faster rate? Why?

- The estimate of the true population of the Merriman's turkey by the Wyoming Game and Fish Department at the end of five years was 2,500. How can we account for the difference? Were any of the original assumptions incorrect? Which ones?
- All populations have the potential to increase at an exponential rate. What factors limit this potential?

Appendix A

Exponential Growth Data Table

Year	1	2	3	4	5	6
1. Beginning population	46	276	506	_____	_____	_____
2. – five year olds	0	0	0	0	46	230
3. – last year's hatch (not yet breeding)	0	230	230	_____	_____	_____
4. = Breeding population	46	46	276	_____	_____	_____
5. Breeding pairs (#4 divided by 2)	23	23	_____	_____	_____	_____
6. Offspring (#5 x 10 eggs/clutch)	230	230	_____	_____	_____	_____
+ breeding population (#4)	46	46	_____	_____	_____	_____
+ last year's hatch (#3)	0	230	_____	_____	_____	_____
7. = Total population	276	506	_____	_____	_____	_____

Appendix B

Linear Growth Data Table

Year	1	2	3	4	5	6
Population	46	276	_____	_____	_____	_____
+ increase	230	230	_____	_____	_____	_____
= total population	276	506	736	_____	_____	_____

Evaluation

- On an island, a rabbit population is doubling every year for six years. If you started with one pair (one male and one female), what would the population number after six years? This is an example of what kind of population growth?
- A population of mountain lions is increasing by two members per year. If you started with two animals, what would the population size be after six years? This is an example of what kind of population growth?
- List three natural limiting factors that could affect the growth of a rabbit population.