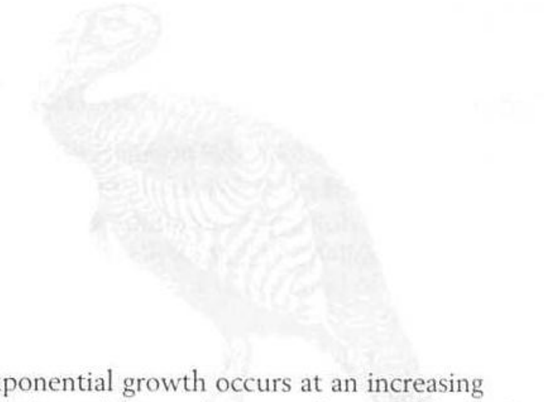


Turkey Trouble

Objectives

Students will (1) define and give examples of exponential and linear growth rates in wildlife populations, and (2) describe factors that affect and limit growth of wildlife populations.

Method

Students make computations and interpret results.

Materials

Paper, graph paper, pencils

Background

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 $1,000 per year.

Grade Level: 9–12

Subject Areas: Environmental Education, Mathematics, Science

Duration: two 45-minute sessions, or one with homework

Group Size: any

Setting: indoors

Conceptual Framework Topic Reference: ITIIA

Key Terms: linear, exponential, limiting factors, population

Appendices: Using Local Resources

Exponential growth occurs at an increasing rate through time. An example would be having your salary increase (or decrease) at a rate of 5 percent 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 release 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 5 years after the release. As background, students should recognize that in reality, these turkeys will be affected by many natural and human-caused limiting factors. For example, growth of bird populations is affected by factors such as the availability of food, water, shelter, and space; disease; predation; and climatic conditions; as well as broken or infertile eggs.

The major purpose of this activity is for students to acquire knowledge of factors affecting wildlife populations.

continued

Name: ____ Class: ___________ Date: ____________

Turkey Trouble

Adapted from Project Wild activity

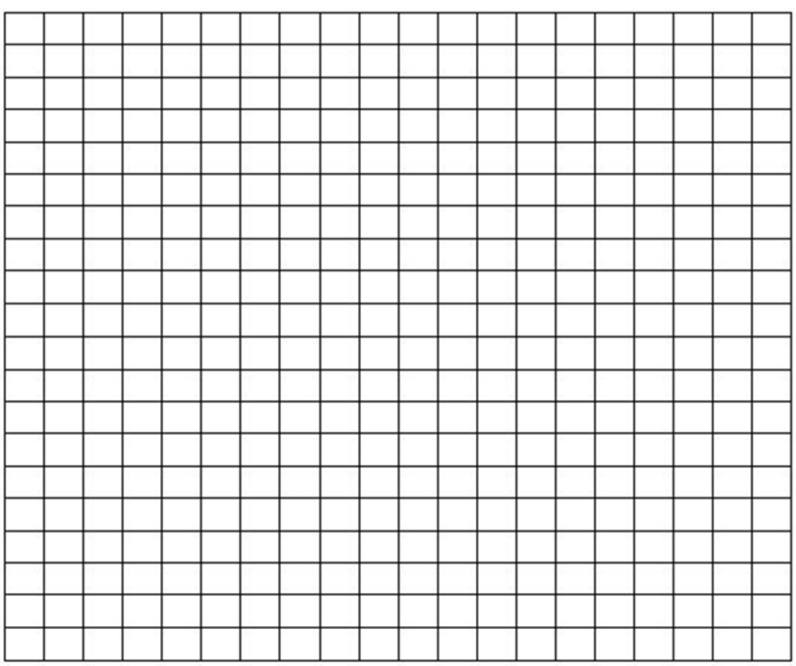
Introduction

In 1935, a decision was made to release 46 Merriam's turkeys within the state of Wyoming. Prior to this decision, none of these turkeys existed within the state. You will predict how the population of these turkeys grows and changes under different conditions.

Linear Growth Model

1. Compute the size of the population of these turkeys in Wyoming using the following assumptions:
    a. Every year, 250 offspring are produced by the turkey population.
    b. No turkeys emigrate, or leave the area.
    c. There were no diseases, shortages of food, or shortage of space that limited the population.
2. Graph the turkey population over the nine generations. Generation is on the x-axis, population on the y-axis.

Turkey Population Data			
Generation	**Starting Population**	**+ Increase**	**Final Population**
1	46	250	296
2	296	250	
3			
4			
5			
6			
7			
8			
9			



3. Do you believe this is an accurate model of the growth of these models? Look at the three assumptions above. Give a reason why each assumption is flawed. What are two other possible variables that are not accounted for in this model?

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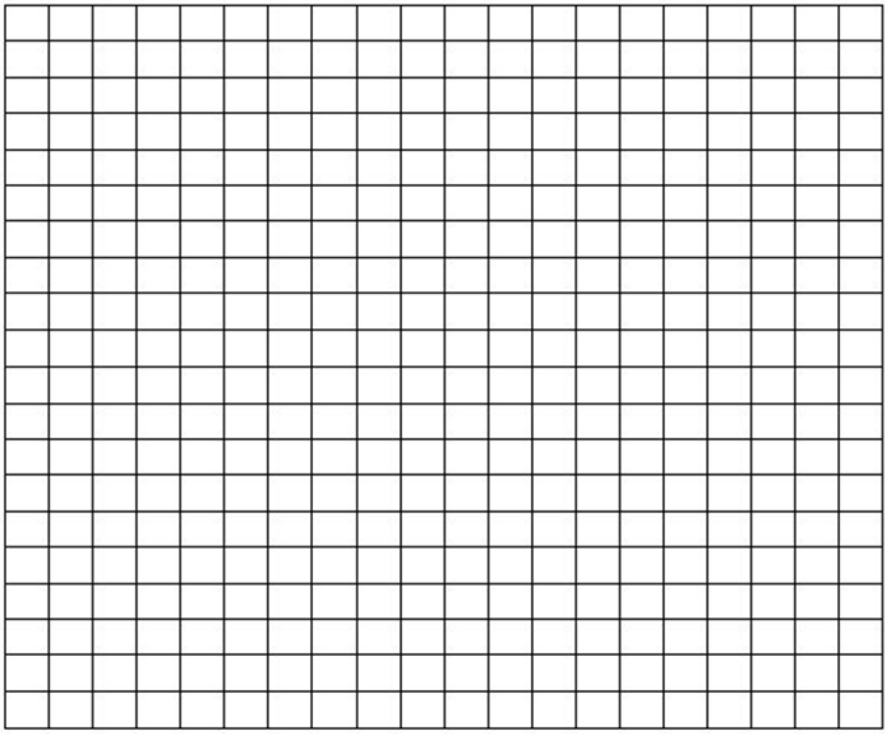
Exponential Growth Model

1. Compute the size of the population of these turkeys in Wyoming using the following assumptions:
   a. No turkeys left the general area during the first five years.
   b. There was no disease, shortage of food or habitat limiting the population.
   c. There were equal numbers of females and males in each hatch.
   d. Each mature female produces 10 eggs per year. Each egg survives.
   e. Turkeys do not reach sexual maturity until they are one year old.
   f. All turkeys only survive five years.
   g. The original population of turkeys were each 1 years old and sexually mature.
   h. There were 23 females and 23 males originally introduces into the population.

2. Graph the turkey population over the ten generations. Generation is on the x-axis, population on the y-axis.

Turkey Population Data							
Generation	**Starting Population**	**- Five year olds (die of old age)**	**- Last Year's Hatch (sexually immature)**	**= Total breeding population**	**Total Breeding Pairs (Divide by 2)**	**Offspring Hatched (10 eggs/pair)**	**New Total Population** **= Offspring + breeding population + last year's hatch**
1	46	0	n/a	46	23	230	276
2	276	0	230	46	23	230	506
3	506						
4							
5							
6							
7							
8							
9							
10							

3. Graph your results from the second turkey population model. Remember, generation is the x-axis, population the y-axis.



4. Do you believe this is a more or less accurate model than the linear growth model? Explain why.

5. If this level of population growth within this same area were to continue, what would eventually happen to the turkeys?

6. List three possible variables or limiting factors that could affect this population's growth that were not included in this model.