Turkey Trouble – Population Growth Rates Simulation-A

Background:

Population growth rates can occur in two ways – linearly (by a fixed amount) or exponentially (by an ever-increasing rate). Population growth is limited by many factors including availability and quality of water, food, shelter, and territory as well as natural and man-made changes in habitat.

In 1935, Wyoming had no Merrimac turkey's within its borders. A decision was made to plant 46 turkeys in a mountainous area in the state. This activity simulates what would happen to their population over a 5 year period if there were no natural or human-made limiting factors.

Part 1: Linear Population Growth

1. Calculate the size of the population of Merrimac turkeys using a linear growth model for five years assuming that the population grows by 230 offspring each year.
2. Complete the Table 1 to calculate the population if linear population growth occurs.

Table 1—Linear Growth

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

Part 2: Exponential Population Growth

1. Calculate the size of the population of Merrimac turkeys using an exponential growth model for five years based on the following assumptions:

Assumptions:

1. None of the turkeys left the general area during the 5 years (no migration).
2. No disease or shortage of habitat limited the population.
3. There were an equal number of males and females in each year's hatch.
4. All sexually mature females successfully hatched a clutch of ten eggs each year.
5. No turkeys reproduced their first year of life.
6. All turkeys died during the winter after their fifth year of life (after hatching their 4^{th} 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 46 breeding group.

2. Complete Table 2 to calculate the population if exponential population growth occurs:

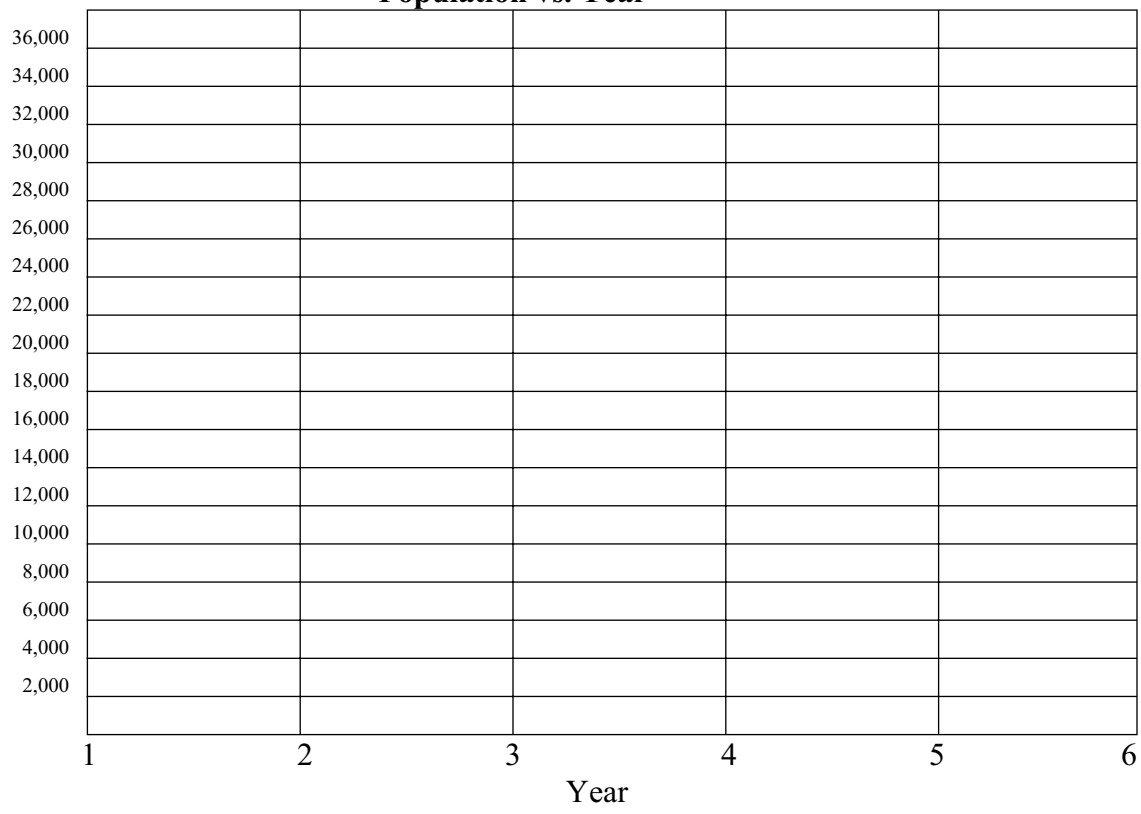
Table 2--Exponential Growth-A

	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 years hatch (#6)	0	230	230			
4. = Breeding population	46	46	276			
5. Breeding pairs (#4/2)	23	23				
6. Offspring (#5x10 eggs/clutch)	230	230				
+ breeding population (#4)	46	46				
+ last year's hatch (#3)	0	230				
7. = Total population	276	506				

Analysis:

1. Plot the data for linear population growth from Table 1 on the grid below in pen.
2. Plot the data for exponential population growth from Table 2 on the grid below in pencil.

Population vs. Year



Conclusions: (answer on notebook paper)

1. Which population grew at a faster rate? Why?
2. The actual population of Merrimac turkeys in Wyoming after 5 years was 2500. Why the difference? Which of our assumptions proved to true? False?
3. All populations have the potential to grow at an exponential rate. What factors limit this potential?