**B. Fibonacci Rabbits**

Consider the following problem proposed by Fibonacci in 1202, “A man put a male-female pair of newly born rabbits in a field. Rabbits take a month to mature before mating. One month after mating, females give birth to one male-female pair and then mate again. No rabbits die. How many rabbit pairs are there after one year?”

1. What mathematical tool would you use to formulate the problem? Briefly describe how it is used.
2. Briefly describe what prediction one might consider asking from the mathematical model.
3. Describe one limitation of the mathematical model described above when applied to the real world.
4. Describe another possible application of the model developed.

**C. Habitat Conversion**

Consider the following problem,

“Habitat conversion from forests to agriculture and then to degraded land is the single biggest factor in the present biological diversity crisis” (Dobson, Bradshaw, Baker 1997).

1. What mathematical tool you would use to develop a mathematical model for this phenomenon?
2. What variables would you introduce in your model? Briefly describe how it is used.

**D. MathWorks Math Modeling Challenge 2018 (https://m3challenge.siam.org/archives/2018/problem)**

Consider the following M3C 2018 problem,

The Food and Agriculture Organization of the United Nations reports that approximately one-third of all food produced in the world for human consumption every year goes uneaten. As an example, perfectly good produce that is considered misshapen or otherwise unattractive is regularly discarded before reaching your grocery store shelves. The problem is even more pronounced in the United States, where the Environmental Protection Agency (EPA) estimates that more food reaches landfills and incinerators than any other single material in our trash. Uneaten food also wastes resources (water, fertilizer, pesticides, land, etc.) used in food production. At the same time, it has been estimated that over 42 million Americans are food-insecure and could take advantage of all of this squandered food, frequently described as “wasted food.”

The challenge is to create a mathematical model that a state could use to determine if it could feed its food-insecure population using the wasted food generated in that state. Participants may choose to use provided data which contain (1) Texas\_food\_data, (2) Food Expenditures, (3) Consumer Behavior Based on Income, and (4) Average Daily Intake of Food.

What mathematical tool you would use to develop the mathematical model? Briefly describe how it is used.