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SIMIODE A SYSTEMIC INITIATIVE FOR MODELING INVESTIGATIONS & OPPORTUNITIES WITH DIFFERENTIAL EQUATIONS

STUDENT VERSION

Death & Migration using M&M [1]

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Synopsis

Each of group will conduct a simulation in which M&M's either live or die, but we will permit immigration to recover the damage to the M&M population from death.

The Experiment

Place 30 M&M's in a cup.

(i) gently toss them out onto a desk;

(ii) discard all the M&M's which have an 'M' facing up (they die);

(iii) add 10 M&M's (immigrants) to the remaining M&M's (they live);

(iv) place these back in the cup and go to (a) unless all the M&M's are gone, in which case stop the simulation.

Questions:

1. What do you think will eventually happen to the M&M's? Will they eventually all die? If not, how many will survive?

[1] Adapted from 1-1-M&M-DeathImmigrationParameterEstimation, SIMIODE modeling scenario by Dr. Brian Winkel, Professor Emeritus, USMA, Director SIMIODE.

2. In the table below, record you observation in each iteration of the simulation.

iteration	# M&M's at start	# of dead M&M's	# M&M's alive
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

3. In each iteration, on the average, what percentage of the M&M's die?

4. Suppose we were to define the number of M&M's alive at the start of iteration n as $P(n)$. What values would n take?

5. What would $P(0)$ be in this case? What would $P(1)$ be in this case?

6. Based on your answer in 3 and other observations, construct a reasonable formula for $P(n)$ that we can use to model the population of M&M's.

7. How can you check how good your model is?