4.14 Matrices Modeling Contexts

AP Precalculus   Name: _____

CALCULATOR ACTIVE: Directions: Use the given information to answer the questions.

1) Each year the world's most dangerous animal, the Hippopotamus, is migrating according to data that Mr. Bean has collected. He found that last year 15% of all Hippos living in the wetlands migrated to the savannah and that 12% of the Hippos living in the savannah migrated to living in the wetlands. 65% of the Hippos lived in the Wetlands and 35% lived in the savannah last year.

A) Find a transition matrix.

B) What will be the distribution of ecosystems for Hippos next year?

C) What will be the eventual long-term distribution of ecosystems be?

D) What was the distribution of Hippos by ecosystem last year?

2) There are currently 2700 Billionaires in the world and 80,000 Hundred-Millionaires. About 2% of all Hundred-Millionaires will become Billionaires next year and about 1% of all Billionaires will lose enough money to become Hundred-Millionaires next year.

A) Find a transition matrix.

B) How many Billionaires and Hundred-Millionaires will there be in 2 years? 5 years?

C) Is there a steady state for this situation? If so what is it?

D) How many Billionaires and Hundred-Millionaires was there last year?

ANSWERS

1) *A)*

	Wet	*Sav*
Wetlands	.85	.12
Savannah	.15	.88

B) 1 year: ⟨59%, 41%⟩

Wet   Sav

C) ⟨44.4%, 55.6%⟩

Wet   Sav

D) ⟨72.6%, 27.4%⟩

Wet   Sav

2) *A)*

	Bill	*Hun − Mil*
Billionaire	.99	.02
Hun − Mill	.01	.98

B) 2 years: ⟨5799, 76901⟩

Bill   Hun − Mil

5 years: ⟨10107, 72593⟩

Bill   Hun − Mil

C) NO STEADY STATE

D) ⟨1078, 81621⟩

Bill   Hun − Mil