

## Mathematics Matrices and Equations Developed by David McAfee

Crazy Bill's Telecommunications is a very popular business. They have two key pricing plans, one that costs \$30 per month and one that costs \$50 per month. At the end of December each year, subscribers upgrade or downgrade their plans depending on the amount of phone calls or Internet data that they use. No one ever cancels Crazy Bill's telecommunications, because they are very price competitive.

According to records from the Crazy Bill Telecommunications database, each year 13% of subscribers switch from the \$50 plan to the \$30 plan and 4% of subscribers switch from the \$30 plan to the \$50 plan. Initially, there were 70% of subscribers on the \$30 plan and 30% of subscribers on the \$50 plan.

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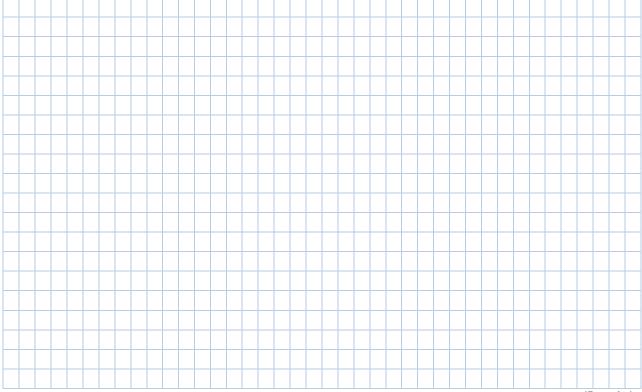
(1 mark)

(b) Use the information provided in the question to construct a transition matrix.



(2 marks)

(c) Hence, using matrices and row operations, determine the proportion of customers on each plan at the steady state.



(5 marks)



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(1 mark)

After a full five years of operation, Crazy Bill, the CEO of Crazy Bill's telecommunications, notices that the proportion of customers on the \$50 plan is not as high as what he had hoped for. He decides to change the \$50 plan so that it not only includes unlimited text messages but also unlimited phone calls too. Starting at the beginning of the sixth year, the percentage of subscribers switching from the \$30 plan to the \$50 plan each year is 9% and the percentage of subscribers changing from the \$50 plan to the \$30 plan each year is 8%.

