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| **School of Mathematical Sciences**  **Assignment Cover Sheet**  **MATHS: Probability and Statistics** |  | MARK: |

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| **Tick the box corresponding to the assignment number** | | | | |
| 1 | 2 | 3 | 4 | 5 |

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| Tutorial Day and Time | Tuesday 1pm |

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Remember to sign the plagiarism declaration at the bottom of the page. *If this is not signed, a mark of 0 will be recorded for this assignment.*

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**Collusion:** another person assisting in the production of an assessment submission without the express requirement, or consent or knowledge of the assessor.

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2)

be the value of a die on the roll.

a)

To be a Markov chain it must be a discrete random process, and must satisfy:

Since each die roll is independent of all previous rolls

b)

Assuming the die is a strictly fair die, and two rolls are independent of each other, the probabilities of rolling any number on the die will be the same. I.e.

3)

a)

is an matrix with a finite state space

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1-p | p | 0 | 0 | 0 | … | … |
| 1-p | 0 | p | 0 | 0 | … | … |
| 0 | 1-p | 0 | p | 0 | … | … |
| 0 | 0 | 1-p | 0 | p | … | … |
| 0 | 0 | 0 | 1-p | 0 | … | … |
| … | … | … | … | … | … | p |
| … | … | … | … | … | 1-p | p |

b)

So the probability to be in state 0 after 2 steps is:

4)

a)

Brief side-note

Case (This is allowed as per the definition of the equation)

(So this is not a transitional probability matrix)

That set aside:

The states are absorbing states as the probability for them is always 1.

I.e. once a unit enters state 0 or N it will not leave

b)

Using the given equations it can be found that

So the matrix with N=3 has form

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 0 | 0 | 0 |
|  | 0 |  | 0 |
| 0 |  | 0 |  |
| 0 | 0 | 0 | 1 |

as given in lectures

From this, the process cannot be absorbed into state 0 or 1

i.e.

c)

Subbing in the values for p and q gives:

Rewrite A in form

For A the probability of being absorbed in state j is: