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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 2pm |

**WARNING**

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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**Plagiarism:** using another person’s ideas, designs, words or works without appropriate acknowledgement.

**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. a

2.b   
Pairwise independence means that the multiple of the probabilities is the same as the intersection of the probabilities of a pair.  
Have to show for XY, XZ, YZ.

2.c   
Independence implies that   
Consider .

But if then

Which is not

So it can be said that X, Y and Z are not independent

3.a

The sample space is the list of possible outcomes. Since it is given as a ‘sequence’ of events, the order is important. A stop is denoted *s* and continuing through a light is denoted ­*c*

where csc implies continuing through the 1st, stopping on the 2nd and continuing through the 3rd light

3.b

is the number of times where is the outcome.   
The number of possible stops in the commute can be 0, 1, 2, or 3. As there are 3 lights and they are discrete values (you cannot stop at half a light)

3.c

If each outcome is equally likely, and is the number of stops   
I.e. , the probability of a particular event happening can be given by where is the total number of outcomes. As the distribution is as it is independent, fixed number of trials, constant probability of success and binary output

As such, the PMF of X will be given as:

I.e.

3.d

The probability of stopping at a light becomes

The distribution can be given as where   
So the PMF can be given as

4.a

For each play of the game it can be given as a binomial distribution. Ignoring the money involved, the game can be written as

But when you include money, the profit earned by player B is given as dollars. This is because every success of X (i.e. a head) gives to player B, but for each game, B must spend $5 to play

4.b

is the probability that strictly less than 19 heads are rolled

4.c

The expected value of Y is

So it is expected that player B will lose $1 every time he plays the game.

From this it can be said that player B should not play as it is.

However when the variance is included:

-> the variance of 5 is 0 and the covariance of 5 and X is also 0

.

So if player B plays the game a few times, it is possible for him to turn a profit, but it becomes less and less likely for any profit for player B.

If player B plays a large number of times, it can be assumed he will lose approximately for each game.