

**COMP3260 Data Security**

**GAME 6**

11<sup>th</sup> and 12<sup>th</sup> April 2019

Number of Questions: 4

Time allowed: 50min

Total marks: 5

In order to score marks you need to show all working/reasoning and not just the end result.

	<i>Student Number</i>	<i>Student Name</i>
<i>Student 1</i>		
<i>Student 2</i>		
<i>Student 3</i>		
<i>Student 4</i>		
<i>Student 5</i>		
<i>Student 6</i>		
<i>Student 7</i>		

Question 1	Question 2	Question 3	Question 4	Total

An evil empress Ruby Cel who owns the largest ruby mines in the Galaxy is doing what it takes to ensure her dominance in the ruby market. To that end, she has recently stolen 12 precious rubies that have a purple hue. You are hired you to retrieve the rubies from Ruby Cel and they gave you the remaining 13th purple ruby as it may come in handy.

As soon as you enter Ruby Cel's empire you were caught by the guards and taken to the empress, who is well known not only for her business ruthlessness but also for her love of good puzzles. She tells you that she will let you go and even give you the 12 rubies if you can solve all of the following puzzles – otherwise you will end up as a slave in one of her mines.

**1. (1 mark)** How old am I? I am between 3 and 4 million hours old. If you multiply my hours by 4 and divide it by 993737 you get remainder 1.

**2. (1 mark)** People call me Ruby Cel but what is my real name? My age will give you a clue.

**3. (1 mark)** What mood am I in? I have 3 moods: cranky, sad and bored. My true mood is twice as likely as the other two moods together. You can ask me yes or no question(s), but ask too many and you go to the mines. (i.e. make a question tree)

**4. (2 marks – explain how you know which 12 are the purple ones)**

The 12 purple rubies that you are after are guarded in the cellar with 12 red rubies. You can take them if you can recognise which ones they are.

Tonight, my 24 sisters will go to the cellar, and the oldest sister will touch the first ruby, the second oldest will touch the second ruby, and so on. Some of my sisters can switch the ruby hue from red to purple or from purple to red, and some can't. (The same thing will always happen when my sisters touch the rubies – the colour will always switch or not switch. Also, the change in colour only lasts for a day, after which it will revert to its original colour)

Tomorrow morning, you can go to the cellar alone and look at the rubies. (The rubies will return to their original colours after you have left)

Tomorrow evening, after the rubies have reverted to their natural colour, my sisters will go to the cellar again and touch the rubies.

The morning after that, you have to go to the cellar again and choose 12 rubies – choose right and you can take them and leave. Choose wrong and you go to the mines. (You must choose before the rubies revert to their original colours)

