CSPB 2824 - Stade - Discrete Structures

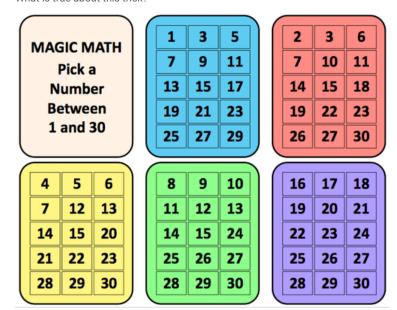|	
Started on	Saturday, 18 November 2023, 2:38 PM
State	Finished
Completed on	Saturday, 18 November 2023, 2:42 PM
Time taken	4 mins 17 secs
Grade	Not yet graded

Question **1**

Correct

Mark 10.00 out of 10.00

Try out the following trick with a friend or yourself.

- Ask someone to pick a number between 1 and 30.
- Then ask them on which cards their number appears.
- You then add the numbers from the top left hand corner of the cards they have picked.
- Is it the number? Amazing!

What is true about this trick?

Select one or more:

☑ a.
The binary expansion of the numbers on each card includes the binary digit in the top left corner. ✔

☐ b.
The colors of the cards are an essential element of the trick.

☐ c.
The trick relies on Fermat's Little Theorem.

☑ d.
The numbers in the top left corner are from the binary sequence. ✔

☑ e.
The "trick" relies on the binary expansion of the numbers from 1 -30 ✔

Your answer is correct.

Correct

Marks for this submission: 10.00/10.00.

Question **2**

Correct

Mark 10.00 out of 10.00

Actually, this version of the trick is incomplete.

What number can be added to the range of possible numbers in this trick - still using 5 cards?

Answer: 31   ✔

> **Correct**
> Marks for this submission: 10.00/10.00.

Question **3**

Correct

Mark 10.00 out of 10.00

On which cards should the additional number be included?

Select one or more:

☑ a.
The card with 4 in the left corner. ✔

☑ b.
The card with 16 in the left corner. ✔

☑ c.
The card with 2 in the left corner. ✔

☑ d.
The card with 1 in the left corner. ✔

☑ e.
The card with 8 in the left corner. ✔

> Your answer is correct.
>
> **Correct**
> Marks for this submission: 10.00/10.00.

Question **4**

Correct

Mark 10.00 out of 10.00

If we expand this trick to 6 cards, what range of numbers can we guess from?

1 - _____

○   a. 64

◉   b. 63   ✔

○   c. 61

○   d. 60

○   e. 128

> **Your answer is correct.**
>
> [Correct]
> Marks for this submission: 10.00/10.00.

Question **5**

Correct

Mark 10.00 out of 10.00

- Suppose you receive a newsletter in the mail that correctly predicts the stock market will go up that week.
- The next week, the newsletter correctly predicts the stock market will go down.
- And this continues for a total of 6 weeks, at which point you are asked to pay for the next newsletter.

Ignoring the fact that it seems scammy, this would this appear to be an attractive offer to some people.
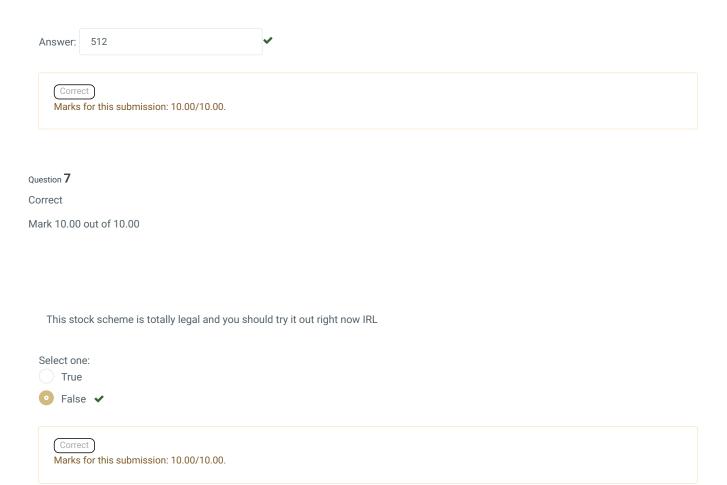
Select one:

◉ True ✔

○ False

> [Correct]
> Marks for this submission: 10.00/10.00.

Question **6**

Correct

Mark 10.00 out of 10.00

Now suppose you are the mastermind behind this scheme with a mailing list of **n** people.

- On week one you send out newsletters to n people - half are told the market goes up, and half that the market goes down.
- The next week, **REMOVE from the list the people who received the wrong prediction,** and continue to send letters to those who got the **RIGHT** prediction.
- You repeat the process until week 6, when one group of people have received **6 correct predictions in a row,** at which point you ask for $10,000 from each for the 7th newsletter.

If you want to make this offer to 16 people in week 6, how many letters do you send out the first week ? **That is, what is n?**

Answer: 512   ✔

> Correct
> Marks for this submission: 10.00/10.00.

Question **7**

Correct

Mark 10.00 out of 10.00

This stock scheme is totally legal and you should try it out right now IRL

Select one:
- ○ True
- ◉ False ✔

> Correct
> Marks for this submission: 10.00/10.00.

Question **8**

Correct

Mark 10.00 out of 10.00

These questions are from the recommended Jacob's Book - Mathematics a Human Endeavor

The martingale system of betting calls for doubling your bet after any losing bet. If you bet $1 and lose, then your next bet should be $2.

Suppose you are playing a game in which, if you win, you get back what you bet plus an equal amount. For example, if you bet $5 and win, you get back the $5 plus $5.

- Suppose that in playing this game you start with a bet of $1 and lose 5 bets in a row using this system (lose 1 dollar on the first bet, then 2 dollars on the second etc..)

How much have you lost altogether?

| 31 |

✔

How much should your sixth bet be?

| 32 |

✔

If you win the sixth bet, how much are you ahead overall?

| 1 |

✔

Now suppose you start with $1 and lose 7 bets in a row.

How much have you lost altogether?

| 127 |

✔

How much should your 8th bet be?

| 128 |

✔

If you win the eight bet, how much are you ahead by?

| 1 |

✔

Now suppose you are so rich you never have to worry about running out of money and you start with a bet of $1. If you lose 64 bets a row, how much have you lost?

| 18446744073709551616 |

✔

Your answer is correct.

Correct

Marks for this submission: 10.00/10.00.

Question **9**

Correct

Mark 10.00 out of 10.00

Which are true of the martingale system of betting?

(you may look up more about the system online)

Select one or more:

☐ a.
You should totally use this system with every game of chance- you can't lose.

☑ b.
Betting limits at Casinos protect Casinos from the martingale system. ✔

☑ c.
After a losing streak, you need to win a few times in a row to come out more than $1 ahead. ✔

☑ d.
If you can use the system perfectly, you have protected your losses. ✔

☑ e.
A drawback is that most gambling games are not "double or nothing." ✔

☑ f.
To work, this system requires almost infinite resources. ✔

Your answer is correct.

〔 Correct 〕

Marks for this submission: 10.00/10.00.

Question **10**

Complete

Marked out of 10.00

These examples of the power of mathematics and computer science range from the entertaining and clever, to the deceitful and illegal.

Please write a response (a short paragraph for each) to the questions:

1. What is responsibility of a Computer Scientist when asked/required to participate in deceptive practices?
2. Can a Computer Scientist alway know when they have been asked or required to participate in deceptive practices?
3. How can a Computer Scientist stay aware of their role in deceptive practices?

Please feel free to look up (and cite!) additional references and resources - Share on Piazza as well.

1. - I think that a computer scientist should not participate in deceptive processes. But in reality, there are a lot of computer scientists that do participate in these processes. For instance, the programming that is done on slot machines is a deceptive process. A lot of the time these slot machines may give someone some hope after losing a couple of pulls but in the long run they are more than likely going to leave with less than they entered with.

2. - I think at first it may be hard for a computer scientist to know if they are involved in one of these processes. Over time it may become more apparent but it is not easily seen at the beginning. I think once the computer scientist has discovered that they are involved in a deceptive process it would be of their best interest to leave and try to find another job if possible.

3. - This really depends. If you are the designer of say the UI for a slot machine then you aren't directly involved in the deceptive process itself. But if you are the programmer for the algorithm then it would be really hard for you to not know that you are involved in this process. Some can have a large role in the deceptive process and others can be in a smaller role where they aren't really involved in the process at all.