Intro to Data Science HW 2

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Contents

Question 1 **1**
1a. 1
1b. 1

Question 2 **1**

Question 3 **1**

Question 4 **1**

Question 5 **2**

Question 7 **2**

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Question 1

1a.

The probability of a bit in the array remaining 0 is:

$$e^{\frac{-20}{99}} \tag{1}$$

which comes out to .819. So, 1-.819 = .181 is the expected fraction of 1's.

1b.

The expected fraction of 0's is 1-.181 = .819

Question 2

The false positive rate is:

$$(1 - e^{\frac{-3*2}{11}}) = (1 - e^{\frac{6}{11}}) \tag{2}$$

Question 3

a	**b**	**c**	**a**	**d**	**e**	**a**	**c**	**b**	**b**
1									
.9	1								
.81	.9	1							
	.81	.9	1.81						
	.729	.81	1.1629	1					
	.6561	.729	1.4661	.9	1				
	.5905	.6561		.81	.9	2.4661			
	.5314			.729	.81	2.219	1.6561		
				.6561	.729	1.997	1.4904	1.5314	
				.5905	.6561	1.797	1.3413		2.5314

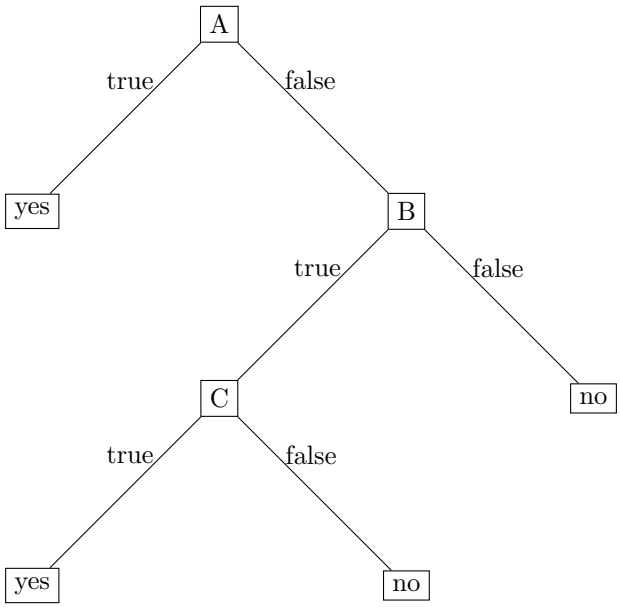
Question 4

(3x +7) mod 11
X=1 10 mod 11 = 10 1010
x=2 13 mod 11 = 2 0010
X=3 16 mod 11 = 5 0101
X=4 19 mod 11 = 8 1000
X=5 22 mod 11 = 0 0000

X=6 25 mod 11 = 3 0011
X=7 28 mod 11 = 6 0110
X=8 31 mod 11 = 9 1001
X=9 34 mod 11 = 1 0001
X=10 37 mod 11 = 4 0100

Set 10 9 1 7 10 would have to be in the set since the estimate of the number of distinct elements is 2^r where r is the max tail length in the set.

Question 5



Question 7

Assuming that you've picked door number 1, there are three (equally likely) possible scenarios:

1. You pick the door with the prize, and the other two doors are empty.
2. Both your door and door number 2 are empty.
3. Both your door and door number 3 are empty.

Overall, there are two groups of possibilities - that you've picked a winning door (1/3) or you've picked an empty door (2/3).

If an empty door is revealed, it must either be door 2 or 3, because you picked door number 1. Now you are presented with the same two groups - but the second group's doors now have probabilities 0 and 2/3 of containing the prize, when originally they were 1/3 each.

Since your door (door number 1) has a probability of 1/3 and the other closed door has a probability of 2/3, you should switch doors.