

# Homework 1

Started: Feb 28 at 12:33pm

## Quiz Instructions

### Question 1

2 pts

[CS04-01] Which one(s) of the following operators are reversible?

☐ IDENTITY

☐ ONE

☐ ZERO

☒ NOT

### Question 2

2 pts

[CS08-01] You are given a classical biased coin with probability of heads 0.2 and probability of tails 0.8. The coin is flipped for 1000 times. What is the most likely outcome?

☐ Heads: 500 Tails: 500

☐ Heads: 320 Tails: 680

☒ Heads: 203 Tails: 797

☐ Heads: 102 Tails: 898

### Question 3

2 pts

[CS20-02] Given a probabilistic system with states {1,2,3,4} and operator,

$$A = \begin{pmatrix} 0.1 & 0.2 & 0.3 & 0.4 \\ 0.9 & 0 & 0 & 0 \\ 0 & 0.8 & 0 & 0 \\ 0 & 0 & 0.7 & 0.6 \end{pmatrix}$$

what is the probability of going from state 2 to state 3?

#### Question 4

2 pts

[CS20-01] Which statements are true for probabilistic operators.

- ☐ Row sum adds up to 1.
- ☐ All entries are real.
- ☒ Column sum adds up to 1.
- ☐ All entries should be positive.
- ☒ All entries are non-negative.

#### Question 5

2 pts

[CS24-01] If we have two probabilistic bits whose state is represented by the vectors,  $\begin{pmatrix} 0.2 \\ 0.8 \end{pmatrix}$  and  $\begin{pmatrix} 0.9 \\ 0.1 \end{pmatrix}$ , what is the probability of observing state 10?

#### Question 6

2 pts

[CS08-02] If we want to simulate a biased coin with probability of heads=0.7, what should be the value of x in the following code?

```
heads = tails = 0
for i in range(1000):
    if randrange(100) < x:
        heads = heads + 1
    else:
        tails = tails + 1
```

70

**Question 7****2 pts**

**[CS24-02]** What is the dimension of the vector representing a system with 3 coins?

- ☐ 9
- ☒ 8
- ☐ 6
- ☐ 3

**Question 8****3 pts**

**[CS16- 01]** Mark the vectors which represent valid probabilistic states.

- ☐  $(1/5 \ 1/5 \ 1/5 \ 2/5 \ -1/5)$
- ☒  $(1/2 \ 1/2 \ 0 \ 0)$
- ☐  $(-1/2 \ 1/4 \ 1/4 \ 0)$
- ☒  $(1 \ 0 \ 0 \ 0)$
- ☒  $(1/3 \ 2/3 \ 0)$

**Question 9****3 pts**

**[CS12-01]** You are given the following probabilistic operator :

$$\begin{pmatrix} 0.2 & 0.4 \\ 0.8 & 0.6 \end{pmatrix}$$

Suppose that we represent the weather being sunny with state 0 and rainy with state 1.  
The transition probabilities can be interpreted as follows:

- If today is sunny, the probability that tomorrow is sunny is 0.2
- If today is sunny, the probability that tomorrow is rainy is 0.8
- If today is rainy, the probability that tomorrow is sunny is 0.4

- If today is rainy, the probability that tomorrow is rainy is 0.6

Given that it is sunny on Monday, what is the probability that it will be rainy on Wednesday?

(Write the probability as a decimal number e.g. 0.3)

No new data to save. Last checked at 4:16pm

Submit Quiz

