

# Homework 1

Due Mar 11 at 8:29pm	Points 20	Questions 9	Time Limit None
Allowed Attempts Unlimited			

Take the Quiz Again

## Attempt History

	Attempt	Time	Score
KEPT	<a href="#">Attempt 13</a>	1 minute	20 out of 20
LATEST	<a href="#">Attempt 13</a>	1 minute	20 out of 20
	<a href="#">Attempt 12</a>	1 minute	17 out of 20
	<a href="#">Attempt 11</a>	1 minute	17 out of 20
	<a href="#">Attempt 10</a>	3 minutes	13.67 out of 20
	<a href="#">Attempt 9</a>	6 minutes	16.33 out of 20
	<a href="#">Attempt 8</a>	5 minutes	15 out of 20
	<a href="#">Attempt 7</a>	2 minutes	15 out of 20
	<a href="#">Attempt 6</a>	1 minute	15 out of 20
	<a href="#">Attempt 5</a>	1 minute	15 out of 20
	<a href="#">Attempt 4</a>	2 minutes	15 out of 20
	<a href="#">Attempt 3</a>	3 minutes	13 out of 20
	<a href="#">Attempt 2</a>	2 minutes	13 out of 20
	<a href="#">Attempt 1</a>	15 minutes	13.33 out of 20

⚠ Correct answers are hidden.

Score for this attempt: **20** out of 20  
Submitted Feb 28 at 1:30pm  
This attempt took 1 minute.

Question 1

2 / 2 pts

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

☐ ZERO

☐ ONE☒ IDENTITY☒ NOT**Question 2****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: 102 Tails: 898☐ Heads: 500 Tails: 500☐ Heads: 320 Tails: 680☒ Heads: 203 Tails: 797**Question 3****2 / 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 / 2 pts**

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

☒ All entries are non-negative.

☒ All entries are real.

☒ Column sum adds up to 1.

☐ Row sum adds up to 1.

☐ All entries should be positive.

### Question 5

2 / 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?

0.72

### Question 6

2 / 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 / 2 pts

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

☐ 3

☐ 9

☐ 6

☒ 8

## Question 8

3 / 3 pts

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

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

## Question 9

3 / 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)

Quiz Score: **20** out of 20

