

# INFO 7390

## Advances in Data Sciences and Architecture

### Assignment 1

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Due: Sunday May 20, 2018

**Q1 (5 Points)** How many people must there be before the probability that at least two people have a birthday on October 3 is greater than  $1/2$ ?

612

```
Number: 609 Ratio: 0.49719493383556246
Number: 610 Ratio: 0.4980571402168832
Number: 611 Ratio: 0.4989183962841321
Number: 612 Ratio: 0.4997787007727037
Number: 613 Ratio: 0.5006380524320544
614
(py3)
```

The calculation is in Assignment1.py under comment #Question1

**Q2 (5 Points)** Write python code to simulate question 1.

```
0.476
0.495
0.484
0.487
0.445
0.477
0.492
0.462
0.477
0.466
0.483
0.505
601
(py3)
```

The simulation is in Assignment1.py under comment #Question2

Q3 (5 Points) What is the probability of getting exactly 2 heads after flipping three coins?

0.375

```
$ python Assignment1.py
0.375
(py3) else:
```

Calculation is in Assignment1.py under comment #Question3

Q4 (5 Points) Write python code to simulate question 3.

```
$ python Assignment1.py
0.369
(py3) else:
```

The simulation is in Assignment1.py under comment #Question4

Q5 (5 Points) Consider a six-sided die that gets a 1 with probability  $p = 1/6$ . What is the probability that you can get a 1 after rolling the die 3 times? What is the probability of getting exactly one success (a roll of 1) in three tries?

0.42

0.35

```
$ python Assignment1.py
0.42129629629629617
0.34722222222222215
(py3)
```

Calculation is in Assignment1.py under comment #Question5

Q6 (5 Points) Write python code to simulate question 5.

```
$ python Assignment1.py
0.409
0.352
(pv3)
```

The simulation is in Assignment1.py under comment #Question6

Q7 (5 Points) Suppose the MTV Video Music Awards allows users to vote for the following for “video of the year.”

- i. Miley Cyrus - "Wrecking Ball" (<https://www.youtube.com/watch?v=My2FRPA3Gf8> )
- ii. Iggy Azalea- "Fancy" (<https://www.youtube.com/watch?v=O-zpOMYRi0w> )
- iii. Brad Paisley - "The Ballad Of Honey Boo Boo" (<https://www.youtube.com/watch?v=11Uq3iGESYM> )

Of those making deliberate votes 50% would vote for Brad Paisley - "The Ballad of Honey Boo Boo," 30% for Miley Cyrus - "Wrecking Ball" and 20% for Iggy Azalea- "Fancy." However, 25% of voters are lazy and just click one of the three options with equal probability.

- i. Let  $M$  be a random variable that represents the expected votes for Miley Cyrus - "Wrecking Ball"
- ii. Let  $I$  be a random variable that represents the expected votes for Iggy Azalea- "Fancy"
- iii. Let  $B$  be a random variable that represents the expected votes for Brad Paisley - "The Ballad Of Honey Boo Boo"

Calculate  $M$ ,  $I$  and  $B$ . Show your work.

$M$ : 0.31

$I$ : 0.23

$B$ : 0.46

```
$ python Assignment1.py
M: 0.3083333333333333
I: 0.2333333333333334
B: 0.4583333333333333
(py3)
```

Calculation is in Assignment1.py under comment #Question7

Q8 (5 Points) Write python code to simulate question 7.

```
$ python Assignment1.py
M: 0.3083546
I: 0.20558
B: 0.4860654
(py3)
```

The simulation is in Assignment1.py under comment #Question8

Q9 (5 Points) Suppose you're on a game show, and you're given the choice of  $n$  doors: Behind one door is a million dollars; behind all the others, donuts. You pick a door, say No. 1, and the host, who knows what's behind the doors, opens another door, say No. 3, which has a donut. He then says to you, "Do you want to another door?"

(1 Point) Is it to your advantage to switch your choice?

Assume  $k$  of the  $n$  doors are revealed:

Yes

(2 Points) What is the probability of getting the million dollar door if you stay?

$1/(n-k)$

(2 Points) What is the probability of getting the million dollar door if you switch to another non- revealed door?

$(n - k - 1) / (n - k) * 1 / (n - k - 2)$

Calculation is in Assignment1.py under comment #Question9 (You can change  $n$  and  $k$  parameter, in example program, we choose  $n = 4$ ,  $k = 2$ )

```
Question9:
Stay: 0.25
Switch: 0.75
(py3)
```

Q10 (5 Points) Write python code to simulate question 9.

```
question10:  
Switch: 0.746  
Stay: 0.24  
(pv3)
```

$n = 4, k = 2$

The simulation is in Assignment1.py under comment #Question10