

Points: 50

This is a skills practice assignment. You can practice skills needed for programming homeworks later. This will also tell me where people are in the class. Finally, it will give you practice submitting homework to the test system. Hope you find the problem fun.

## The Birthday Paradox

The Birthday Paradox is the odd observation that if you have a room with 23 people in there is about a 50/50 chance that two people will have a birthday on the same day. This assumes that everyone's birthday must fall with equal probability on one of 365 days, "The Pirates of Penzance" notwithstanding.

This can be shown to be true as follows: Let  $P(d)$  be the probability that in a room with exactly  $d$  people there is NOT a pair with a shared birthday. It is clear that  $P(1) = 1$ .

$$P(2) = P(1) \frac{364}{365}$$

because  $P$  is the probability of the day not being shared so the second person must be any of the 364 days that does not include the birthday of the first person. So the probability of selecting one of those days is  $\frac{364}{365}$ . Similarly:

$$P(3) = P(2) \frac{363}{365}$$

and

$$P(4) = P(3) \frac{362}{365}$$

etc.

Write a python3 program to compute the program to print out the probability that a pair in the room does have the same birthday, that is, print out  $1 - P(d)$  for  $d$  in the range from 1 to 100. Print the number of people and probability rounded to 4 digits after the decimal one per line. Do not print any extra text or numbers. The first part of the table will look something like:

```
1 0
2 0.0027
3 0.0082
4 0.0164
5 0.0271
6 0.0405
7 0.0562
8 0.0743
9 0.0946
10 0.1169
11 0.1411
12 0.167
13 0.1944
14 0.2231
```

Submit a single file named `birthday.py` to the class submission page. Remember no late papers and so always turn something in for partial credit.