

4a)

```
In [8]: import numpy as np
count = 0
for x7 in range(1, 7):
    for x6 in range(1, 7):
        for x5 in range(1, 7):
            for x4 in range(1, 7):
                for x3 in range(1, 7):
                    for x2 in range(1, 7):
                        for x1 in range(1, 7):
                            count+=1
                            print((x1, x2, x3, x4, x5, x6, x7))
```

```
(1, 1, 1, 1, 1, 1, 1)
(2, 1, 1, 1, 1, 1, 1)
(3, 1, 1, 1, 1, 1, 1)
(4, 1, 1, 1, 1, 1, 1)
(5, 1, 1, 1, 1, 1, 1)
(6, 1, 1, 1, 1, 1, 1)
(1, 2, 1, 1, 1, 1, 1)
(2, 2, 1, 1, 1, 1, 1)
(3, 2, 1, 1, 1, 1, 1)
(4, 2, 1, 1, 1, 1, 1)
(5, 2, 1, 1, 1, 1, 1)
(6, 2, 1, 1, 1, 1, 1)
(1, 3, 2, 1, 1, 1, 1)
(2, 3, 2, 1, 1, 1, 1)
(3, 3, 2, 1, 1, 1, 1)
(4, 3, 2, 1, 1, 1, 1)
(5, 3, 2, 1, 1, 1, 1)
(6, 3, 2, 1, 1, 1, 1)
(1, 4, 2, 2, 1, 1, 1)
(2, 4, 2, 2, 1, 1, 1)
(3, 4, 2, 2, 1, 1, 1)
(4, 4, 2, 2, 1, 1, 1)
(5, 4, 2, 2, 1, 1, 1)
(6, 4, 2, 2, 1, 1, 1)
(1, 5, 2, 2, 2, 1, 1)
(2, 5, 2, 2, 2, 1, 1)
(3, 5, 2, 2, 2, 1, 1)
(4, 5, 2, 2, 2, 1, 1)
(5, 5, 2, 2, 2, 1, 1)
(6, 5, 2, 2, 2, 1, 1)
(1, 6, 2, 2, 2, 2, 1)
(2, 6, 2, 2, 2, 2, 1)
(3, 6, 2, 2, 2, 2, 1)
(4, 6, 2, 2, 2, 2, 1)
(5, 6, 2, 2, 2, 2, 1)
(6, 6, 2, 2, 2, 2, 1)
```

4b)

```
In [9]: print("number of possible outcomes = ", count)
print("prob of any given outcome = ", 1/count)
```

```
number of possible outcomes = 279936
prob of any given outcome = 3.5722450845907635e-06
```

4d)

```
In [38]: multi_nom_dict = []
i = 0
for x7 in range(1, 7):
    for x6 in range(1, 7):
        for x5 in range(1, 7):
            for x4 in range(1, 7):
                for x3 in range(1, 7):
                    for x2 in range(1, 7):
                        for x1 in range(1, 7):
                            enum = ((x1, x2, x3, x4, x5, x6, x7))
                            key = (enum.count(1), enum.count(2), enum.
                                    enum.count(4), enum.count(5), enum.
                            if key in multi_nom_dict:
                                multi_nom_dict[key] += 1
                            else:
                                multi_nom_dict[key] = 1
```

792

4e)

```
In [39]: print("possible outcomes = ", len(multi_nom_dict))
```

possible outcomes = 792

4f)

```
In [46]: {k: v for k, v in sorted(multi_nom_dict.items(), key=lambda item: item[0])}
```

(2, 0, 0, 2, 3, 0): 210,
(2, 0, 0, 2, 0, 3): 210,
(2, 0, 0, 0, 3, 2): 210,
(2, 0, 0, 0, 2, 3): 210,
(1, 4, 1, 1, 0, 0): 210,
(1, 4, 1, 0, 1, 0): 210,
(1, 4, 1, 0, 0, 1): 210,
(1, 4, 0, 1, 1, 0): 210,
(1, 4, 0, 1, 0, 1): 210,
(1, 4, 0, 0, 1, 1): 210,
(1, 1, 4, 1, 0, 0): 210,
(1, 1, 4, 0, 1, 0): 210,
(1, 1, 4, 0, 0, 1): 210,
(1, 1, 1, 4, 0, 0): 210,
(1, 1, 1, 0, 4, 0): 210,
(1, 1, 1, 0, 0, 4): 210,
(1, 1, 0, 4, 1, 0): 210,
(1, 1, 0, 4, 0, 1): 210,
(1, 1, 0, 1, 4, 0): 210,
(1, 1, 0, 1, 0, 4): 210,

there are 6 outcomes that are equally as likely, with probability of 0.002829.

(outcome): count

```
outcome = (count of #1, count of #2, count of #3, count of #4, count of #5, count of #6)  
(2, 1, 1, 1, 1, 1): 2520,  
(1, 2, 1, 1, 1, 1): 2520,  
(1, 1, 2, 1, 1, 1): 2520,  
(1, 1, 1, 2, 1, 1): 2520,  
(1, 1, 1, 1, 2, 1): 2520,  
(1, 1, 1, 1, 1, 2): 2520,
```

In []:

In []: