

Assignment #3 Solutions

2.1.

	Coin #:	#1	#2	#3	#4
4 Heads: $\Omega(4) = 1$	{	H	H	H	H
3 Heads: $\Omega(3) = 4$	{	H	H	H	T
		H	H	T	H
		H	T	H	H
		T	H	H	H
2 Heads: $\Omega(2) = 6$	{	H	H	T	T
		H	T	H	T
		H	T	T	H
		T	H	H	T
		T	H	T	H
		T	T	H	H
1 Head: $\Omega(1) = 4$	{	H	T	T	T
		T	H	T	T
		T	T	H	T
		T	T	T	H
No Head: $\Omega(0) = 1$		T	T	T	T

$$\Omega(4) = \frac{4!}{4!0!} = 1 = \binom{4}{4}$$

$$\Omega(3) = \binom{4}{3} = \frac{4!}{3!1!} = 4$$

$$\Omega(2) = \binom{4}{2} = \frac{4!}{2!2!} = 6$$

$$\Omega(1) = \binom{4}{1} = \frac{4!}{1!3!} = 4$$

2.5

Oscillator =

#1

#2

#3

 $q =$

5

0

0

0

5

0

0

0

5

4

1

0

4

0

1

1

4

0

0

4

1

1

0

4

0

1

4

3

1

1

1

3

1

1

1

3

2

2

1

2

1

2

1

2

2

3

2

0

3

0

2

2

3

0

0

3

2

2

0

3

0

2

3

$$q=5, N=3$$

$$\Omega(N, q) = \frac{(q+N-1)!}{q!(N-1)!}$$

$$= \frac{7!}{5!2!}$$

$$= 21$$

#2.9

A3-3

	qA	OA	qB	OB	Ototal	
NA	0	1	6	84	84	
6	1	6	5	56	336	
	2	21	4	35	735	
NB	3	56	3	20	1120	
4	4	126	2	10	1260	
	5	252	1	4	1008	
q	6	462	0	1	462	
6					5005	5005

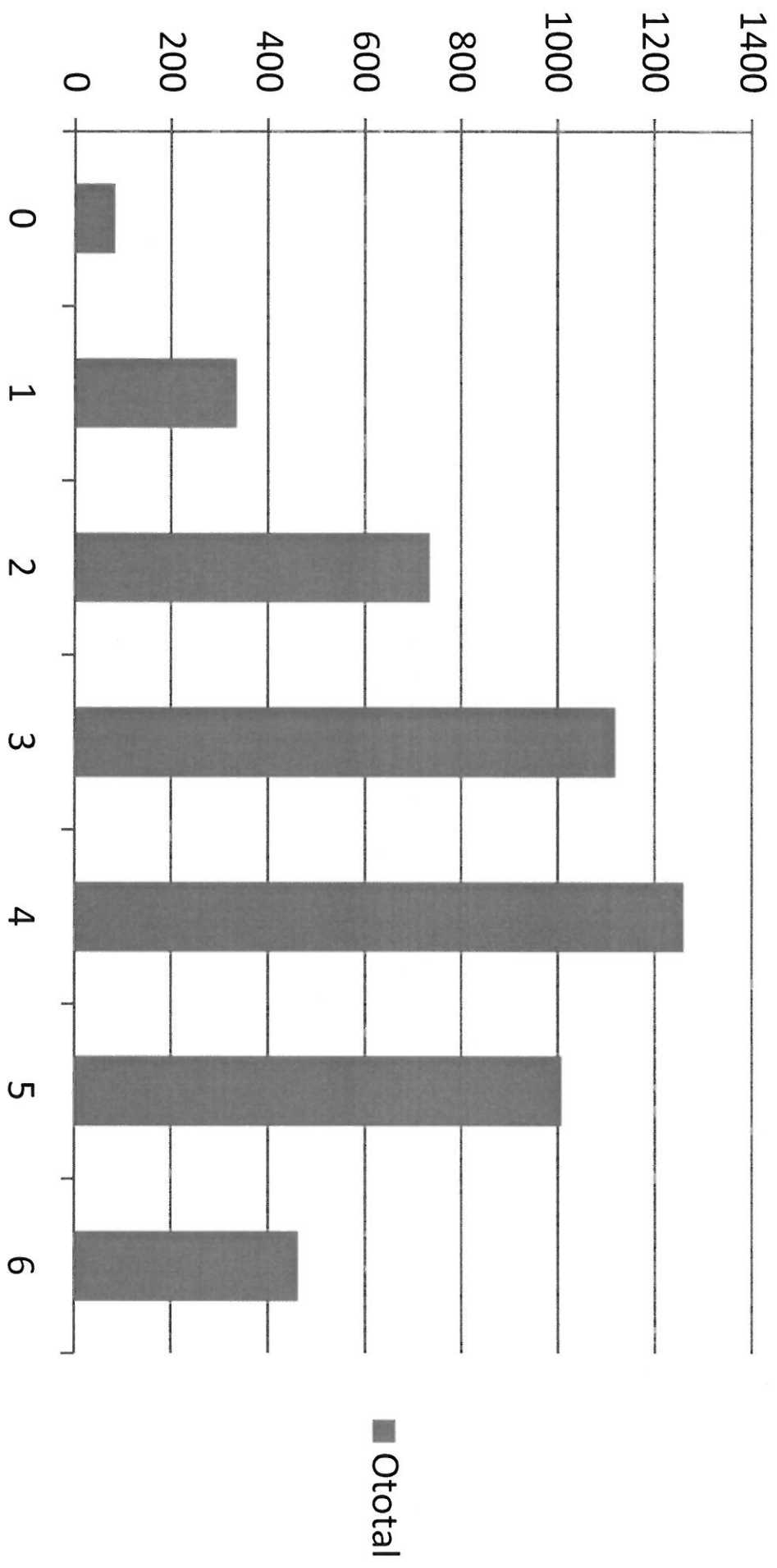
most probable state: $q_A = 4, q_B = 2$.

$$\text{Probability} = \frac{1260}{5005} = 0.252 \approx 25\%$$

Least probable macrostate: $q_A = 0, q_B = 6$

$$\text{probability} = \frac{84}{5005} = 0.0168 \approx 1.6\%$$

Q_{total} vs. q_A



	qA	OA	qB	OB	Ototal	
NA	0	1	6	28	28	
3	1	3	5	21	63	
	2	6	4	15	90	
NB	3	10	3	10	100	
3	4	15	2	6	90	
	5	21	1	3	63	
q	6	28	0	1	28	
6					462	462