Summary

Number of eggs	Optimal Configuration						Center of Mass Objective: (0,0)	I_P Angular Moment of Inertia (g-cm^2)	I_P Within Possible Range Objective: 0.5
12	O	O	O	O	O	O	(0.00,0.00)	113,913.27	N/A
	O	O	O	O	O	O			
11	O		O	O	O	O	(0.94,0.94)	106,458.21	0.67
	O	O	O	O	O	O			
10	O		O	O	O	O	(0.00,0.00)	99,003.14	0.67
	O	O	O	O		O			
9	O		O	O	O	O	(0.38,0.38)	97,661.20	0.78
	O	O		O		O			
8	O		O		O	O	(0.00,0.00)	96,319.26	0.83
	O	O		O		O			
7	O		O		O		(-2.46,-2.46)	76,637.95	0.67
	O	O		O		O			
6	O		O		O		(0.00,0.00)	56,956.64	0.50
		O		O		O			
5	O		O		O		(2.07,2.07)	49,501.57	0.50
				O		O			
4	O		O				(0.00,0.00)	42,046.51	0.50
				O		O			
3	O						(1.15,1.15)	40,704.57	0.67
				O		O			
2		O					(0.00,0.00)	14,910.13	0.33
					O				
1			O				(-3.45,-3.45)	1,341.94	0.00

Parameters

Egg position reference

1	2	3	4	5	6
7	8	9	10	11	12

Origin

Assumptions:

The mass and mass distribution of the empty carton are ignored in these calculations
All eggs are of equal mass
Egg spacing is uniform in x direction and uniform in y direction

Objectives:

1. Maintain center of mass as close as possible to origin (center of mass of full carton)
2. Keep angular moment of inertia at midpoint between highest and lowest possible

Mass of egg	64.2	g
x-axis space between eggs	6.9	cm
y-axis space between eggs	6.0	cm

	x	**y**
Origin	0	0

Egg Position	**x**	**y**	**Distance from origin R**	**R^2**	**Moment of Inertia I_P**
1	-17.25	3.00	17.5089	306.56	19681.31
2	-10.35	3.00	10.7760	116.12	7455.06
3	-3.45	3.00	4.5719	20.90	1341.94
4	3.45	3.00	4.5719	20.90	1341.94
5	10.35	3.00	10.7760	116.12	7455.06
6	17.25	3.00	17.5089	306.56	19681.31
7	-17.25	-3.00	17.5089	306.56	19681.31
8	-10.35	-3.00	10.7760	116.12	7455.06
9	-3.45	-3.00	4.5719	20.90	1341.94
10	3.45	-3.00	4.5719	20.90	1341.94
11	10.35	-3.00	10.7760	116.12	7455.06
12	17.25	-3.00	17.5089	306.56	19681.31

Configurations

Optimally Distributed

12	O	O	O	O	O	O
	O	O	O	O	O	O

Angular moment (g-cm^2) 113913.27 Percentage within range: N/A

	x	y
Center of mass	0	0
	1	O
	2	O
	3	O
	4	O
	5	O
	6	O
	7	O
	8	O
	9	O
	10	O
	11	O
	12	O

Highest Angular Moment (highest dispersion from origin)

12	O	O	O	O	O	O
	O	O	O	O	O	O

113913.27

	x	y
	0	0
	1	O
	2	O
	3	O
	4	O
	5	O
	6	O
	7	O
	8	O
	9	O
	10	O
	11	O
	12	O

Lowest Angular Moment (lowest dispersion from origin)

12	O	O	O	O	O	O
	O	O	O	O	O	O

113913.27

	x	y
	0	0
	1	O
	2	O
	3	O
	4	O
	5	O
	6	O
	7	O
	8	O
	9	O
	10	O
	11	O
	12	O

Optimally Distributed

11	O		O	O	O	O
	O	O	O	O	O	O

Angular moment (g-cm^2) 106458.21 Percentage within range: 66.7%

	x	y
Center of mass	0.94090909	0.940909
	1	O
	2	
	3	O
	4	O
	5	O
	6	O
	7	O
	8	O
	9	O
	10	O
	11	O
	12	O

Highest Angular Moment

11	O	O		O	O	O
	O	O	O	O	O	O

112571.33

	x	y
	0.31363636	0.313636
	1	O
	2	O
	3	
	4	O
	5	O
	6	O
	7	O
	8	O
	9	O
	10	O
	11	O
	12	O

Lowest Angular Moment

11		O	O	O	O	O
	O	O	O	O	O	O

94231.96

	x	y
	1.56818182	1.568182
	1	
	2	O
	3	O
	4	O
	5	O
	6	O
	7	O
	8	O
	9	O
	10	O
	11	O
	12	O

Optimally Distributed

10	O		O	O	O	O
	O	O	O	O		O

Angular moment (g-cm^2) 99003.14 Percentage within range: 66.7%

	x	y
Center of mass	0	0
	1	O
	2	
	3	O
	4	O
	5	O
	6	O
	7	O
	8	O
	9	O

Highest Angular Moment

10	O	O		O	O	O
	O	O	O		O	O

111229.39

	x	y
	0	0
	1	O
	2	O
	3	
	4	O
	5	O
	6	O
	7	O
	8	O
	9	O

Lowest Angular Moment

10		O	O	O	O	O
	O	O	O	O	O	

74550.65

	x	y
	0	0
	1	
	2	O
	3	O
	4	O
	5	O
	6	O
	7	O
	8	O
	9	O

10	O	
11		
12	O	

Optimally Distributed

9	O		O	O	O	O
	O	O		O		O

Angular moment (g-cm^2) 97661.20 Percentage within range: 77.8%

	x	y
Center of mass	0.38333333	0.383333

1	O	
2		
3	O	
4	O	
5	O	
6	O	
7	O	
8	O	
9		
10	O	
11		
12	O	

Highest Angular Moment

9	O	O		O	O	O
	O	O			O	O

Angular moment (g-cm^2) 109887.45

	x	y
Center of mass	0.38333333	0.383333

1	O	
2	O	
3		
4	O	
5	O	
6	O	
7	O	
8	O	
9		
10		
11	O	
12	O	

Lowest Angular Moment

9		O	O	O	O	O
		O	O	O	O	

Angular moment (g-cm^2) 54869.33

	x	y
Center of mass	1.91666667	1.916667

1		
2	O	
3	O	
4	O	
5	O	
6	O	
7		
8	O	
9	O	
10	O	
11	O	
12		

Optimally Distributed

8	O		O		O	O
	O	O		O		O

Angular moment (g-cm^2) 96319.26 Percentage within range: 83.3%

	x	y
Center of mass	0	0

1	O	
2		
3	O	
4		
5	O	
6	O	
7	O	
8	O	
9		
10	O	
11		
12	O	

Highest Angular Moment

8	O	O			O	O
	O	O			O	O

Angular moment (g-cm^2) 108545.51

	x	y
Center of mass	0	0

1	O	
2	O	
3		
4		
5	O	
6	O	
7	O	
8	O	
9		
10		
11	O	
12	O	

Lowest Angular Moment

8		O	O	O	O	
		O	O	O	O	

Angular moment (g-cm^2) 35188.02

	x	y
Center of mass	0	0

1		
2	O	
3	O	
4	O	
5	O	
6		
7		
8	O	
9	O	
10	O	
11	O	
12		

Optimally Distributed

7	O		O		O	
	O	O		O		O

Angular moment (g-cm^2) 76637.95 Percentage within range: 66.7%

	x	y
Center of mass	-2.46428571	-2.46429

1	O	
2		
3	O	
4		
5	O	
6		
7	O	
8	O	
9		

Highest Angular Moment

7	O	O				O
	O	O			O	O

Angular moment (g-cm^2) 101090.44

	x	y
Center of mass	-1.47857143	-1.47857

1	O	
2	O	
3		
4		
5		
6	O	
7	O	
8	O	
9		

Lowest Angular Moment

7		O	O	O		
		O	O	O	O	

Angular moment (g-cm^2) 27732.96

	x	y
Center of mass	-1.47857143	-1.47857

1		
2	O	
3	O	
4	O	
5		
6		
7		
8	O	
9	O	

10	O	
11		
12	O	

Optimally Distributed

6	O		O		O	
		O		O		O

Angular moment (g-cm^2) 56956.64 Percentage within range: 50.0%

	x	y
Center of mass	0	0

1	O
2	
3	O
4	
5	O
6	
7	
8	O
9	
10	O
11	
12	O

Highest Angular Moment

10		
11	O	
12	O	

6	O				O	O
	O	O				O

93635.38

	x	y
	0	0

1	O
2	
3	
4	
5	O
6	O
7	O
8	O
9	
10	
11	
12	O

Lowest Angular Moment

10	O	
11	O	
12		

6		O	O	O		
			O	O	O	

20277.89

	x	y
	0	0

1	
2	O
3	O
4	O
5	
6	
7	
8	
9	O
10	O
11	O
12	

Optimally Distributed

5	O		O		O	
				O		O

Angular moment (g-cm^2) 49501.57 Percentage within range: 50.0%

	x	y
Center of mass	2.07	2.07

1	O
2	
3	O
4	
5	O
6	
7	
8	
9	
10	O
11	
12	O

Highest Angular Moment

5	O				O	O
	O					O

86180.31

	x	y
	2.07	2.07

1	O
2	
3	
4	
5	O
6	O
7	O
8	
9	
10	
11	
12	O

Lowest Angular Moment

5			O	O		
			O	O	O	

12822.83

	x	y
	2.07	2.07

1	
2	
3	O
4	O
5	
6	
7	
8	
9	O
10	O
11	O
12	

Optimally Distributed

4	O		O			
				O		O

Angular moment (g-cm^2) 42046.51 Percentage within range: 50.0%

	x	y
Center of mass	0	0

1	O
2	
3	O
4	
5	
6	
7	
8	
9	

Highest Angular Moment

4	O					O
	O					O

78725.25

	x	y
	0	0

1	O
2	
3	
4	
5	
6	O
7	O
8	
9	

Lowest Angular Moment

4			O	O		
			O	O		

5367.76

	x	y
	0	0

1	
2	
3	O
4	O
5	
6	
7	
8	
9	O

10	O	10	10 O
11		11	11
12	O	12 O	12

Optimally Distributed

3	O					
				O		O

Highest Angular Moment

3	O					
	O					O

Lowest Angular Moment

3			O			
			O	O		

Angular moment (g-cm^2) 40704.57 Percentage within range: 66.7%

	x	y
Center of mass	1.15	1.15

1	O	1 O	1
2		2	2
3		3	3 O
4		4	4
5		5	5
6		6	6
7		7 O	7
8		8	8
9		9	9 O
10	O	10	10 O
11		11	11
12	O	12 O	12

Optimally Distributed

2		O				
				O		

Highest Angular Moment

2	O					
					O	

Lowest Angular Moment

2			O			
				O		

Angular moment (g-cm^2) 14910.13 Percentage within range: 33.3%

	x	y
Center of mass	0	0

1		1 O	1
2	O	2	2
3		3	3 O
4		4	4
5		5	5
6		6	6
7		7	7
8		8	8
9		9	9
10		10	10 O
11	O	11	11
12		12 O	12

Optimally Distributed

1			O			

Highest Angular Moment

1	O					

Lowest Angular Moment

1			O			

Angular moment (g-cm^2) 1341.94 Percentage within range: 0.0%

	x	y
Center of mass	-3.45	-3.45

1		1 O	1
2		2	2
3	O	3	3 O
4		4	4
5		5	5
6		6	6
7		7	7
8		8	8
9		9	9

10
11
12

10
11
12

10
11
12