

### **Applying Fuzzy Logic to Risk Assessment and Decision-Making**

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Tab Name	Description
2.2 Misconduct Risk - Setup	<p><b>1. Inputs:</b> Set up assumptions of both input and output variables, membership functions, inference rules, and defuzzification method</p>
	<p><b>2. Membership Functions:</b> Graphs</p>
	<p><b>3. Distribution:</b> Set up distribution assumptions of input variables</p>
	<p><b>4. Correlation/Copula:</b> Set up the correlation assumption of input variables</p>
2.2 Misconduct Risk - Calc	<p><b>1. Single Case:</b> Calculate the value of the output variable using fuzzy logic model</p>
	<p><b>2. Distribution:</b> Simulate the distribution of output variable based on fuzzy logic system</p>

**Notes :**

1. Tab "6.2 Risk Aggregation" is used for aggregat
2. Tabs "Appendix B - Setup" and "Appendix B - Ca

### Input

- (a) Cells "**B6:E8**": Set the input variables' name, range of values, and unit.
- (b) Cells "**D12:M20**": Set the membership functions of input variables. Built-in membership functions and their parameters are explained in rows 33 to 39.
- (c) Cells "**B26:E26**": Set the output variable' name, range of values, and unit.
- (d) Cells "**D29:M31**": Set the membership functions of input variables. Built-in membership functions and their parameters are explained in rows 33 to 39.
- (e) **Rows 43-48**: Set up the inference rules.
- (f) Cell "**C56**": Set the defuzzification method.
- (g) Cells "**E209:M211**": Set the distribution type and parameters for input variables.
- (h) Cell "**C319**": Choose the the type of copula.
- (i) Cells "**B323:D323**": Set the parameter(s) for the chosen copula.

- (a) Cell "**H5**": Whether the input variables use the hardcoded value or the value in the specified simulation.
- (b) Cell "**H6**": Set the simulation number.
- (c) Cells "**D5:D7**": Hardcoded value of input variables.
- (d) Cell "**C139**": Number of simulations.
- (e) Cell "**F139**": Random number seed for the simulation.

ion using correlation matrix approach  
alc" are a simplified version of the fuzzy logic model for misconduct

### Macros/VBA Functions

- (a) Function "**pdf**": used in cell "C216" to calculate the probability density function.
- (b) Function "**cdf**": used in cell "D216" to calculate the cumulative probability function.
- (c) Function "**Membership**": used in cells "C104" to calculate the membership function.

- (a) Button "**Simulate**": When pressed, the distribution of the output variable will be simulated.
- (b) Function "**Dfuzz**": used in cell "C135" for defuzzification.
- (c) Function "**cdfinv**": used in cells "B143:D143" to get the simulated value of input variables using the inversion of cumulative distribution function.
- (d) Function "**CTEcal**": used in cell "L147" to calculate the CTE of the simulated results of the output variable.

risk.

## Section 2.2 Numerical Example - Misconduct Risk - Mod

### 1. Inputs

#### I. Independent Variables

NO.	Name	Range		Unit
		Lower End	Higher End	
1	Settlement Cost	0	5	\$ Million
2	Product Complexity	0	10	1
3	Compensation Level	0	10	1

#### Fuzzification

Variable NO.	Name	Set No.	Linguistic Description	Type	Membership Function	
					1	2
1	Settlement Cost	1	High	Linear	2.5	0
1	Settlement Cost	2	Medium	Triangle	1	0
1	Settlement Cost	3	Low	Linear	0	1
2	Product Complexity	1	High	Linear	5	0
2	Product Complexity	2	Medium	Trapezoid	1	0
2	Product Complexity	3	Low	Linear	0	1
3	Compensation Level	1	High	Linear	5	0
3	Compensation Level	2	Medium	Guassian	5	1.5
3	Compensation Level	3	Low	Linear	0	1

#### II. Dependent Variables

NO.	Name	Range		Unit
		Lower End	Higher End	
1	Misconduct Risk	0	10	1

#### Fuzzification

Variable NO.	Name	Set No.	Linguistic Description	Type	Membership Function	
					1	2
1	Misconduct Risk	1	High	Linear	5	0
1	Misconduct Risk	2	Medium	Gamma	3	1.5
1	Misconduct Risk	3	Low	Linear	0	1

#### Notes on membership function parameters:

#### III. Inference Rules

NO.	Variable		Fuzzy Hedges	AND/OR	Variable
1. IF	Product Complexity	is		OR	Compensation Level
Then	Misconduct Risk	is	High		
2. IF	Product Complexity	is	High	OR	Settlement Cost

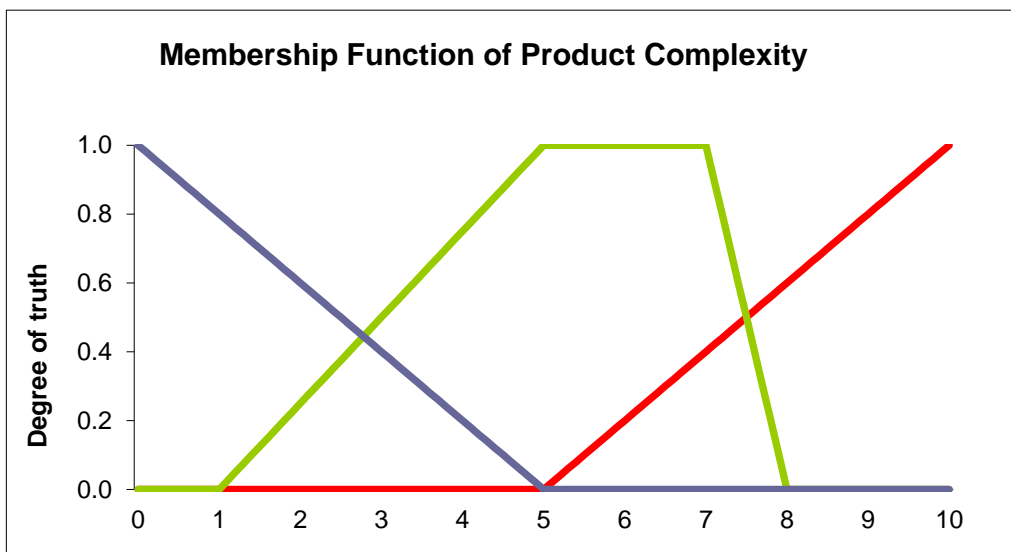
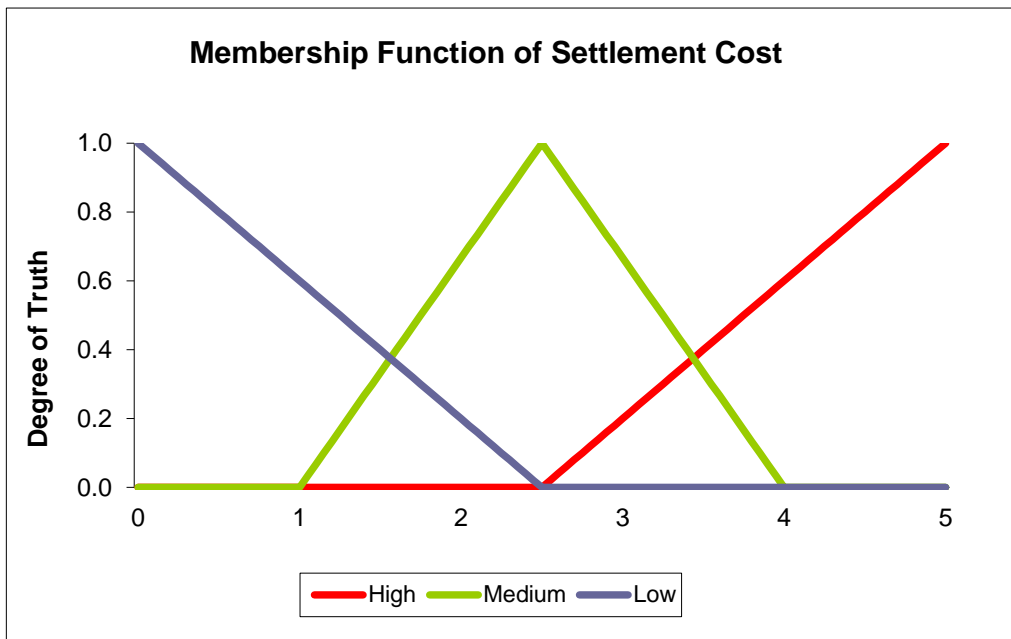
Then **Misconduct Risk** is **High**  
 3. IF **Product Complexity** is **NOT High** AND **Settlement Cost**  
 Then **Misconduct Risk** is **Medium**

**Notes on fuzzy hedges**

**IV. Defuzzification**

NO.	Variable	Method
1	Misconduct Risk	Centroid

**2. Membership Functions**



High Medium Low

**Interim Calculation**

	<b>Settlement Cost</b>			<b>Product Complexity</b>		
	<i>X</i>	<i>High</i>	<i>Medium</i>	<i>Low</i>	<i>X</i>	<i>High</i>
0	0.00	0.00	0.00	1.00	0.00	0.00
1	0.05	0.00	0.00	0.98	0.10	0.00
2	0.10	0.00	0.00	0.96	0.20	0.00
3	0.15	0.00	0.00	0.94	0.30	0.00
4	0.20	0.00	0.00	0.92	0.40	0.00
5	0.25	0.00	0.00	0.90	0.50	0.00
6	0.30	0.00	0.00	0.88	0.60	0.00
7	0.35	0.00	0.00	0.86	0.70	0.00
8	0.40	0.00	0.00	0.84	0.80	0.00
9	0.45	0.00	0.00	0.82	0.90	0.00
10	0.50	0.00	0.00	0.80	1.00	0.00
11	0.55	0.00	0.00	0.78	1.10	0.00
12	0.60	0.00	0.00	0.76	1.20	0.00
13	0.65	0.00	0.00	0.74	1.30	0.00
14	0.70	0.00	0.00	0.72	1.40	0.00
15	0.75	0.00	0.00	0.70	1.50	0.00
16	0.80	0.00	0.00	0.68	1.60	0.00
17	0.85	0.00	0.00	0.66	1.70	0.00
18	0.90	0.00	0.00	0.64	1.80	0.00
19	0.95	0.00	0.00	0.62	1.90	0.00
20	1.00	0.00	0.00	0.60	2.00	0.00
21	1.05	0.00	0.03	0.58	2.10	0.00
22	1.10	0.00	0.07	0.56	2.20	0.00
23	1.15	0.00	0.10	0.54	2.30	0.00
24	1.20	0.00	0.13	0.52	2.40	0.00
25	1.25	0.00	0.17	0.50	2.50	0.00
26	1.30	0.00	0.20	0.48	2.60	0.00
27	1.35	0.00	0.23	0.46	2.70	0.00
28	1.40	0.00	0.27	0.44	2.80	0.00
29	1.45	0.00	0.30	0.42	2.90	0.00
30	1.50	0.00	0.33	0.40	3.00	0.00
31	1.55	0.00	0.37	0.38	3.10	0.00
32	1.60	0.00	0.40	0.36	3.20	0.00
33	1.65	0.00	0.43	0.34	3.30	0.00
34	1.70	0.00	0.47	0.32	3.40	0.00
35	1.75	0.00	0.50	0.30	3.50	0.00
36	1.80	0.00	0.53	0.28	3.60	0.00
37	1.85	0.00	0.57	0.26	3.70	0.00
38	1.90	0.00	0.60	0.24	3.80	0.00
39	1.95	0.00	0.63	0.22	3.90	0.00
40	2.00	0.00	0.67	0.20	4.00	0.00
41	2.05	0.00	0.70	0.18	4.10	0.00
42	2.10	0.00	0.73	0.16	4.20	0.00



43	2.15	0.00	0.77	0.14	4.30	0.00
44	2.20	0.00	0.80	0.12	4.40	0.00
45	2.25	0.00	0.83	0.10	4.50	0.00
46	2.30	0.00	0.87	0.08	4.60	0.00
47	2.35	0.00	0.90	0.06	4.70	0.00
48	2.40	0.00	0.93	0.04	4.80	0.00
49	2.45	0.00	0.97	0.02	4.90	0.00
50	2.50	0.00	1.00	0.00	5.00	0.00
51	2.55	0.02	0.97	0.00	5.10	0.02
52	2.60	0.04	0.93	0.00	5.20	0.04
53	2.65	0.06	0.90	0.00	5.30	0.06
54	2.70	0.08	0.87	0.00	5.40	0.08
55	2.75	0.10	0.83	0.00	5.50	0.10
56	2.80	0.12	0.80	0.00	5.60	0.12
57	2.85	0.14	0.77	0.00	5.70	0.14
58	2.90	0.16	0.73	0.00	5.80	0.16
59	2.95	0.18	0.70	0.00	5.90	0.18
60	3.00	0.20	0.67	0.00	6.00	0.20
61	3.05	0.22	0.63	0.00	6.10	0.22
62	3.10	0.24	0.60	0.00	6.20	0.24
63	3.15	0.26	0.57	0.00	6.30	0.26
64	3.20	0.28	0.53	0.00	6.40	0.28
65	3.25	0.30	0.50	0.00	6.50	0.30
66	3.30	0.32	0.47	0.00	6.60	0.32
67	3.35	0.34	0.43	0.00	6.70	0.34
68	3.40	0.36	0.40	0.00	6.80	0.36
69	3.45	0.38	0.37	0.00	6.90	0.38
70	3.50	0.40	0.33	0.00	7.00	0.40
71	3.55	0.42	0.30	0.00	7.10	0.42
72	3.60	0.44	0.27	0.00	7.20	0.44
73	3.65	0.46	0.23	0.00	7.30	0.46
74	3.70	0.48	0.20	0.00	7.40	0.48
75	3.75	0.50	0.17	0.00	7.50	0.50
76	3.80	0.52	0.13	0.00	7.60	0.52
77	3.85	0.54	0.10	0.00	7.70	0.54
78	3.90	0.56	0.07	0.00	7.80	0.56
79	3.95	0.58	0.03	0.00	7.90	0.58
80	4.00	0.60	0.00	0.00	8.00	0.60
81	4.05	0.62	0.00	0.00	8.10	0.62
82	4.10	0.64	0.00	0.00	8.20	0.64
83	4.15	0.66	0.00	0.00	8.30	0.66
84	4.20	0.68	0.00	0.00	8.40	0.68
85	4.25	0.70	0.00	0.00	8.50	0.70
86	4.30	0.72	0.00	0.00	8.60	0.72
87	4.35	0.74	0.00	0.00	8.70	0.74
88	4.40	0.76	0.00	0.00	8.80	0.76
89	4.45	0.78	0.00	0.00	8.90	0.78
90	4.50	0.80	0.00	0.00	9.00	0.80
91	4.55	0.82	0.00	0.00	9.10	0.82
92	4.60	0.84	0.00	0.00	9.20	0.84

93	4.65	0.86	0.00	0.00	9.30	0.86
94	4.70	0.88	0.00	0.00	9.40	0.88
95	4.75	0.90	0.00	0.00	9.50	0.90
96	4.80	0.92	0.00	0.00	9.60	0.92
97	4.85	0.94	0.00	0.00	9.70	0.94
98	4.90	0.96	0.00	0.00	9.80	0.96
99	4.95	0.98	0.00	0.00	9.90	0.98
100	5.00	1.00	0.00	0.00	10.00	1.00

### 3. Distribution

NO.	Name	Range		Distribution		
		Lower End	Higher End	Type	Parameters	
1	Settlement Cost	0	5	Truncated Normal	2	1
2	Product Complexity	0	10	Uniform		
3	Compensation Level	0	10	Multinomial	2	0.4

### Interim Calculation

	<i>Settlement Cost</i>	<i>p.d.f.</i>	<i>c.d.f.</i>	<i>Product Complexity</i>	<i>p.d.f.</i>	<i>c.d.f.</i>
0	0.00	0.06	0.00	0.00	0.10	0.00
1	0.05	0.06	0.00	0.10	0.10	0.01
2	0.10	0.07	0.01	0.20	0.10	0.02
3	0.15	0.07	0.01	0.30	0.10	0.03
4	0.20	0.08	0.01	0.40	0.10	0.04
5	0.25	0.09	0.02	0.50	0.10	0.05
6	0.30	0.10	0.02	0.60	0.10	0.06
7	0.35	0.10	0.03	0.70	0.10	0.07
8	0.40	0.11	0.03	0.80	0.10	0.08
9	0.45	0.12	0.04	0.90	0.10	0.09
10	0.50	0.13	0.05	1.00	0.10	0.10
11	0.55	0.14	0.05	1.10	0.10	0.11
12	0.60	0.15	0.06	1.20	0.10	0.12
13	0.65	0.16	0.07	1.30	0.10	0.13
14	0.70	0.18	0.08	1.40	0.10	0.14
15	0.75	0.19	0.08	1.50	0.10	0.15
16	0.80	0.20	0.09	1.60	0.10	0.16
17	0.85	0.21	0.10	1.70	0.10	0.17
18	0.90	0.22	0.12	1.80	0.10	0.18
19	0.95	0.24	0.13	1.90	0.10	0.19
20	1.00	0.25	0.14	2.00	0.10	0.20
21	1.05	0.26	0.15	2.10	0.10	0.21
22	1.10	0.27	0.17	2.20	0.10	0.22
23	1.15	0.28	0.18	2.30	0.10	0.23
24	1.20	0.30	0.19	2.40	0.10	0.24
25	1.25	0.31	0.21	2.50	0.10	0.25
26	1.30	0.32	0.22	2.60	0.10	0.26
27	1.35	0.33	0.24	2.70	0.10	0.27
28	1.40	0.34	0.26	2.80	0.10	0.28

29	1.45	0.35	0.28	2.90	0.10	0.29
30	1.50	0.36	0.29	3.00	0.10	0.30
31	1.55	0.37	0.31	3.10	0.10	0.31
32	1.60	0.38	0.33	3.20	0.10	0.32
33	1.65	0.38	0.35	3.30	0.10	0.33
34	1.70	0.39	0.37	3.40	0.10	0.34
35	1.75	0.40	0.39	3.50	0.10	0.35
36	1.80	0.40	0.41	3.60	0.10	0.36
37	1.85	0.40	0.43	3.70	0.10	0.37
38	1.90	0.41	0.45	3.80	0.10	0.38
39	1.95	0.41	0.47	3.90	0.10	0.39
40	2.00	0.41	0.49	4.00	0.10	0.40
41	2.05	0.41	0.51	4.10	0.10	0.41
42	2.10	0.41	0.53	4.20	0.10	0.42
43	2.15	0.40	0.55	4.30	0.10	0.43
44	2.20	0.40	0.57	4.40	0.10	0.44
45	2.25	0.40	0.59	4.50	0.10	0.45
46	2.30	0.39	0.61	4.60	0.10	0.46
47	2.35	0.38	0.63	4.70	0.10	0.47
48	2.40	0.38	0.65	4.80	0.10	0.48
49	2.45	0.37	0.67	4.90	0.10	0.49
50	2.50	0.36	0.69	5.00	0.10	0.50
51	2.55	0.35	0.70	5.10	0.10	0.51
52	2.60	0.34	0.72	5.20	0.10	0.52
53	2.65	0.33	0.74	5.30	0.10	0.53
54	2.70	0.32	0.75	5.40	0.10	0.54
55	2.75	0.31	0.77	5.50	0.10	0.55
56	2.80	0.30	0.78	5.60	0.10	0.56
57	2.85	0.28	0.80	5.70	0.10	0.57
58	2.90	0.27	0.81	5.80	0.10	0.58
59	2.95	0.26	0.83	5.90	0.10	0.59
60	3.00	0.25	0.84	6.00	0.10	0.60
61	3.05	0.24	0.85	6.10	0.10	0.61
62	3.10	0.22	0.86	6.20	0.10	0.62
63	3.15	0.21	0.87	6.30	0.10	0.63
64	3.20	0.20	0.88	6.40	0.10	0.64
65	3.25	0.19	0.89	6.50	0.10	0.65
66	3.30	0.18	0.90	6.60	0.10	0.66
67	3.35	0.16	0.91	6.70	0.10	0.67
68	3.40	0.15	0.92	6.80	0.10	0.68
69	3.45	0.14	0.93	6.90	0.10	0.69
70	3.50	0.13	0.93	7.00	0.10	0.70
71	3.55	0.12	0.94	7.10	0.10	0.71
72	3.60	0.11	0.95	7.20	0.10	0.72
73	3.65	0.10	0.95	7.30	0.10	0.73
74	3.70	0.10	0.96	7.40	0.10	0.74
75	3.75	0.09	0.96	7.50	0.10	0.75
76	3.80	0.08	0.96	7.60	0.10	0.76
77	3.85	0.07	0.97	7.70	0.10	0.77
78	3.90	0.07	0.97	7.80	0.10	0.78

79	3.95	0.06	0.98	7.90	0.10	0.79
80	4.00	0.06	0.98	8.00	0.10	0.80
81	4.05	0.05	0.98	8.10	0.10	0.81
82	4.10	0.05	0.98	8.20	0.10	0.82
83	4.15	0.04	0.99	8.30	0.10	0.83
84	4.20	0.04	0.99	8.40	0.10	0.84
85	4.25	0.03	0.99	8.50	0.10	0.85
86	4.30	0.03	0.99	8.60	0.10	0.86
87	4.35	0.03	0.99	8.70	0.10	0.87
88	4.40	0.02	0.99	8.80	0.10	0.88
89	4.45	0.02	0.99	8.90	0.10	0.89
90	4.50	0.02	1.00	9.00	0.10	0.90
91	4.55	0.02	1.00	9.10	0.10	0.91
92	4.60	0.01	1.00	9.20	0.10	0.92
93	4.65	0.01	1.00	9.30	0.10	0.93
94	4.70	0.01	1.00	9.40	0.10	0.94
95	4.75	0.01	1.00	9.50	0.10	0.95
96	4.80	0.01	1.00	9.60	0.10	0.96
97	4.85	0.01	1.00	9.70	0.10	0.97
98	4.90	0.01	1.00	9.80	0.10	0.98
99	4.95	0.01	1.00	9.90	0.10	0.99
100	5.00	0.00	1.00	10.00	0.10	1.00

#### 4. Correlation/Copula

**Method** Clayton Copula

**Parameters**

$\theta$  6 0 0

# el Setting

Parameter

3	4	5	6	7	8
5	1				
2.5	1	4	0		
2.5	0				
10	1				
5	1	7	1	8	0
5	0				
10	1				
1					
5	0				

Parameter

3	4	5	6	7	8
10	1				
1	0				
5	0				

	Fuzzy Hedges		AND/OR	Variable		Fuzzy Hedges
is	Very	High	AND	Settlement Cost	is	
is		High	AND	Compensation Level	is	

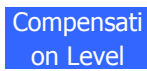
is



NOT High



AND

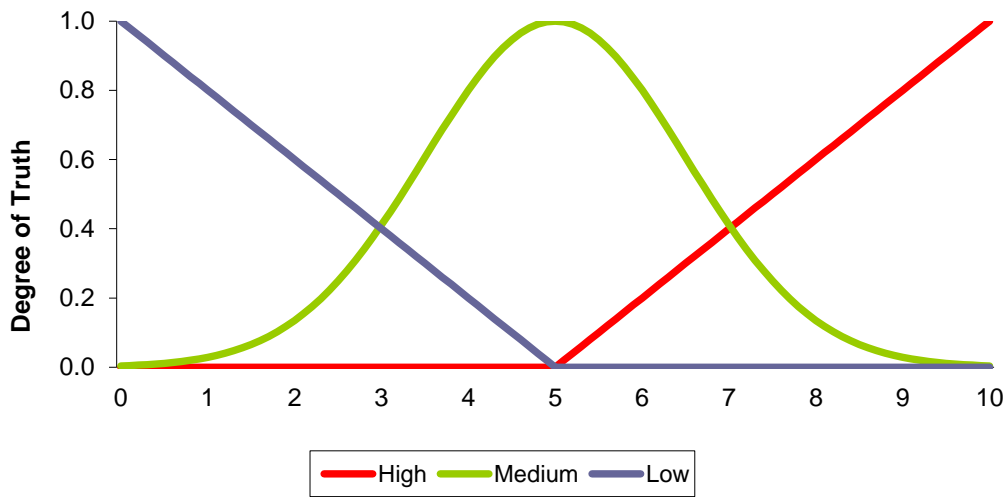


Compensation Level

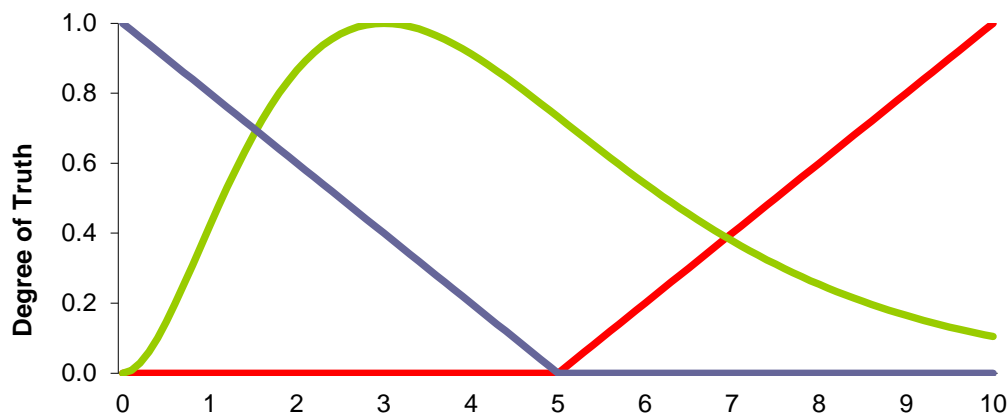
is



**Membership Function of Compensation Level**



**Membership Function of Misconduct Risk**



High Medium Low

<b>Compensation Level</b>						<b>Misconduct</b>
<i>Medium</i>	<i>Low</i>	<i>X</i>	<i>High</i>	<i>Medium</i>	<i>Low</i>	<i>X</i>
0.00	1.00	0.00	0.00	0.00	1.00	0.00
0.00	0.98	0.10	0.00	0.00	0.98	0.10
0.00	0.96	0.20	0.00	0.01	0.96	0.20
0.00	0.94	0.30	0.00	0.01	0.94	0.30
0.00	0.92	0.40	0.00	0.01	0.92	0.40
0.00	0.90	0.50	0.00	0.01	0.90	0.50
0.00	0.88	0.60	0.00	0.01	0.88	0.60
0.00	0.86	0.70	0.00	0.02	0.86	0.70
0.00	0.84	0.80	0.00	0.02	0.84	0.80
0.00	0.82	0.90	0.00	0.02	0.82	0.90
0.00	0.80	1.00	0.00	0.03	0.80	1.00
0.03	0.78	1.10	0.00	0.03	0.78	1.10
0.05	0.76	1.20	0.00	0.04	0.76	1.20
0.08	0.74	1.30	0.00	0.05	0.74	1.30
0.10	0.72	1.40	0.00	0.06	0.72	1.40
0.13	0.70	1.50	0.00	0.07	0.70	1.50
0.15	0.68	1.60	0.00	0.08	0.68	1.60
0.18	0.66	1.70	0.00	0.09	0.66	1.70
0.20	0.64	1.80	0.00	0.10	0.64	1.80
0.23	0.62	1.90	0.00	0.12	0.62	1.90
0.25	0.60	2.00	0.00	0.14	0.60	2.00
0.28	0.58	2.10	0.00	0.15	0.58	2.10
0.30	0.56	2.20	0.00	0.18	0.56	2.20
0.33	0.54	2.30	0.00	0.20	0.54	2.30
0.35	0.52	2.40	0.00	0.22	0.52	2.40
0.38	0.50	2.50	0.00	0.25	0.50	2.50
0.40	0.48	2.60	0.00	0.28	0.48	2.60
0.43	0.46	2.70	0.00	0.31	0.46	2.70
0.45	0.44	2.80	0.00	0.34	0.44	2.80
0.48	0.42	2.90	0.00	0.38	0.42	2.90
0.50	0.40	3.00	0.00	0.41	0.40	3.00
0.53	0.38	3.10	0.00	0.45	0.38	3.10
0.55	0.36	3.20	0.00	0.49	0.36	3.20
0.58	0.34	3.30	0.00	0.53	0.34	3.30
0.60	0.32	3.40	0.00	0.57	0.32	3.40
0.63	0.30	3.50	0.00	0.61	0.30	3.50
0.65	0.28	3.60	0.00	0.65	0.28	3.60
0.68	0.26	3.70	0.00	0.69	0.26	3.70
0.70	0.24	3.80	0.00	0.73	0.24	3.80
0.73	0.22	3.90	0.00	0.76	0.22	3.90
0.75	0.20	4.00	0.00	0.80	0.20	4.00
0.78	0.18	4.10	0.00	0.84	0.18	4.10
0.80	0.16	4.20	0.00	0.87	0.16	4.20

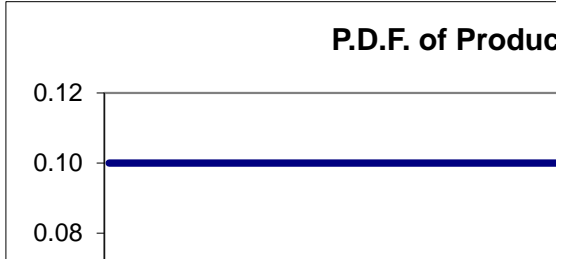
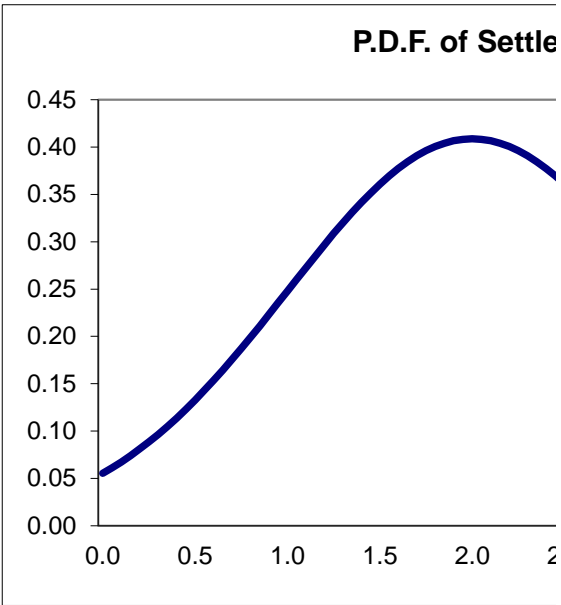
0.83	0.14	4.30	0.00	0.90	0.14	4.30
0.85	0.12	4.40	0.00	0.92	0.12	4.40
0.88	0.10	4.50	0.00	0.95	0.10	4.50
0.90	0.08	4.60	0.00	0.97	0.08	4.60
0.93	0.06	4.70	0.00	0.98	0.06	4.70
0.95	0.04	4.80	0.00	0.99	0.04	4.80
0.98	0.02	4.90	0.00	1.00	0.02	4.90
1.00	0.00	5.00	0.00	1.00	0.00	5.00
1.00	0.00	5.10	0.02	1.00	0.00	5.10
1.00	0.00	5.20	0.04	0.99	0.00	5.20
1.00	0.00	5.30	0.06	0.98	0.00	5.30
1.00	0.00	5.40	0.08	0.97	0.00	5.40
1.00	0.00	5.50	0.10	0.95	0.00	5.50
1.00	0.00	5.60	0.12	0.92	0.00	5.60
1.00	0.00	5.70	0.14	0.90	0.00	5.70
1.00	0.00	5.80	0.16	0.87	0.00	5.80
1.00	0.00	5.90	0.18	0.84	0.00	5.90
1.00	0.00	6.00	0.20	0.80	0.00	6.00
1.00	0.00	6.10	0.22	0.76	0.00	6.10
1.00	0.00	6.20	0.24	0.73	0.00	6.20
1.00	0.00	6.30	0.26	0.69	0.00	6.30
1.00	0.00	6.40	0.28	0.65	0.00	6.40
1.00	0.00	6.50	0.30	0.61	0.00	6.50
1.00	0.00	6.60	0.32	0.57	0.00	6.60
1.00	0.00	6.70	0.34	0.53	0.00	6.70
1.00	0.00	6.80	0.36	0.49	0.00	6.80
1.00	0.00	6.90	0.38	0.45	0.00	6.90
1.00	0.00	7.00	0.40	0.41	0.00	7.00
0.90	0.00	7.10	0.42	0.38	0.00	7.10
0.80	0.00	7.20	0.44	0.34	0.00	7.20
0.70	0.00	7.30	0.46	0.31	0.00	7.30
0.60	0.00	7.40	0.48	0.28	0.00	7.40
0.50	0.00	7.50	0.50	0.25	0.00	7.50
0.40	0.00	7.60	0.52	0.22	0.00	7.60
0.30	0.00	7.70	0.54	0.20	0.00	7.70
0.20	0.00	7.80	0.56	0.18	0.00	7.80
0.10	0.00	7.90	0.58	0.15	0.00	7.90
0.00	0.00	8.00	0.60	0.14	0.00	8.00
0.00	0.00	8.10	0.62	0.12	0.00	8.10
0.00	0.00	8.20	0.64	0.10	0.00	8.20
0.00	0.00	8.30	0.66	0.09	0.00	8.30
0.00	0.00	8.40	0.68	0.08	0.00	8.40
0.00	0.00	8.50	0.70	0.07	0.00	8.50
0.00	0.00	8.60	0.72	0.06	0.00	8.60
0.00	0.00	8.70	0.74	0.05	0.00	8.70
0.00	0.00	8.80	0.76	0.04	0.00	8.80
0.00	0.00	8.90	0.78	0.03	0.00	8.90
0.00	0.00	9.00	0.80	0.03	0.00	9.00
0.00	0.00	9.10	0.82	0.02	0.00	9.10
0.00	0.00	9.20	0.84	0.02	0.00	9.20



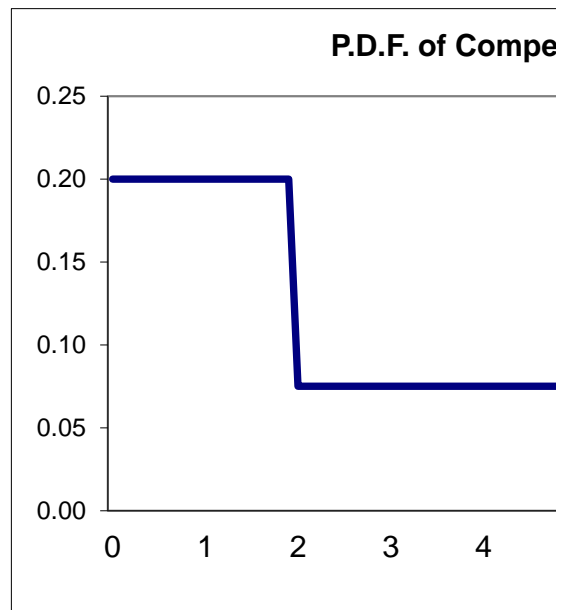
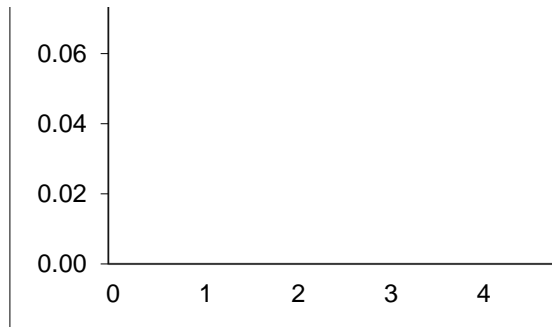
0.00	0.00	9.30	0.86	0.02	0.00	9.30
0.00	0.00	9.40	0.88	0.01	0.00	9.40
0.00	0.00	9.50	0.90	0.01	0.00	9.50
0.00	0.00	9.60	0.92	0.01	0.00	9.60
0.00	0.00	9.70	0.94	0.01	0.00	9.70
0.00	0.00	9.80	0.96	0.01	0.00	9.80
0.00	0.00	9.90	0.98	0.00	0.00	9.90
0.00	0.00	10.00	1.00	0.00	0.00	10.00

6	0.3	8	0.2	10	0.1
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<i>Compensation Level</i>	<i>p.d.f.</i>	<i>c.d.f.</i>
0.00	0.20	0.00
0.10	0.20	0.02
0.20	0.20	0.04
0.30	0.20	0.06
0.40	0.20	0.08
0.50	0.20	0.10
0.60	0.20	0.12
0.70	0.20	0.14
0.80	0.20	0.16
0.90	0.20	0.18
1.00	0.20	0.20
1.10	0.20	0.22
1.20	0.20	0.24
1.30	0.20	0.26
1.40	0.20	0.28
1.50	0.20	0.30
1.60	0.20	0.32
1.70	0.20	0.34
1.80	0.20	0.36
1.90	0.20	0.38
2.00	0.08	0.40
2.10	0.08	0.41
2.20	0.08	0.42
2.30	0.08	0.42
2.40	0.08	0.43
2.50	0.08	0.44
2.60	0.08	0.45
2.70	0.08	0.45
2.80	0.08	0.46



2.90	0.08	0.47
3.00	0.08	0.48
3.10	0.08	0.48
3.20	0.08	0.49
3.30	0.08	0.50
3.40	0.08	0.51
3.50	0.08	0.51
3.60	0.08	0.52
3.70	0.08	0.53
3.80	0.08	0.54
3.90	0.08	0.54
4.00	0.08	0.55
4.10	0.08	0.56
4.20	0.08	0.57
4.30	0.08	0.57
4.40	0.08	0.58
4.50	0.08	0.59
4.60	0.08	0.60
4.70	0.08	0.60
4.80	0.08	0.61
4.90	0.08	0.62
5.00	0.08	0.63
5.10	0.08	0.63
5.20	0.08	0.64
5.30	0.08	0.65
5.40	0.08	0.66
5.50	0.08	0.66
5.60	0.08	0.67
5.70	0.08	0.68
5.80	0.08	0.69
5.90	0.08	0.69
6.00	0.08	0.70
6.10	0.10	0.71
6.20	0.10	0.72
6.30	0.10	0.73
6.40	0.10	0.74
6.50	0.10	0.75
6.60	0.10	0.76
6.70	0.10	0.77
6.80	0.10	0.78
6.90	0.10	0.79
7.00	0.10	0.80
7.10	0.10	0.81
7.20	0.10	0.82
7.30	0.10	0.83
7.40	0.10	0.84
7.50	0.10	0.85
7.60	0.10	0.86
7.70	0.10	0.87
7.80	0.10	0.88



7.90	0.10	0.89
8.00	0.10	0.90
8.10	0.05	0.90
8.20	0.05	0.91
8.30	0.05	0.91
8.40	0.05	0.92
8.50	0.05	0.92
8.60	0.05	0.93
8.70	0.05	0.93
8.80	0.05	0.94
8.90	0.05	0.94
9.00	0.05	0.95
9.10	0.05	0.95
9.20	0.05	0.96
9.30	0.05	0.96
9.40	0.05	0.97
9.50	0.05	0.97
9.60	0.05	0.98
9.70	0.05	0.98
9.80	0.05	0.99
9.90	0.05	0.99
10.00	0.05	1.00

**Sets**

High  
Medium  
Low  
NOT High  
NOT Medium  
NOT Low

Settlement Cost '2.2 Misconduct Ri:  
Settlement Cost '2.2 Misconduct Ri:  
Settlement Cost '2.2 Misconduct Ri:  
Product Complex '2.2 Misconduct Ri:  
Product Complex '2.2 Misconduct Ri:  
Product Complex '2.2 Misconduct Ri:  
Compensation Le '2.2 Misconduct Ri:  
Compensation Le '2.2 Misconduct Ri:  
Compensation Le '2.2 Misconduct Ri:

NOT Low

High

NOT High

**Defuzzification Method**

Average of Maximum

Centroid

Average

**Risk**

<i>High</i>	<i>Mediun</i>	<i>Low</i>
0.00	0.00	1.00
0.00	0.01	0.98
0.00	0.03	0.96
0.00	0.06	0.94
0.00	0.10	0.92
0.00	0.15	0.90
0.00	0.20	0.88
0.00	0.25	0.86
0.00	0.31	0.84
0.00	0.36	0.82
0.00	0.42	0.80
0.00	0.48	0.78
0.00	0.53	0.76
0.00	0.58	0.74
0.00	0.63	0.72
0.00	0.68	0.70
0.00	0.72	0.68
0.00	0.76	0.66
0.00	0.80	0.64
0.00	0.84	0.62
0.00	0.87	0.60
0.00	0.89	0.58
0.00	0.92	0.56
0.00	0.94	0.54
0.00	0.95	0.52
0.00	0.97	0.50
0.00	0.98	0.48
0.00	0.99	0.46
0.00	1.00	0.44
0.00	1.00	0.42
0.00	1.00	0.40
0.00	1.00	0.38
0.00	1.00	0.36
0.00	0.99	0.34
0.00	0.98	0.32
0.00	0.98	0.30
0.00	0.97	0.28
0.00	0.95	0.26
0.00	0.94	0.24
0.00	0.93	0.22
0.00	0.91	0.20
0.00	0.90	0.18
0.00	0.88	0.16

0.00	0.86	0.14
0.00	0.85	0.12
0.00	0.83	0.10
0.00	0.81	0.08
0.00	0.79	0.06
0.00	0.77	0.04
0.00	0.75	0.02
0.00	0.73	0.00
0.02	0.71	0.00
0.04	0.69	0.00
0.06	0.67	0.00
0.08	0.65	0.00
0.10	0.63	0.00
0.12	0.62	0.00
0.14	0.60	0.00
0.16	0.58	0.00
0.18	0.56	0.00
0.20	0.54	0.00
0.22	0.52	0.00
0.24	0.51	0.00
0.26	0.49	0.00
0.28	0.47	0.00
0.30	0.46	0.00
0.32	0.44	0.00
0.34	0.42	0.00
0.36	0.41	0.00
0.38	0.39	0.00
0.40	0.38	0.00
0.42	0.36	0.00
0.44	0.35	0.00
0.46	0.34	0.00
0.48	0.32	0.00
0.50	0.31	0.00
0.52	0.30	0.00
0.54	0.29	0.00
0.56	0.28	0.00
0.58	0.26	0.00
0.60	0.25	0.00
0.62	0.24	0.00
0.64	0.23	0.00
0.66	0.22	0.00
0.68	0.21	0.00
0.70	0.21	0.00
0.72	0.20	0.00
0.74	0.19	0.00
0.76	0.18	0.00
0.78	0.17	0.00
0.80	0.16	0.00
0.82	0.16	0.00
0.84	0.15	0.00

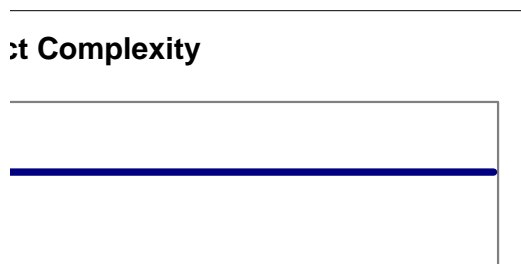
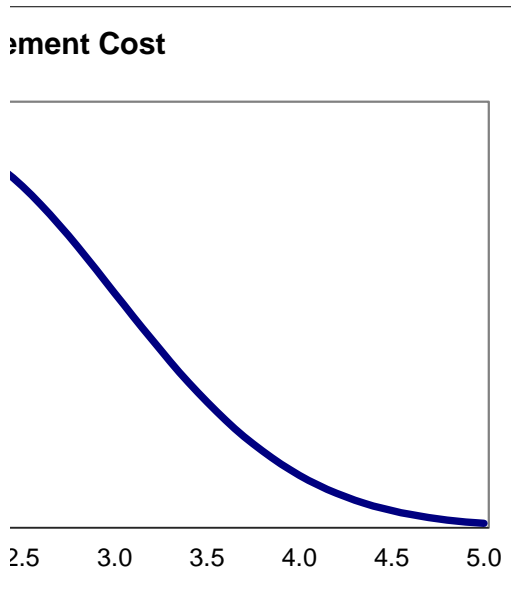
0.86	0.14	0.00
0.88	0.14	0.00
0.90	0.13	0.00
0.92	0.13	0.00
0.94	0.12	0.00
0.96	0.11	0.00
0.98	0.11	0.00
1.00	0.10	0.00

**Distribution Type**

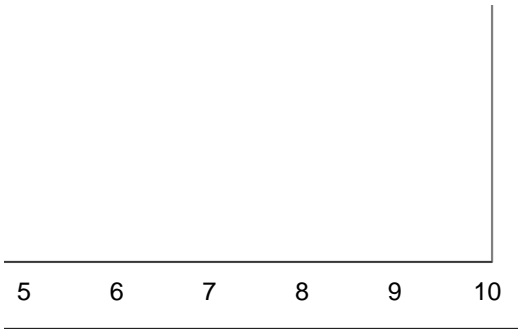
Uniform  
 Truncated Normal Distribution  
 Truncated Gamma Distribution  
 Multinomial

***Parameters***

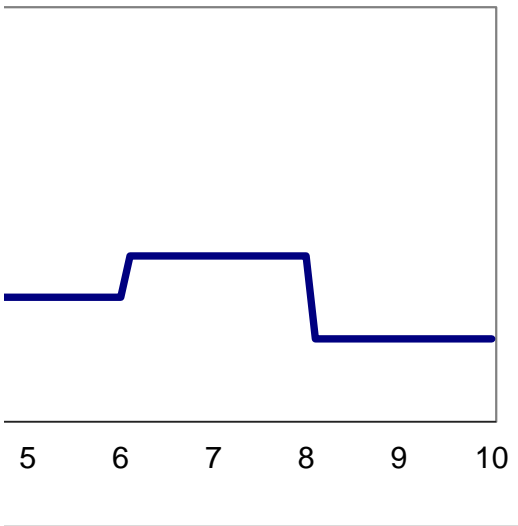
$\mu$                      $\sigma$   
 $\kappa$                       $\theta$   
 $a$                        $p_a$







**Insatiation Level**



**Copula Type**

Gaussian Copula (Correlation Matrix)

Clayton Copula

***Parameters***

$\rho_{12}$

$\theta$

$\rho_{13}$

'2.2 Misconduct Ri'2.2 Misconduct Risk - Setup'!D6  
'2.2 Misconduct Ri'2.2 Misconduct Risk - Setup'!D6  
'2.2 Misconduct Ri'2.2 Misconduct Risk - Setup'!D6  
'2.2 Misconduct Ri'2.2 Misconduct Risk - Setup'!D7  
'2.2 Misconduct Ri'2.2 Misconduct Risk - Setup'!D7  
'2.2 Misconduct Ri'2.2 Misconduct Risk - Setup'!D7  
'2.2 Misconduct Ri'2.2 Misconduct Risk - Setup'!D8  
'2.2 Misconduct Ri'2.2 Misconduct Risk - Setup'!D8  
'2.2 Misconduct Ri'2.2 Misconduct Risk - Setup'!D8







b

$p_b$

c

$p_c$

d















$\rho_d$

$e$

$\rho_e$

## Section 2.2 Numerical Example - Misconduct Risk - Calc

### I. Single Case

NO.	Name	Value	Hardcoded	Simulation No. 324	
1	Settlement Cost	1.91	2	1.91	Based on Simulation
2	Product Complexity	7.37	5	7.37	Simulation No.
3	Compensation Level	7.92	8	7.92	

### Reference Rules

1. IF (Product Complexity is NOT Low OR Compensation Level is Very High) AND Settlement Cost is High
2. IF (Product Complexity is High OR Settlement Cost is High) AND Compensation Level is High
3. IF (Product Complexity is NOT High AND Settlement Cost is NOT High) AND Compensation Level is Low

### True Value Calculation

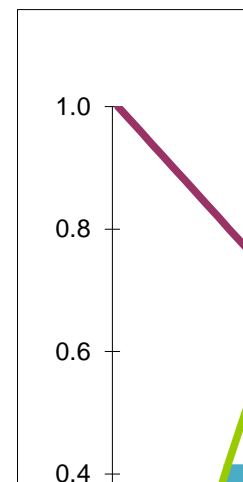
Rule	Product Complexity	Compensation Level	Settlement Cost
Rule 1	NOT Low	High	High
True Values	1	0.584222856	0
Rule 2	High	High	High
True Values	0.47377688	0	0
Rule 3	NOT High	NOT High	NOT High
True Values	0.52622312	1	1

### Min-Max Implication Rule

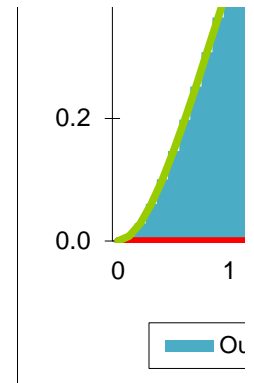
High	0.76
Medium	0.42
Low	0.00

### Output Set - Misconduct Risk - High

X	Output Set	Original Set - High	Original Set - Medium	Original Set - Low
0.00	0.00	0.00	0.00	1.00
0.10	0.01	0.00	0.01	0.98
0.20	0.03	0.00	0.03	0.96
0.30	0.06	0.00	0.06	0.94
0.40	0.10	0.00	0.10	0.92
0.50	0.15	0.00	0.15	0.90
0.60	0.20	0.00	0.20	0.88
0.70	0.25	0.00	0.25	0.86
0.80	0.31	0.00	0.31	0.84
0.90	0.36	0.00	0.36	0.82
1.00	0.42	0.00	0.42	0.80
1.10	0.42	0.00	0.48	0.78
1.20	0.42	0.00	0.53	0.76
1.30	0.42	0.00	0.58	0.74
1.40	0.42	0.00	0.63	0.72
1.50	0.42	0.00	0.68	0.70
1.60	0.42	0.00	0.72	0.68



1.70	0.42	0.00	0.76	0.66
1.80	0.42	0.00	0.80	0.64
1.90	0.42	0.00	0.84	0.62
2.00	0.42	0.00	0.87	0.60
2.10	0.42	0.00	0.89	0.58
2.20	0.42	0.00	0.92	0.56
2.30	0.42	0.00	0.94	0.54
2.40	0.42	0.00	0.95	0.52
2.50	0.42	0.00	0.97	0.50
2.60	0.42	0.00	0.98	0.48
2.70	0.42	0.00	0.99	0.46
2.80	0.42	0.00	1.00	0.44
2.90	0.42	0.00	1.00	0.42
3.00	0.42	0.00	1.00	0.40
3.10	0.42	0.00	1.00	0.38
3.20	0.42	0.00	1.00	0.36
3.30	0.42	0.00	0.99	0.34
3.40	0.42	0.00	0.98	0.32
3.50	0.42	0.00	0.98	0.30
3.60	0.42	0.00	0.97	0.28
3.70	0.42	0.00	0.95	0.26
3.80	0.42	0.00	0.94	0.24
3.90	0.42	0.00	0.93	0.22
4.00	0.42	0.00	0.91	0.20
4.10	0.42	0.00	0.90	0.18
4.20	0.42	0.00	0.88	0.16
4.30	0.42	0.00	0.86	0.14
4.40	0.42	0.00	0.85	0.12
4.50	0.42	0.00	0.83	0.10
4.60	0.42	0.00	0.81	0.08
4.70	0.42	0.00	0.79	0.06
4.80	0.42	0.00	0.77	0.04
4.90	0.42	0.00	0.75	0.02
5.00	0.42	0.00	0.73	0.00
5.10	0.42	0.02	0.71	0.00
5.20	0.42	0.04	0.69	0.00
5.30	0.42	0.06	0.67	0.00
5.40	0.42	0.08	0.65	0.00
5.50	0.42	0.10	0.63	0.00
5.60	0.42	0.12	0.62	0.00
5.70	0.42	0.14	0.60	0.00
5.80	0.42	0.16	0.58	0.00
5.90	0.42	0.18	0.56	0.00
6.00	0.42	0.20	0.54	0.00
6.10	0.42	0.22	0.52	0.00
6.20	0.42	0.24	0.51	0.00
6.30	0.42	0.26	0.49	0.00
6.40	0.42	0.28	0.47	0.00
6.50	0.42	0.30	0.46	0.00
6.60	0.42	0.32	0.44	0.00





6.70	0.42	0.34	0.42	0.00
6.80	0.41	0.36	0.41	0.00
6.90	0.39	0.38	0.39	0.00
7.00	0.40	0.40	0.38	0.00
7.10	0.42	0.42	0.36	0.00
7.20	0.44	0.44	0.35	0.00
7.30	0.46	0.46	0.34	0.00
7.40	0.48	0.48	0.32	0.00
7.50	0.50	0.50	0.31	0.00
7.60	0.52	0.52	0.30	0.00
7.70	0.54	0.54	0.29	0.00
7.80	0.56	0.56	0.28	0.00
7.90	0.58	0.58	0.26	0.00
8.00	0.60	0.60	0.25	0.00
8.10	0.62	0.62	0.24	0.00
8.20	0.64	0.64	0.23	0.00
8.30	0.66	0.66	0.22	0.00
8.40	0.68	0.68	0.21	0.00
8.50	0.70	0.70	0.21	0.00
8.60	0.72	0.72	0.20	0.00
8.70	0.74	0.74	0.19	0.00
8.80	0.76	0.76	0.18	0.00
8.90	0.76	0.78	0.17	0.00
9.00	0.76	0.80	0.16	0.00
9.10	0.76	0.82	0.16	0.00
9.20	0.76	0.84	0.15	0.00
9.30	0.76	0.86	0.14	0.00
9.40	0.76	0.88	0.14	0.00
9.50	0.76	0.90	0.13	0.00
9.60	0.76	0.92	0.13	0.00
9.70	0.76	0.94	0.12	0.00
9.80	0.76	0.96	0.11	0.00
9.90	0.76	0.98	0.11	0.00
10.00	0.76	1.00	0.10	0.00

**Defuzzification**

Misconduct Risk

**5.86**

**II. Distribution**

Simulate

No. of Simulations

**1000**

Random Number Seed

**137531**

Simulated Input Variables				Output Variable
No.	Settlement Cost	Product Complexity	Compensation Level	Misconduct Risk
1	0.99	1.41	0.73	4.63
2	2.68	8.37	6.04	5.35
3	1.21	1.11	0.11	4.80
4	0.76	0.88	0.40	4.45

Clayton Copula

$u_1$	$u_2$
0.14	0.14
0.75	0.84
0.20	0.11
0.09	0.09

5	2.34	8.62	4.94	5.22	0.63	0.86
6	1.89	3.62	0.76	5.13	0.45	0.36
7	2.14	4.95	1.74	5.19	0.55	0.49
8	3.40	7.66	1.72	5.22	0.92	0.77
9	2.19	4.59	1.52	5.20	0.57	0.46
10	2.31	6.81	5.56	5.26	0.61	0.68
11	1.43	2.60	1.27	4.93	0.27	0.26
12	2.27	6.04	1.87	5.21	0.60	0.60
13	2.56	8.13	4.05	5.22	0.71	0.81
14	2.07	6.23	5.02	5.17	0.52	0.62
15	3.60	9.43	8.05	6.03	0.95	0.94
16	2.35	6.79	6.60	5.47	0.63	0.68
17	2.99	9.63	7.93	5.97	0.84	0.96
18	1.92	2.51	0.07	5.13	0.45	0.25
19	2.00	6.13	3.85	5.16	0.49	0.61
20	1.54	3.51	1.41	4.98	0.31	0.35
21	1.21	2.26	1.26	4.80	0.20	0.23
22	1.65	2.76	0.67	5.03	0.35	0.28
23	2.57	6.24	1.30	5.22	0.71	0.62
24	3.81	9.12	4.90	5.22	0.97	0.91
25	1.12	1.79	0.95	4.73	0.17	0.18
26	2.32	5.66	1.78	5.21	0.62	0.57
27	0.80	1.63	0.51	4.48	0.09	0.16
28	1.90	5.72	3.60	5.13	0.45	0.57
29	1.15	2.81	1.15	4.76	0.18	0.28
30	1.48	4.19	1.89	4.95	0.29	0.42
31	3.10	7.79	3.52	5.22	0.86	0.78
32	3.08	9.70	9.06	6.84	0.86	0.97
33	3.17	8.75	3.66	5.22	0.88	0.88
34	1.61	3.16	1.54	5.02	0.34	0.32
35	1.42	3.91	1.72	4.92	0.26	0.39
36	2.09	7.42	5.73	5.25	0.53	0.74
37	2.17	5.18	1.72	5.19	0.56	0.52
38	1.58	3.29	1.72	5.00	0.32	0.33
39	0.94	1.14	0.62	4.59	0.12	0.11
40	1.40	2.22	1.52	4.91	0.26	0.22
41	3.01	9.92	8.24	6.15	0.84	0.99
42	1.32	2.86	1.24	4.87	0.23	0.29
43	2.38	5.20	0.82	5.22	0.64	0.52
44	2.88	8.49	4.41	5.22	0.81	0.85
45	2.21	6.55	5.86	5.30	0.57	0.66
46	2.25	2.97	0.04	5.21	0.59	0.30
47	1.84	5.80	4.53	5.11	0.42	0.58
48	2.34	7.14	4.74	5.22	0.63	0.71
49	0.32	0.22	0.16	4.21	0.02	0.02
50	2.94	7.84	2.92	5.22	0.82	0.78
51	2.89	8.07	1.95	5.22	0.81	0.81
52	2.96	9.74	8.21	6.13	0.83	0.97
53	1.49	2.47	1.20	4.96	0.29	0.25
54	3.11	8.90	5.96	5.34	0.86	0.89

55	1.76	4.31	1.73	5.08	0.39	0.43
56	1.89	3.96	2.15	5.12	0.44	0.40
57	3.83	8.56	1.59	5.22	0.97	0.86
58	0.23	0.13	0.09	4.21	0.02	0.01
59	2.93	7.24	2.20	5.22	0.82	0.72
60	3.24	8.09	5.78	5.31	0.89	0.81
61	0.78	0.86	0.72	4.47	0.09	0.09
62	0.58	0.47	0.46	4.33	0.06	0.05
63	3.09	8.46	6.08	5.36	0.86	0.85
64	2.57	7.40	4.07	5.22	0.71	0.74
65	1.49	4.59	1.58	4.96	0.29	0.46
66	2.29	5.04	1.38	5.21	0.60	0.50
67	2.46	3.59	0.06	5.22	0.67	0.36
68	2.17	6.92	3.12	5.19	0.56	0.69
69	1.24	2.90	1.04	4.81	0.20	0.29
70	2.60	7.14	5.75	5.30	0.72	0.71
71	1.70	3.98	2.27	5.06	0.37	0.40
72	1.86	7.93	4.56	5.12	0.43	0.79
73	1.16	2.47	1.03	4.76	0.18	0.25
74	2.77	7.03	4.22	5.22	0.78	0.70
75	2.89	9.17	8.22	6.13	0.81	0.92
76	1.09	1.83	0.71	4.71	0.16	0.18
77	1.15	2.02	0.97	4.75	0.18	0.20
78	2.16	7.55	4.88	5.19	0.55	0.75
79	2.41	9.52	2.04	5.22	0.65	0.95
80	1.00	1.41	1.49	4.65	0.14	0.14
81	3.47	9.45	7.68	5.85	0.93	0.94
82	2.30	8.03	6.90	5.55	0.61	0.80
83	2.38	9.81	7.24	5.67	0.64	0.98
84	1.53	3.40	1.57	4.98	0.30	0.34
85	1.75	2.41	0.22	5.07	0.39	0.24
86	3.22	9.72	8.72	6.50	0.89	0.97
87	1.07	2.39	0.83	4.70	0.16	0.24
88	1.71	5.34	4.30	5.06	0.37	0.53
89	1.72	4.35	3.36	5.07	0.38	0.43
90	2.21	7.96	4.93	5.20	0.57	0.80
91	0.29	0.21	0.18	4.21	0.02	0.02
92	1.63	2.85	2.17	5.02	0.34	0.28
93	2.11	5.29	2.84	5.18	0.53	0.53
94	1.22	2.29	1.93	4.80	0.20	0.23
95	2.10	8.47	3.48	5.18	0.53	0.85
96	1.19	2.07	1.59	4.78	0.19	0.21
97	1.93	3.96	0.90	5.14	0.46	0.40
98	0.31	0.32	0.10	4.21	0.02	0.03
99	2.72	6.90	2.20	5.22	0.76	0.69
100	3.31	9.92	9.35	7.19	0.90	0.99
101	1.06	1.92	0.89	4.69	0.16	0.19
102	2.30	5.24	1.18	5.21	0.61	0.52
103	0.91	1.27	0.84	4.57	0.12	0.13
104	2.45	8.08	7.46	5.76	0.67	0.81

105	2.50	6.79	2.36	5.22	0.69	0.68
106	2.58	9.84	7.15	5.65	0.71	0.98
107	0.94	1.10	0.62	4.59	0.12	0.11
108	1.75	3.35	1.28	5.07	0.39	0.34
109	0.88	1.59	0.66	4.54	0.11	0.16
110	1.71	3.64	3.44	5.06	0.37	0.36
111	1.96	5.08	1.96	5.15	0.47	0.51
112	1.76	3.50	1.97	5.08	0.39	0.35
113	2.39	4.39	0.34	5.22	0.64	0.44
114	1.46	3.99	1.75	4.95	0.28	0.40
115	1.59	2.56	0.92	5.01	0.33	0.26
116	1.90	4.77	3.21	5.13	0.45	0.48
117	0.77	0.78	0.67	4.46	0.09	0.08
118	1.74	7.01	4.28	5.07	0.39	0.70
119	3.06	8.94	6.17	5.38	0.85	0.89
120	3.88	9.49	6.74	5.52	0.97	0.95
121	2.02	3.36	0.29	5.16	0.50	0.34
122	2.71	9.53	7.18	5.65	0.76	0.95
123	0.43	0.36	0.32	4.25	0.04	0.04
124	2.07	3.77	0.38	5.17	0.52	0.38
125	0.85	1.01	0.64	4.52	0.10	0.10
126	2.51	6.20	1.91	5.22	0.69	0.62
127	2.58	5.10	0.59	5.22	0.71	0.51
128	2.08	4.63	1.78	5.18	0.52	0.46
129	2.00	4.13	1.69	5.16	0.49	0.41
130	0.62	0.91	0.37	4.35	0.06	0.09
131	3.17	9.42	7.96	5.99	0.88	0.94
132	1.46	2.58	1.38	4.95	0.28	0.26
133	0.10	0.05	0.03	4.21	0.01	0.01
134	3.73	9.76	7.20	5.66	0.96	0.98
135	1.28	2.69	1.51	4.84	0.22	0.27
136	1.16	0.90	0.05	4.76	0.18	0.09
137	1.89	4.78	4.26	5.13	0.45	0.48
138	2.05	4.65	1.73	5.17	0.51	0.46
139	3.45	8.74	4.84	5.22	0.93	0.87
140	1.21	1.85	1.04	4.79	0.20	0.19
141	3.82	9.18	5.96	5.34	0.97	0.92
142	0.26	0.22	0.09	4.21	0.02	0.02
143	2.63	5.27	0.54	5.22	0.73	0.53
144	2.29	6.09	4.94	5.21	0.60	0.61
145	1.41	3.88	1.92	4.92	0.26	0.39
146	1.53	2.18	0.39	4.98	0.30	0.22
147	1.25	3.54	1.59	4.82	0.21	0.35
148	4.18	9.10	5.71	5.30	0.99	0.91
149	4.17	7.77	0.99	5.22	0.99	0.78
150	1.59	5.64	1.85	5.01	0.33	0.56
151	1.58	3.12	3.22	5.00	0.32	0.31
152	1.92	3.66	0.93	5.13	0.46	0.37
153	1.83	3.79	1.73	5.10	0.42	0.38
154	0.43	0.58	0.33	4.25	0.04	0.06

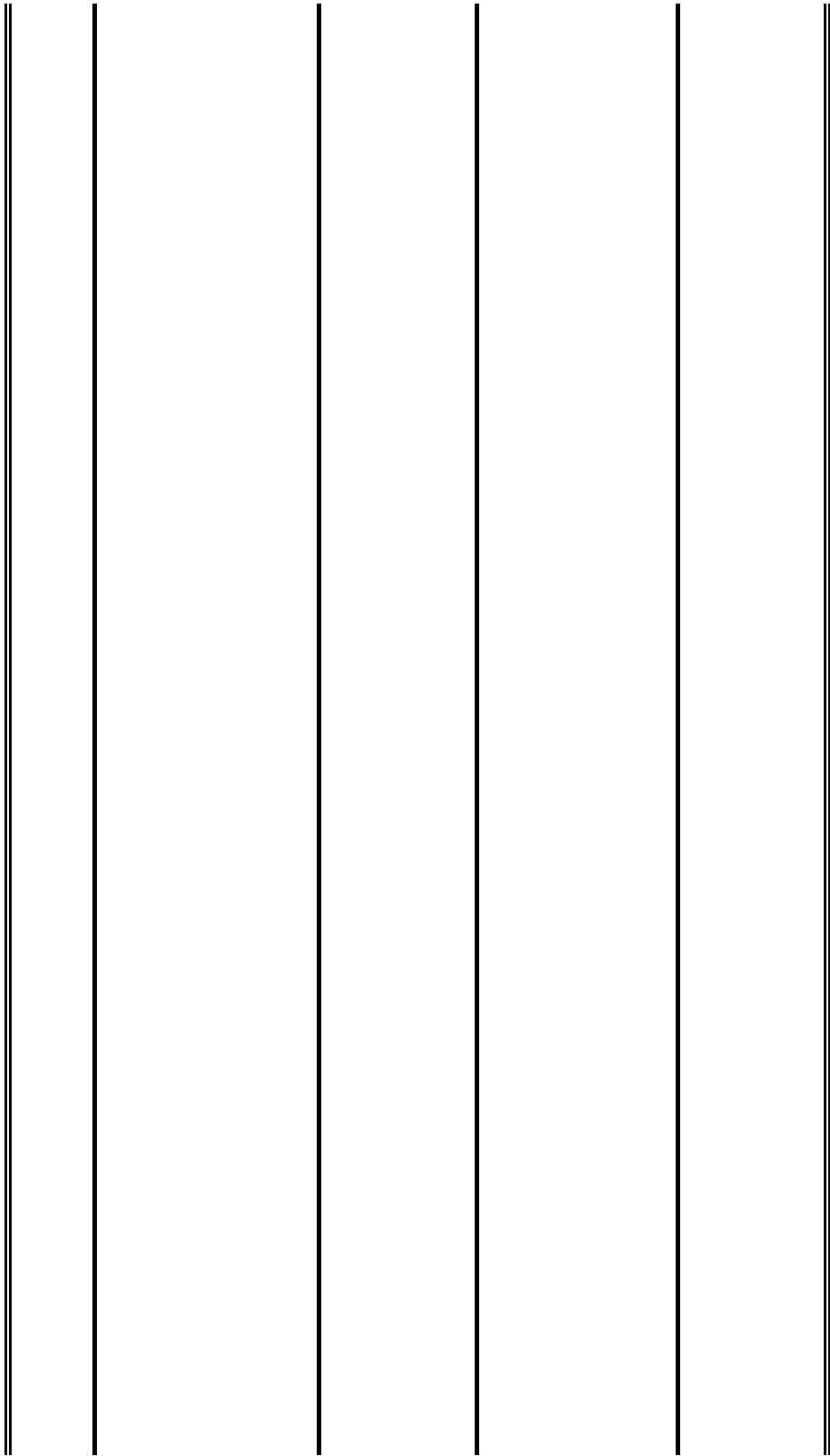
155	1.25	1.75	1.42	4.82	0.21	0.17
156	1.00	2.05	0.88	4.64	0.14	0.20
157	1.77	3.90	3.10	5.08	0.39	0.39
158	1.99	4.35	1.72	5.15	0.49	0.44
159	1.40	2.46	1.12	4.91	0.26	0.25
160	3.40	5.74	0.22	5.22	0.92	0.57
161	1.96	5.15	5.27	5.16	0.47	0.52
162	1.19	2.87	0.94	4.78	0.19	0.29
163	1.69	3.62	2.26	5.05	0.36	0.36
164	1.80	4.73	1.67	5.09	0.41	0.47
165	1.65	3.31	1.07	5.04	0.35	0.33
166	2.64	7.32	4.63	5.22	0.74	0.73
167	2.06	5.65	7.72	5.81	0.51	0.56
168	1.19	4.38	1.43	4.78	0.19	0.44
169	2.16	7.52	7.28	5.66	0.55	0.75
170	2.38	8.55	7.45	5.75	0.64	0.85
171	2.17	5.77	6.28	5.37	0.56	0.58
172	1.55	4.07	1.92	4.99	0.31	0.41
173	1.62	1.96	0.13	5.02	0.34	0.20
174	1.93	6.65	2.30	5.14	0.46	0.66
175	1.43	1.61	0.12	4.93	0.27	0.16
176	4.31	8.69	3.87	5.22	0.99	0.87
177	3.17	9.99	8.88	6.65	0.88	1.00
178	1.05	1.06	0.44	4.68	0.15	0.11
179	2.37	6.05	2.39	5.22	0.64	0.61
180	2.36	6.31	2.99	5.22	0.63	0.63
181	2.47	9.59	6.40	5.43	0.67	0.96
182	2.49	9.48	5.74	5.30	0.68	0.95
183	1.79	4.23	2.61	5.09	0.40	0.42
184	0.50	0.48	0.37	4.28	0.04	0.05
185	1.33	1.75	0.55	4.87	0.24	0.18
186	3.19	8.43	9.90	8.13	0.88	0.84
187	3.22	9.08	7.99	6.00	0.89	0.91
188	3.45	8.57	2.57	5.22	0.93	0.86
189	4.76	9.65	6.21	5.39	1.00	0.96
190	2.18	6.49	4.99	5.20	0.56	0.65
191	0.03	0.01	0.01	4.21	0.00	0.00
192	2.27	4.95	1.10	5.21	0.60	0.50
193	2.02	3.55	0.53	5.16	0.50	0.36
194	3.15	8.46	4.37	5.22	0.87	0.85
195	2.19	4.55	0.91	5.20	0.56	0.46
196	0.06	0.05	0.02	4.21	0.00	0.00
197	2.79	7.92	2.43	5.22	0.78	0.79
198	3.34	7.02	0.63	5.22	0.91	0.70
199	3.04	8.56	2.74	5.22	0.85	0.86
200	3.39	6.46	0.57	5.22	0.92	0.65
201	0.84	0.76	0.54	4.52	0.10	0.08
202	2.19	5.21	3.13	5.20	0.57	0.52
203	1.70	3.14	1.17	5.05	0.37	0.31
204	1.90	4.47	3.12	5.13	0.45	0.45

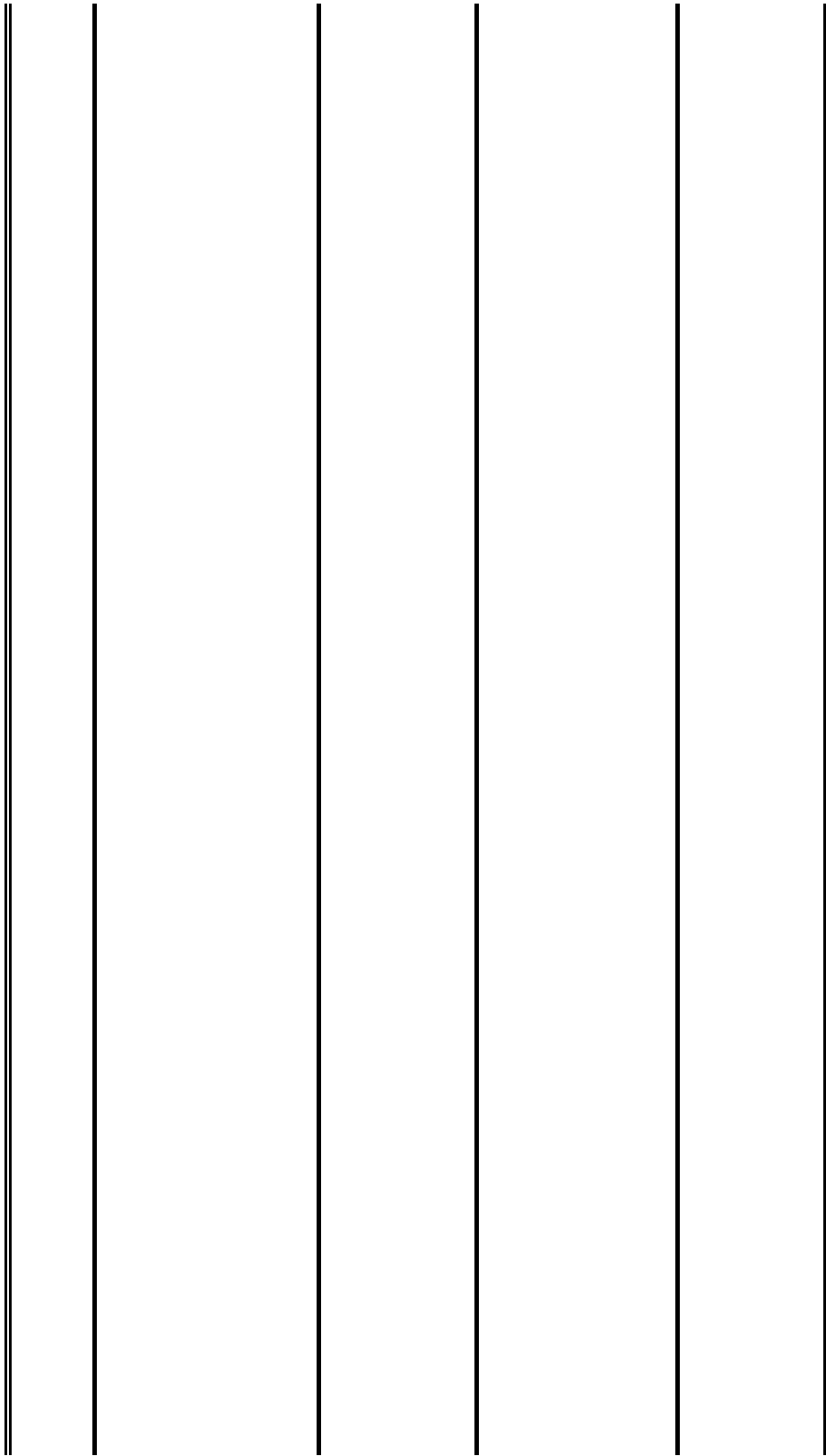
205	2.94	7.51	1.84	5.22	0.82	0.75
206	2.44	4.02	0.16	5.22	0.66	0.40
207	3.50	9.64	6.96	5.58	0.93	0.96
208	2.76	7.17	4.05	5.22	0.77	0.72
209	2.24	4.06	0.56	5.20	0.58	0.41
210	1.49	2.88	1.36	4.96	0.29	0.29
211	3.61	8.52	2.96	5.22	0.95	0.85
212	0.87	0.84	0.97	4.54	0.11	0.08
213	2.68	9.02	6.97	5.58	0.75	0.90
214	1.82	2.85	0.22	5.10	0.42	0.29
215	3.63	8.83	5.16	5.23	0.95	0.88
216	3.74	7.57	1.29	5.22	0.96	0.76
217	0.48	0.35	0.26	4.27	0.04	0.04
218	2.72	6.26	1.54	5.22	0.76	0.63
219	1.81	5.90	6.09	5.23	0.41	0.59
220	2.26	6.57	3.68	5.21	0.59	0.66
221	2.05	5.82	3.50	5.17	0.51	0.58
222	3.22	8.75	4.04	5.22	0.89	0.87
223	2.83	7.38	1.97	5.22	0.79	0.74
224	2.80	5.62	0.48	5.22	0.79	0.56
225	2.43	6.38	1.95	5.22	0.66	0.64
226	2.23	5.22	1.60	5.20	0.58	0.52
227	2.94	9.89	6.62	5.48	0.82	0.99
228	2.81	8.78	5.49	5.26	0.79	0.88
229	3.25	9.80	8.79	6.57	0.89	0.98
230	1.90	7.76	2.92	5.13	0.45	0.78
231	0.63	0.52	0.38	4.36	0.06	0.05
232	2.21	6.37	5.45	5.24	0.58	0.64
233	1.19	3.45	1.15	4.78	0.19	0.35
234	2.73	6.31	1.47	5.22	0.76	0.63
235	2.52	7.62	7.36	5.72	0.69	0.76
236	1.60	2.41	0.64	5.01	0.33	0.24
237	0.15	0.13	0.07	4.21	0.01	0.01
238	2.28	5.07	1.88	5.21	0.60	0.51
239	2.18	2.15	0.01	5.20	0.56	0.21
240	1.11	2.09	1.50	4.72	0.17	0.21
241	1.97	6.36	3.12	5.15	0.48	0.64
242	1.18	2.36	0.80	4.77	0.19	0.24
243	2.00	9.35	2.48	5.16	0.49	0.93
244	0.96	1.29	0.44	4.61	0.13	0.13
245	2.84	5.26	0.38	5.22	0.80	0.53
246	2.03	4.75	2.04	5.16	0.50	0.48
247	2.84	9.13	5.36	5.25	0.80	0.91
248	1.82	4.16	1.69	5.10	0.42	0.42
249	3.50	7.91	1.06	5.22	0.93	0.79
250	1.00	1.59	0.94	4.64	0.14	0.16
251	0.95	1.59	0.64	4.60	0.13	0.16
252	3.12	7.21	1.02	5.22	0.87	0.72
253	2.08	4.66	1.59	5.18	0.52	0.47
254	1.85	3.02	0.39	5.11	0.43	0.30

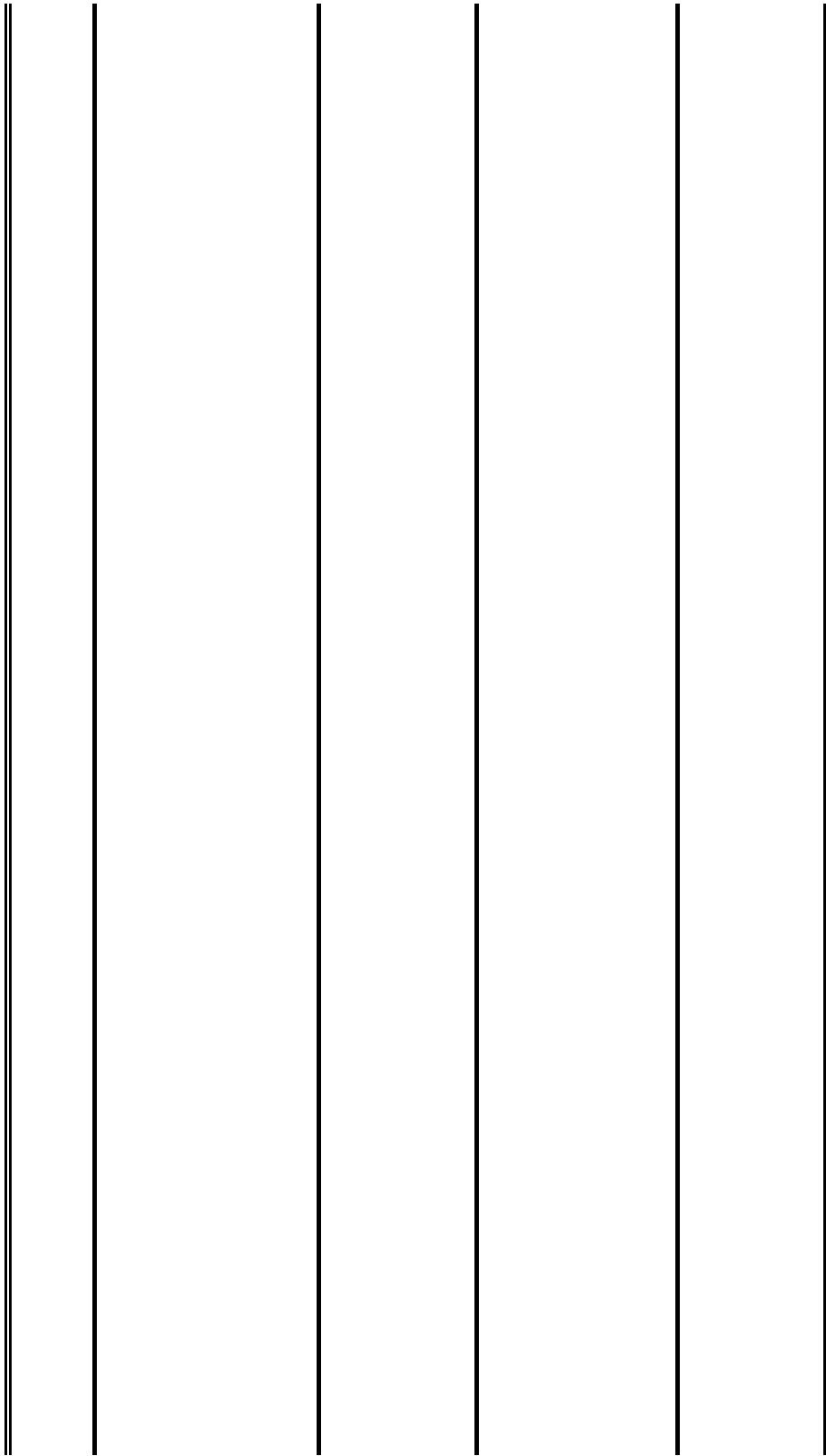
255	1.96	2.59	0.08	5.15	0.47	0.26
256	2.53	4.72	0.34	5.22	0.69	0.47
257	0.55	0.47	0.27	4.31	0.05	0.05
258	2.81	9.13	6.53	5.46	0.79	0.91
259	1.99	6.39	2.54	5.15	0.48	0.64
260	1.97	3.82	0.94	5.15	0.48	0.38
261	1.47	3.45	1.50	4.95	0.28	0.34
262	1.57	2.00	0.14	5.00	0.32	0.20
263	0.09	0.07	0.02	4.21	0.01	0.01
264	1.75	6.39	2.18	5.07	0.39	0.64
265	3.33	7.34	1.34	5.22	0.91	0.73
266	2.53	5.29	1.00	5.22	0.69	0.53
267	3.20	9.17	7.46	5.76	0.88	0.92
268	2.46	7.29	5.64	5.28	0.67	0.73
269	2.02	5.69	3.75	5.16	0.50	0.57
270	1.35	2.57	1.18	4.88	0.24	0.26
271	0.09	0.11	0.04	4.21	0.01	0.01
272	1.77	5.86	1.54	5.08	0.39	0.59
273	2.40	3.73	0.13	5.22	0.65	0.37
274	1.56	3.65	1.88	4.99	0.31	0.36
275	2.28	4.49	0.58	5.21	0.60	0.45
276	1.83	3.39	1.63	5.10	0.42	0.34
277	1.83	5.33	4.98	5.10	0.42	0.53
278	3.31	9.92	7.10	5.63	0.90	0.99
279	2.83	9.71	7.09	5.62	0.79	0.97
280	2.37	7.22	6.68	5.49	0.64	0.72
281	4.90	6.97	0.50	5.22	1.00	0.70
282	2.00	4.87	4.77	5.16	0.49	0.49
283	1.72	3.37	2.30	5.06	0.38	0.34
284	1.92	3.48	0.67	5.13	0.46	0.35
285	2.35	8.33	8.26	6.15	0.63	0.83
286	1.07	1.39	1.00	4.70	0.16	0.14
287	3.23	9.12	6.77	5.53	0.89	0.91
288	2.14	5.48	2.93	5.19	0.54	0.55
289	2.76	7.53	5.93	5.33	0.77	0.75
290	3.68	9.45	6.73	5.51	0.95	0.95
291	3.23	9.12	5.85	5.32	0.89	0.91
292	2.83	9.71	9.61	7.58	0.79	0.97
293	2.11	4.47	1.05	5.18	0.54	0.45
294	2.02	4.94	1.50	5.16	0.50	0.49
295	2.07	3.45	0.27	5.17	0.52	0.35
296	2.20	5.55	5.36	5.22	0.57	0.56
297	1.65	3.61	4.03	5.03	0.35	0.36
298	2.97	8.78	5.84	5.32	0.83	0.88
299	1.46	2.76	2.22	4.94	0.28	0.28
300	1.20	2.63	1.10	4.79	0.19	0.26
301	3.15	5.99	0.41	5.22	0.87	0.60
302	2.15	4.15	1.37	5.19	0.55	0.42
303	0.84	0.89	0.56	4.52	0.10	0.09
304	2.47	5.28	0.63	5.22	0.67	0.53

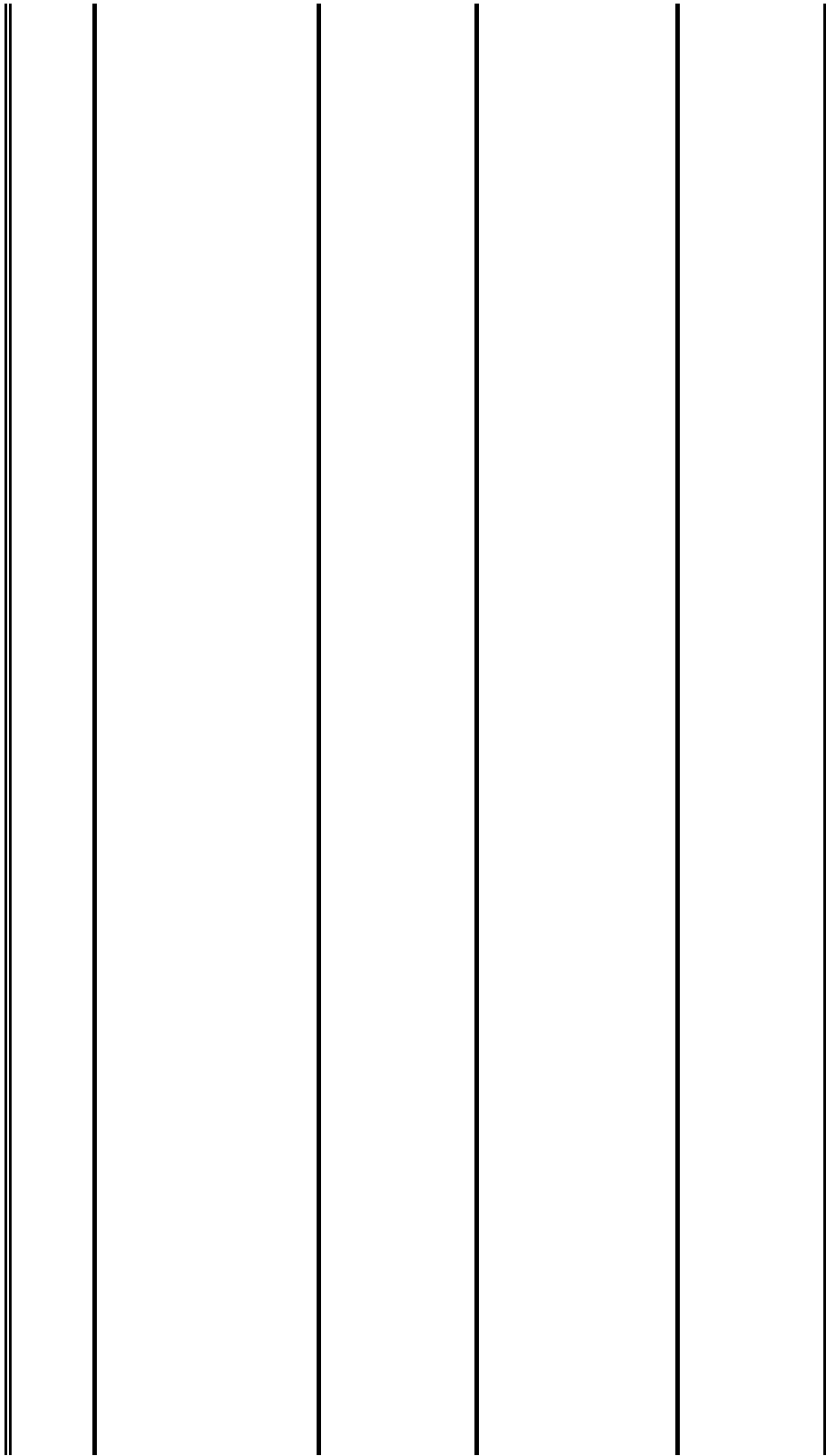
305	1.18	1.76	1.44	4.78	0.19	0.18
306	1.00	1.68	0.98	4.64	0.14	0.17
307	2.37	7.42	5.50	5.26	0.64	0.74
308	2.52	5.79	1.09	5.22	0.69	0.58
309	1.24	1.83	1.48	4.81	0.21	0.18
310	2.26	9.06	2.80	5.21	0.59	0.91
311	2.79	7.16	1.50	5.22	0.78	0.72
312	2.99	6.93	1.42	5.22	0.84	0.69
313	1.62	3.11	1.31	5.02	0.34	0.31
314	1.47	2.24	0.88	4.95	0.28	0.22
315	2.04	4.96	5.05	5.17	0.50	0.50
316	0.77	0.70	0.54	4.46	0.09	0.07
317	1.84	4.84	1.90	5.11	0.43	0.48
318	0.46	0.35	0.30	4.26	0.04	0.03
319	3.19	9.69	7.45	5.75	0.88	0.97
320	2.16	6.20	3.64	5.19	0.56	0.62
321	3.35	8.97	6.77	5.53	0.91	0.90
322	2.16	6.03	6.54	5.43	0.55	0.60
323	1.74	4.09	3.40	5.07	0.38	0.41
324	1.91	7.37	7.92		0.45	0.74

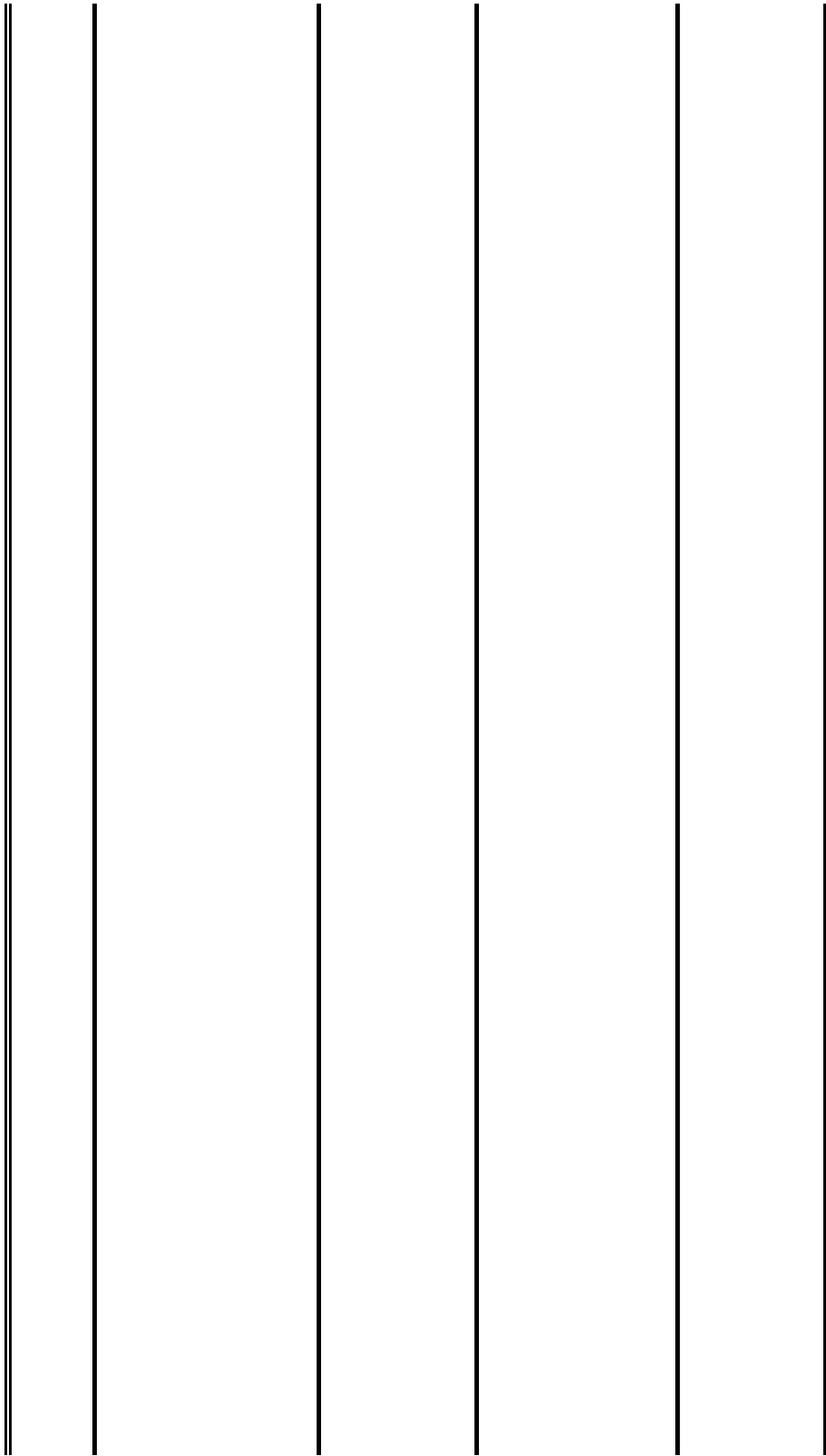


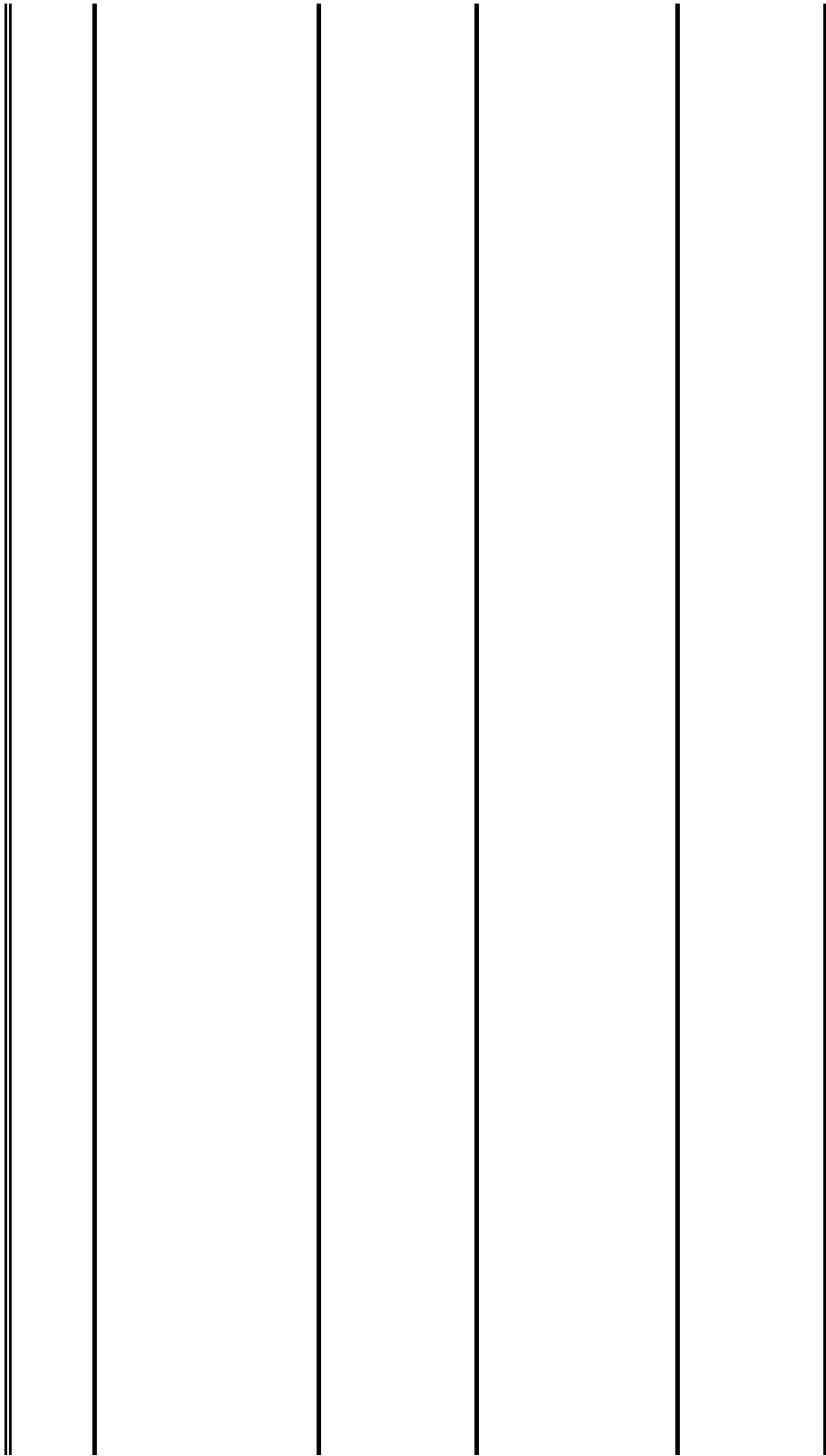


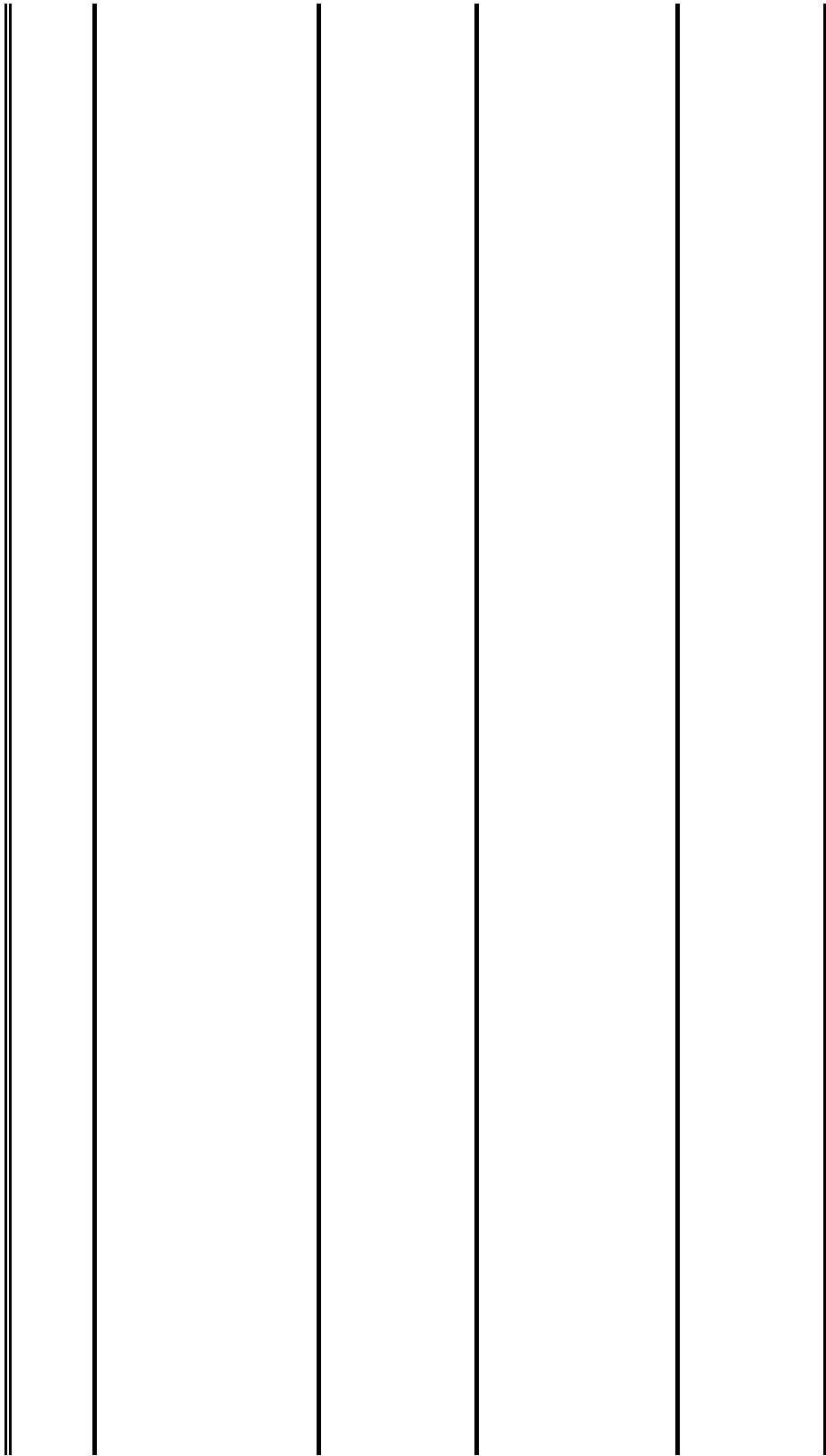


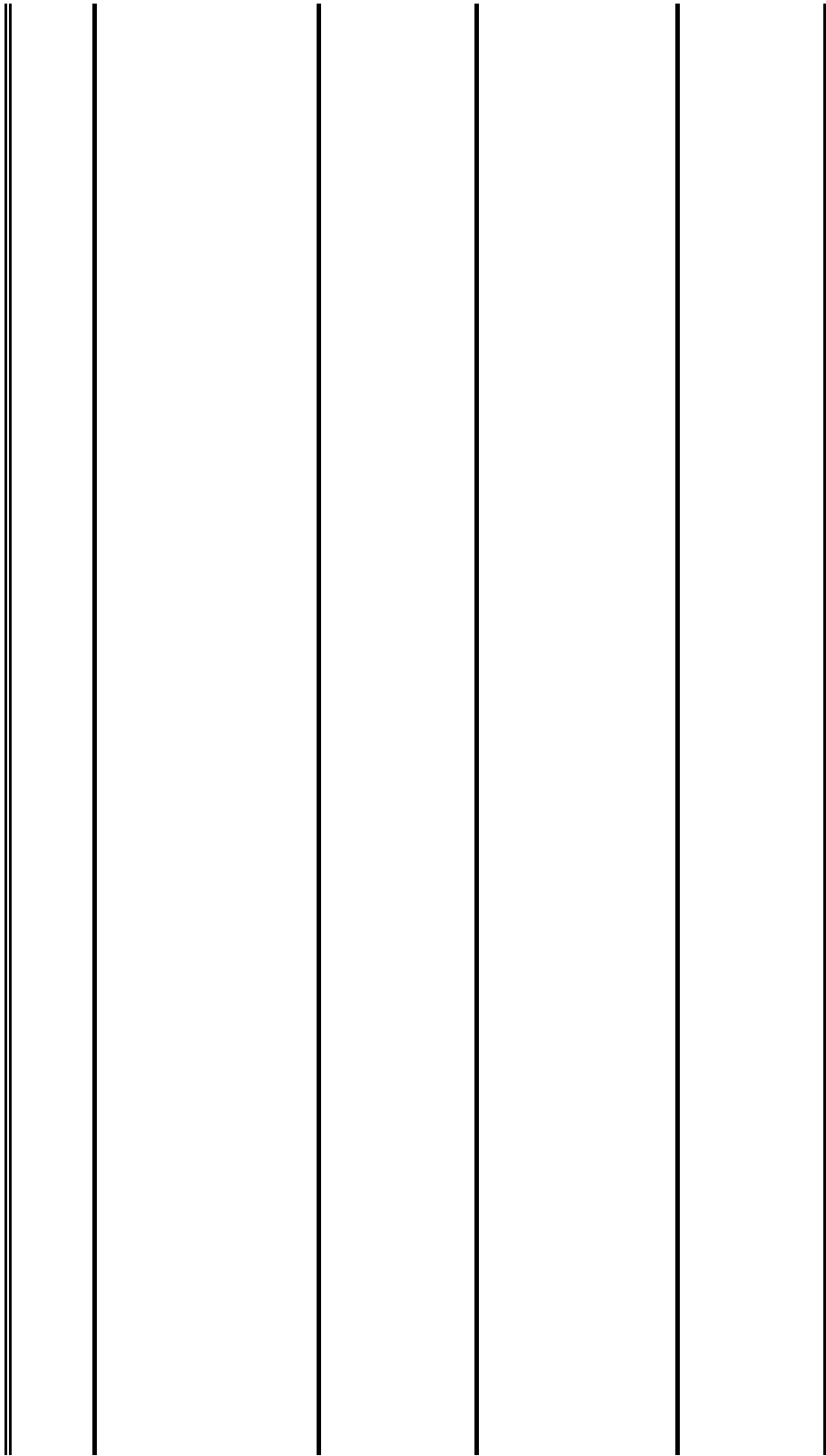




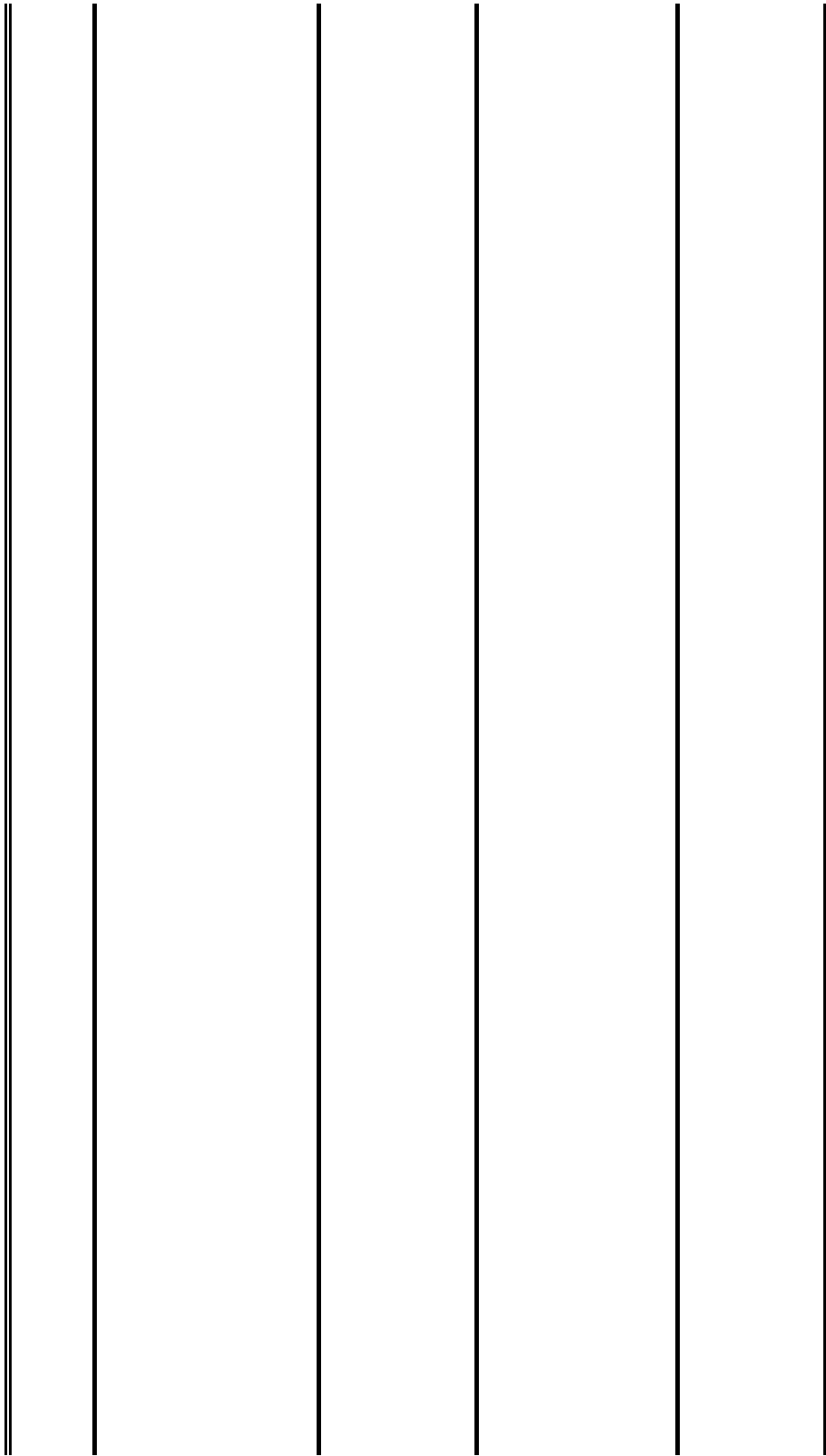


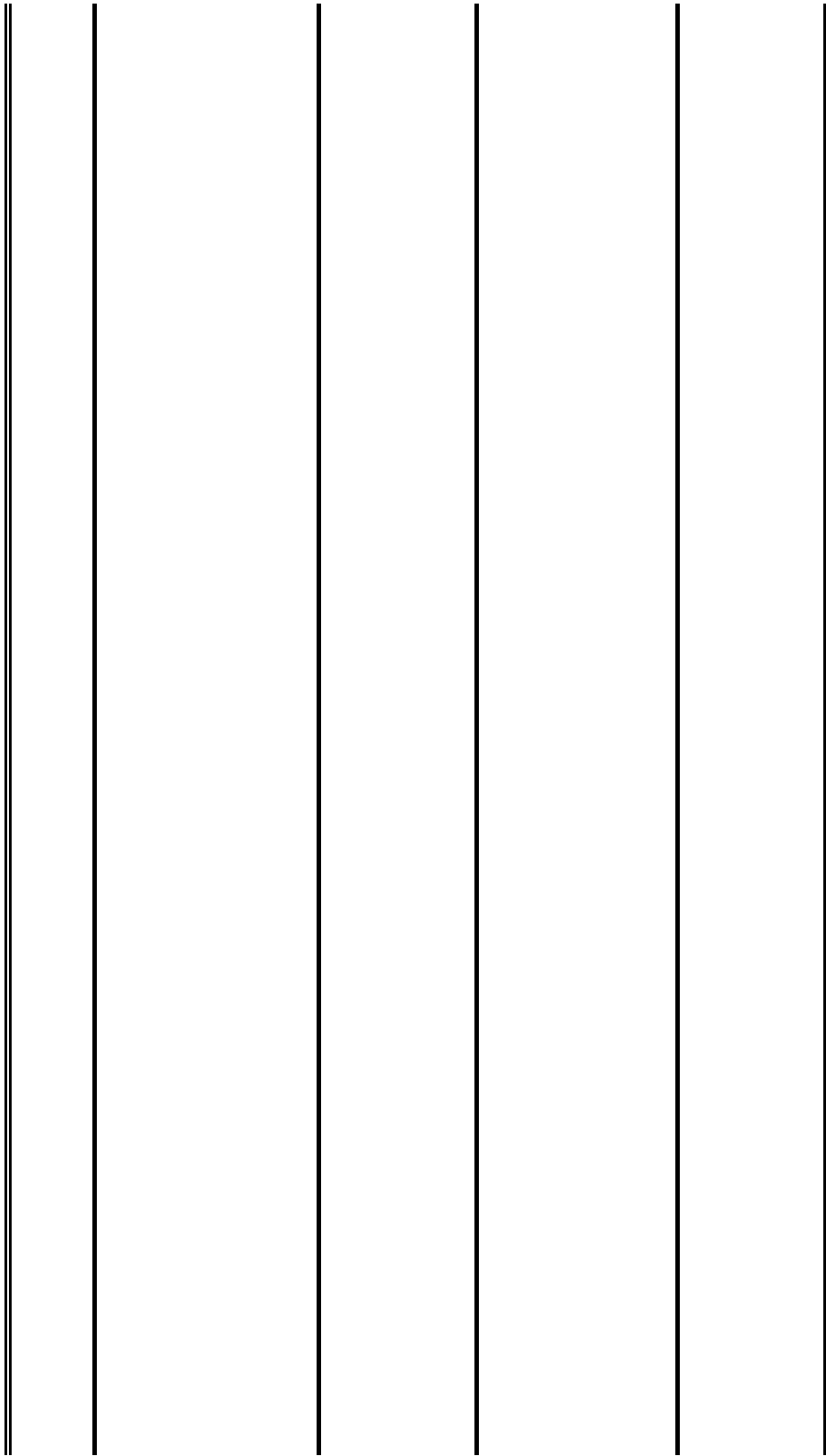


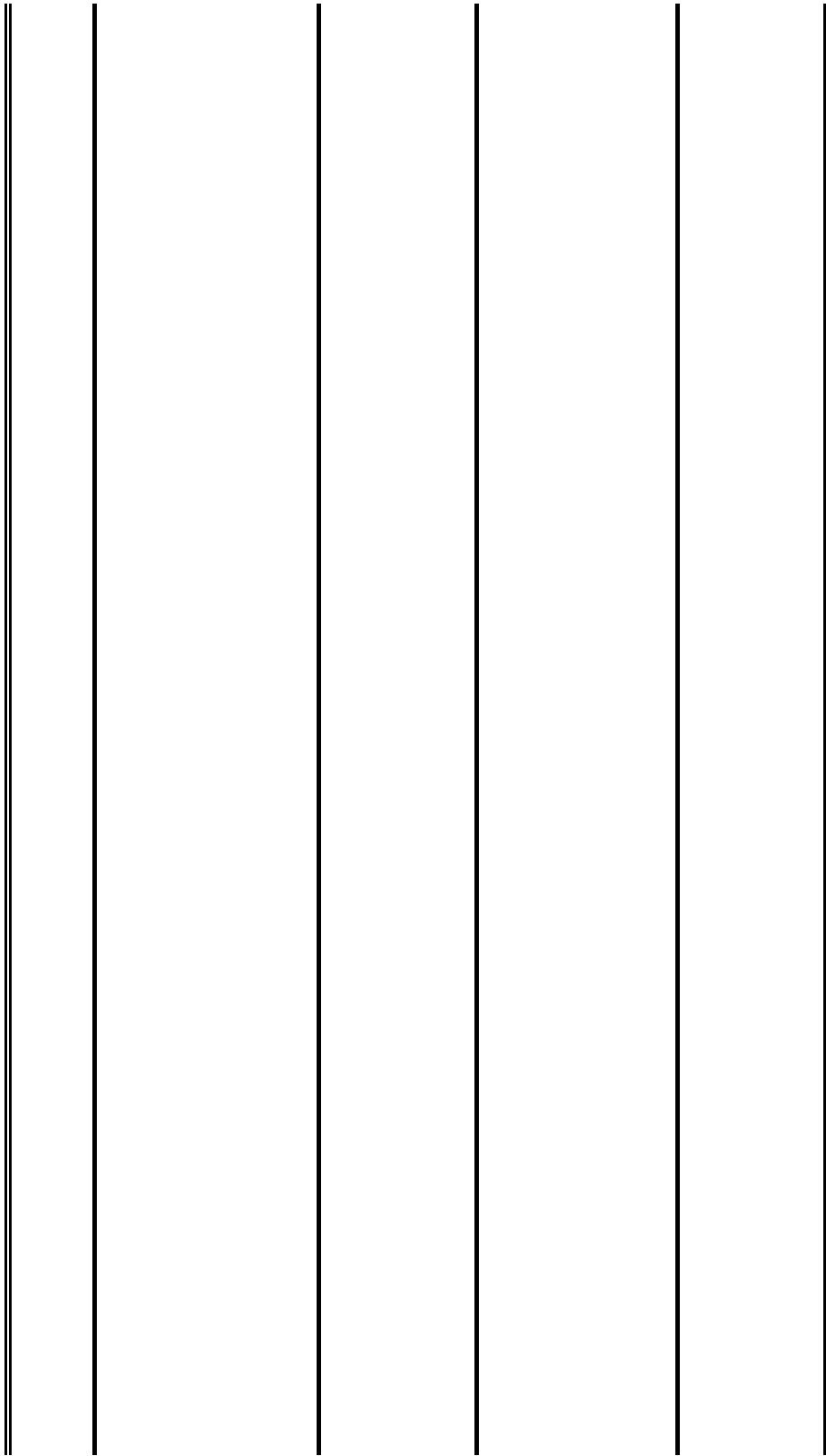


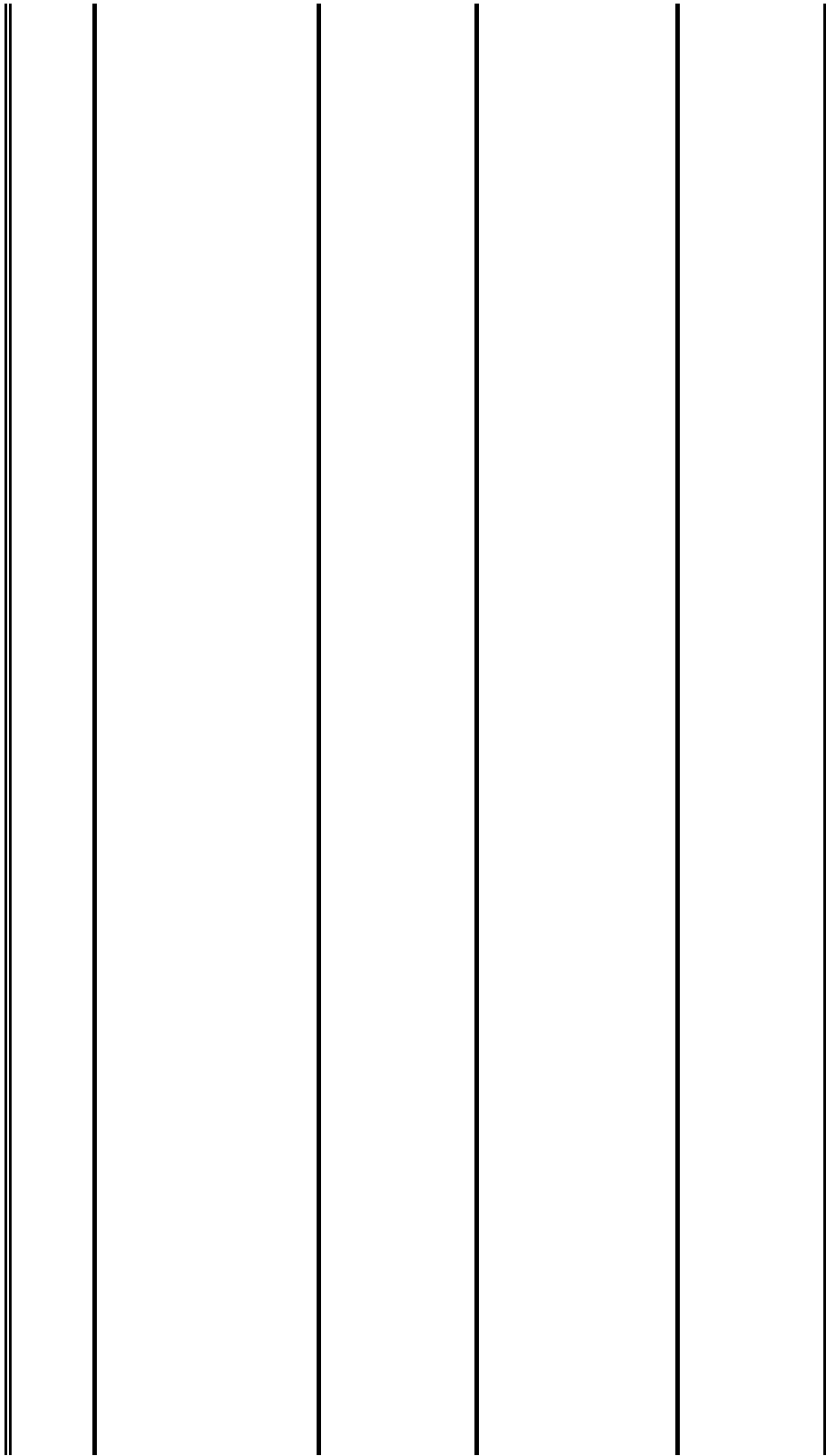










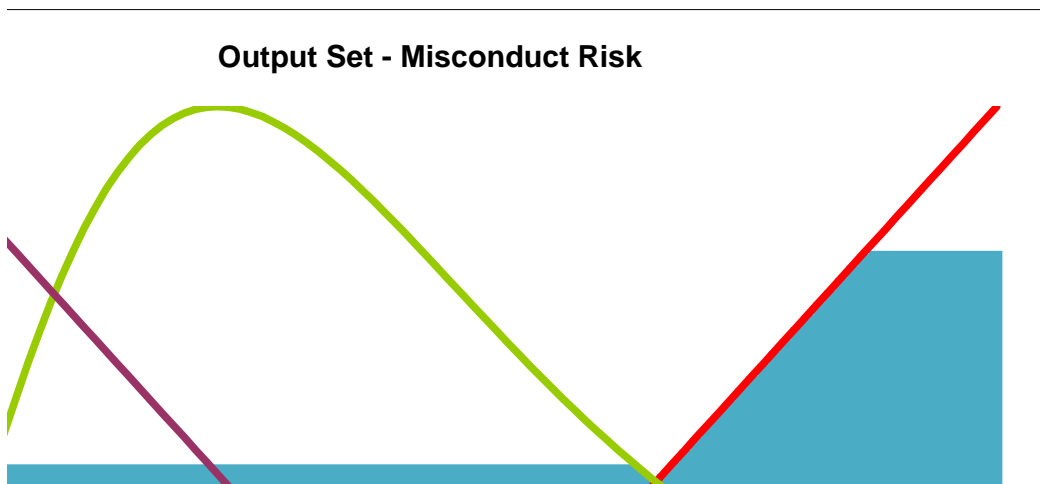


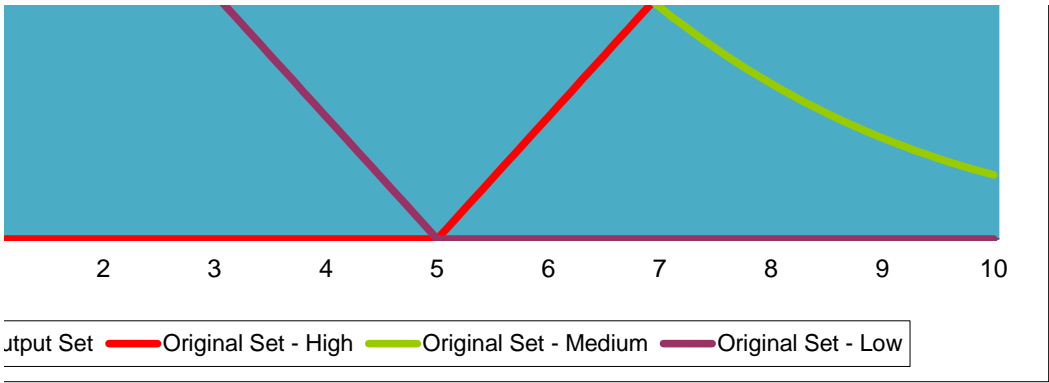
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Yes  
324

*Cost is NOT Low, Then Misconduct Risk is High*  
*Level is NOT High, Then Misconduct Risk is High*  
*Level is NOT High, Then Misconduct Risk is Medium*

		<b>Settlement Cost</b>		
=	1	AND	NOT Low	=
			0.764	<b>0.764</b>
			<b>Compensation Level</b>	
=	0.5	AND	High	=
			0.584222856	<b>0.5842</b>
			<b>Compensation Level</b>	
=	0.5	AND	NOT High	=
			0.415777144	<b>0.4158</b>



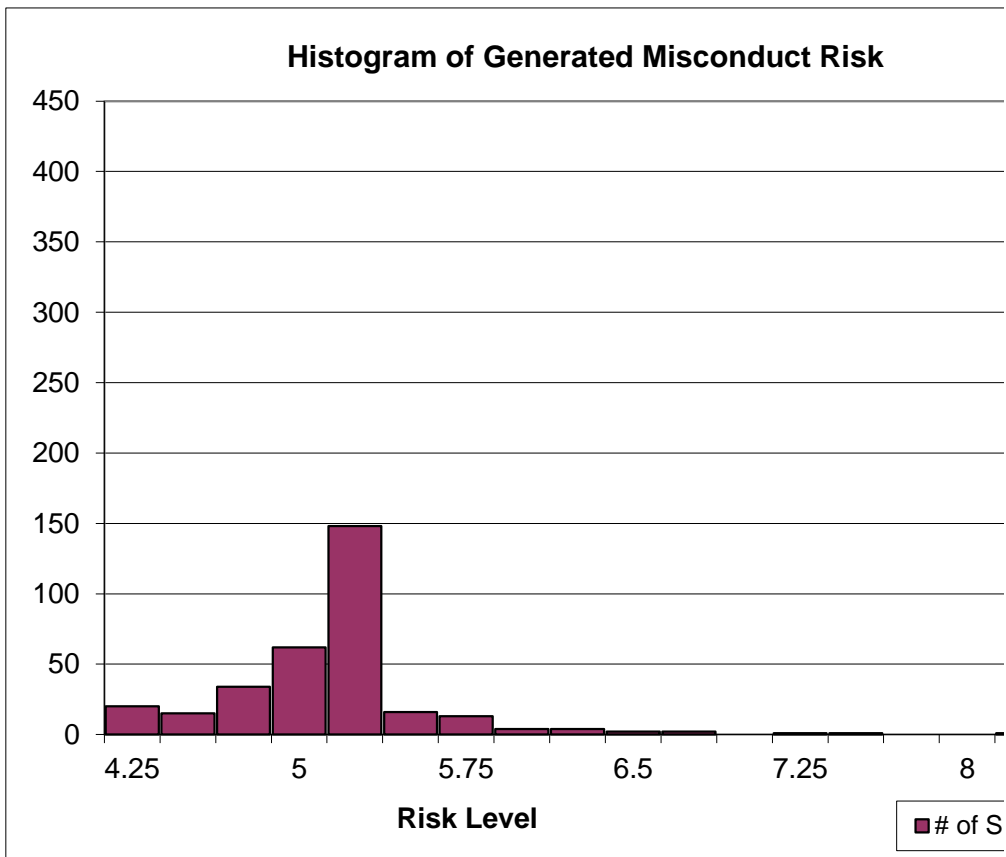


**$u_3$**   
0.15  
0.70  
0.02  
0.08

<b>Simulated Misconduct Risk</b>	
# of data	323
Maximum	8.13
Minimum	4.21
Average	5.13
95% VaR	5.81



Misconduct Risk	95% CTE = CTECal(0.95,E143:E1142)		
	# of Simulation		
0.62			
0.15			
0.35	4.25	20	20
0.34	4.5	15	35
0.30	4.75	34	69
0.67	5	62	131
0.25	5.25	148	279
0.37	5.5	16	295
0.55	5.75	13	308
0.63	6	4	312
0.90	6.25	4	316
0.76	6.5	2	318
0.89	6.75	2	320
0.01	7	0	320
0.54	7.25	1	321
0.28	7.5	1	322
0.25	7.75	0	322
0.13	8	0	322
0.26	8.25	1	323
0.62	#VALUE!		#VALUE!
0.19			
0.36			
0.10			
0.52			
0.23			
0.38			
0.51			
0.95			
0.52			
0.31			
0.34			
0.68			
0.34			
0.34			
0.12			
0.30			
0.91			
0.25			
0.16			
0.58			
0.69			
0.01			
0.59			
0.61			
0.03			
0.47			
0.39			
0.91			
0.24			
0.70			



0.35  
0.41  
0.32  
0.02  
0.42  
0.68  
0.14  
0.09  
0.71  
0.56  
0.32  
0.28  
0.01  
0.48  
0.21  
0.68  
0.42  
0.59  
0.21  
0.57  
0.91  
0.14  
0.19  
0.62  
0.40  
0.30  
0.87  
0.79  
0.82  
0.31  
0.04  
0.94  
0.17  
0.57  
0.50  
0.62  
0.04  
0.41  
0.46  
0.39  
0.51  
0.32  
0.18  
0.02  
0.41  
0.97  
0.18  
0.24  
0.17  
0.85

0.43  
0.82  
0.12  
0.26  
0.13  
0.51  
0.39  
0.39  
0.07  
0.35  
0.18  
0.49  
0.13  
0.57  
0.72  
0.77  
0.06  
0.82  
0.06  
0.08  
0.13  
0.38  
0.12  
0.36  
0.34  
0.07  
0.90  
0.28  
0.01  
0.82  
0.30  
0.01  
0.57  
0.35  
0.61  
0.21  
0.70  
0.02  
0.11  
0.62  
0.38  
0.08  
0.32  
0.68  
0.20  
0.37  
0.49  
0.19  
0.35  
0.07

0.28  
0.18  
0.48  
0.34  
0.22  
0.04  
0.65  
0.19  
0.42  
0.33  
0.21  
0.60  
0.87  
0.29  
0.83  
0.84  
0.73  
0.38  
0.03  
0.42  
0.02  
0.54  
0.94  
0.09  
0.43  
0.47  
0.74  
0.68  
0.45  
0.07  
0.11  
1.00  
0.90  
0.44  
0.72  
0.62  
0.00  
0.22  
0.11  
0.58  
0.18  
0.00  
0.43  
0.13  
0.46  
0.11  
0.11  
0.48  
0.23  
0.48

0.37  
0.03  
0.80  
0.55  
0.11  
0.27  
0.47  
0.19  
0.80  
0.04  
0.64  
0.26  
0.05  
0.31  
0.71  
0.53  
0.51  
0.55  
0.39  
0.10  
0.39  
0.32  
0.76  
0.66  
0.94  
0.47  
0.08  
0.66  
0.23  
0.29  
0.84  
0.13  
0.01  
0.38  
0.00  
0.30  
0.48  
0.16  
0.44  
0.09  
0.08  
0.40  
0.65  
0.34  
0.21  
0.19  
0.13  
0.20  
0.32  
0.08

0.02  
0.07  
0.05  
0.75  
0.44  
0.19  
0.30  
0.03  
0.00  
0.41  
0.27  
0.20  
0.85  
0.67  
0.53  
0.24  
0.01  
0.31  
0.03  
0.38  
0.12  
0.33  
0.62  
0.81  
0.81  
0.77  
0.10  
0.61  
0.42  
0.13  
0.91  
0.20  
0.78  
0.47  
0.70  
0.77  
0.69  
0.98  
0.21  
0.30  
0.05  
0.65  
0.55  
0.69  
0.42  
0.22  
0.08  
0.27  
0.11  
0.13

0.29  
0.20  
0.66  
0.22  
0.30  
0.46  
0.30  
0.28  
0.26  
0.18  
0.63  
0.11  
0.38  
0.06  
0.84  
0.52  
0.78  
0.75  
0.51  
0.89



























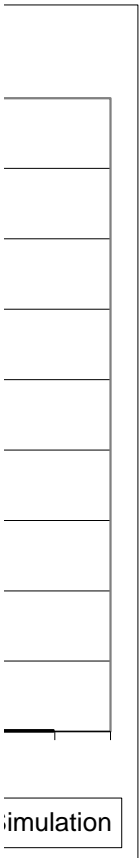














**Correlation Matrix Approach**

<i>US\$ Million</i>	North America	Middle East
Climate Change	100	20
Cyber Security	40	35
Negative Publicity	60	50
Regional Instability	15	120
Terrorism	50	100

***Aggregate***

- Business Unit	<b>156</b>	<b>238</b>
- Company Total	<b>385</b>	

Correlation	Climate Change	Cyber Security	Negative Publicity	Regional Instability
Climate Change	1	0.1	0.1	0.1
Cyber Security	0.1	1	0.1	0.1
Negative Publicity	0.1	0.1	1	0.1
Regional Instability	0.1	0.1	0.1	1
Terrorism	0.1	0.1	0.1	0.95

Correlation	North America	Middle East
North America	1	0.9
Middle East	0.9	1

Terrorism
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0.1
-----

0.1
-----

0.1
-----

0.95
------

1
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# Appendix B Use Experience Data

## 1. Inputs

### I. Independent Variables

NO.	Name	Range		Unit
		Lower End	Higher End	
1	Credit Score	0	5	1

#### Fuzzification

Variable NO.	Name	Set No.	Linguistic Description	Membership Function		
				Type	1	2
1	Credit Score	1	High	Linear	3	0
1	Credit Score	2	Medium	Triangle	2	0
1	Credit Score	3	Low	Linear	0	1

### II. Dependent Variables

NO.	Name	Range		Unit
		Lower End	Higher End	
1	Default Risk	0	10	1

#### Fuzzification

Variable NO.	Name	Set No.	Linguistic Description	Membership Function		
				Type	1	2
1	Default Risk	1	High	Linear	5	0
1	Default Risk	2	Medium	Triangle	2	0
1	Default Risk	3	Low	Linear	0	1

#### Notes on membership function parameters:

##### Function Types

Function Type	Parameter 1	Parameter 2
Linear	Starting Position	Starting Value
Triangle	1st Vertex Position	1st Vertex Value
Trapezoid	1st Vertex Position	1st Vertex Value
Gaussian (pdf)	$\mu$	$\sigma$
Gamma (pdf)	$\kappa$	$\theta$

### III. Inference Rules

NO.	Variable	Fuzzy Hedges
1. IF	Credit Score	High
Then	Default Risk	Low

#### Notes on fuzzy hedges

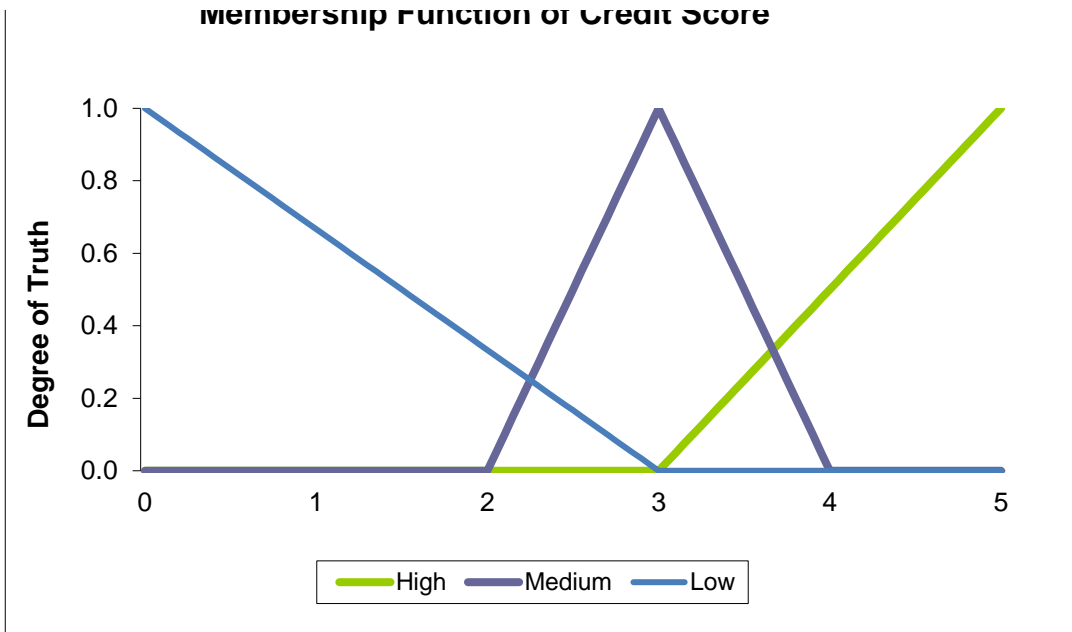
Slightly Low Set: new Membership Function  $g(x) = f(2x/3 + \text{lower end}/3)$ ; High Set: new Membership Function  $g(x) = f(x + (x - \text{lower end})/2)$

Very Low Set: new Membership Function  $g(x) = f(x + (x - \text{lower end})/2)$ ; High Set: new Membership Function  $g(x) = f(2x/3 + \text{lower end}/3)$

### IV. Defuzzification

NO.	Variable	Method
1	Default Risk	Average of Maximum

Membership Function of Credit Score



### Interim Calculation

	Credit Score			Default Risk		
	<i>X</i>	<i>High</i>	<i>Medium</i>	<i>Low</i>	<i>X</i>	<i>High</i>
0	0.00	0.00	0.00	1.00	0.00	0.00
1	0.05	0.00	0.00	0.98	0.10	0.00
2	0.10	0.00	0.00	0.97	0.20	0.00
3	0.15	0.00	0.00	0.95	0.30	0.00
4	0.20	0.00	0.00	0.93	0.40	0.00
5	0.25	0.00	0.00	0.92	0.50	0.00
6	0.30	0.00	0.00	0.90	0.60	0.00
7	0.35	0.00	0.00	0.88	0.70	0.00
8	0.40	0.00	0.00	0.87	0.80	0.00
9	0.45	0.00	0.00	0.85	0.90	0.00
10	0.50	0.00	0.00	0.83	1.00	0.00
11	0.55	0.00	0.00	0.82	1.10	0.00
12	0.60	0.00	0.00	0.80	1.20	0.00
13	0.65	0.00	0.00	0.78	1.30	0.00
14	0.70	0.00	0.00	0.77	1.40	0.00
15	0.75	0.00	0.00	0.75	1.50	0.00
16	0.80	0.00	0.00	0.73	1.60	0.00
17	0.85	0.00	0.00	0.72	1.70	0.00
18	0.90	0.00	0.00	0.70	1.80	0.00
19	0.95	0.00	0.00	0.68	1.90	0.00
20	1.00	0.00	0.00	0.67	2.00	0.00
21	1.05	0.00	0.00	0.65	2.10	0.00
22	1.10	0.00	0.00	0.63	2.20	0.00
23	1.15	0.00	0.00	0.62	2.30	0.00
24	1.20	0.00	0.00	0.60	2.40	0.00
25	1.25	0.00	0.00	0.58	2.50	0.00
26	1.30	0.00	0.00	0.57	2.60	0.00
27	1.35	0.00	0.00	0.55	2.70	0.00
28	1.40	0.00	0.00	0.53	2.80	0.00
29	1.45	0.00	0.00	0.52	2.90	0.00
30	1.50	0.00	0.00	0.50	3.00	0.00
31	1.55	0.00	0.00	0.48	3.10	0.00
32	1.60	0.00	0.00	0.47	3.20	0.00
33	1.65	0.00	0.00	0.45	3.30	0.00

34	1.70	0.00	0.00	0.43	3.40	0.00
35	1.75	0.00	0.00	0.42	3.50	0.00
36	1.80	0.00	0.00	0.40	3.60	0.00
37	1.85	0.00	0.00	0.38	3.70	0.00
38	1.90	0.00	0.00	0.37	3.80	0.00
39	1.95	0.00	0.00	0.35	3.90	0.00
40	2.00	0.00	0.00	0.33	4.00	0.00
41	2.05	0.00	0.05	0.32	4.10	0.00
42	2.10	0.00	0.10	0.30	4.20	0.00
43	2.15	0.00	0.15	0.28	4.30	0.00
44	2.20	0.00	0.20	0.27	4.40	0.00
45	2.25	0.00	0.25	0.25	4.50	0.00
46	2.30	0.00	0.30	0.23	4.60	0.00
47	2.35	0.00	0.35	0.22	4.70	0.00
48	2.40	0.00	0.40	0.20	4.80	0.00
49	2.45	0.00	0.45	0.18	4.90	0.00
50	2.50	0.00	0.50	0.17	5.00	0.00
51	2.55	0.00	0.55	0.15	5.10	0.02
52	2.60	0.00	0.60	0.13	5.20	0.04
53	2.65	0.00	0.65	0.12	5.30	0.06
54	2.70	0.00	0.70	0.10	5.40	0.08
55	2.75	0.00	0.75	0.08	5.50	0.10
56	2.80	0.00	0.80	0.07	5.60	0.12
57	2.85	0.00	0.85	0.05	5.70	0.14
58	2.90	0.00	0.90	0.03	5.80	0.16
59	2.95	0.00	0.95	0.02	5.90	0.18
60	3.00	0.00	1.00	0.00	6.00	0.20
61	3.05	0.02	0.95	0.00	6.10	0.22
62	3.10	0.05	0.90	0.00	6.20	0.24
63	3.15	0.07	0.85	0.00	6.30	0.26
64	3.20	0.10	0.80	0.00	6.40	0.28
65	3.25	0.12	0.75	0.00	6.50	0.30
66	3.30	0.15	0.70	0.00	6.60	0.32
67	3.35	0.17	0.65	0.00	6.70	0.34
68	3.40	0.20	0.60	0.00	6.80	0.36
69	3.45	0.22	0.55	0.00	6.90	0.38
70	3.50	0.25	0.50	0.00	7.00	0.40
71	3.55	0.27	0.45	0.00	7.10	0.42
72	3.60	0.30	0.40	0.00	7.20	0.44
73	3.65	0.32	0.35	0.00	7.30	0.46
74	3.70	0.35	0.30	0.00	7.40	0.48
75	3.75	0.37	0.25	0.00	7.50	0.50
76	3.80	0.40	0.20	0.00	7.60	0.52
77	3.85	0.42	0.15	0.00	7.70	0.54
78	3.90	0.45	0.10	0.00	7.80	0.56
79	3.95	0.47	0.05	0.00	7.90	0.58
80	4.00	0.50	0.00	0.00	8.00	0.60
81	4.05	0.52	0.00	0.00	8.10	0.62
82	4.10	0.55	0.00	0.00	8.20	0.64
83	4.15	0.57	0.00	0.00	8.30	0.66
84	4.20	0.60	0.00	0.00	8.40	0.68
85	4.25	0.62	0.00	0.00	8.50	0.70
86	4.30	0.65	0.00	0.00	8.60	0.72
87	4.35	0.67	0.00	0.00	8.70	0.74
88	4.40	0.70	0.00	0.00	8.80	0.76
89	4.45	0.72	0.00	0.00	8.90	0.78
90	4.50	0.75	0.00	0.00	9.00	0.80

91	4.55	0.77	0.00	0.00	9.10	0.82
92	4.60	0.80	0.00	0.00	9.20	0.84
93	4.65	0.82	0.00	0.00	9.30	0.86
94	4.70	0.85	0.00	0.00	9.40	0.88
95	4.75	0.87	0.00	0.00	9.50	0.90
96	4.80	0.90	0.00	0.00	9.60	0.92
97	4.85	0.92	0.00	0.00	9.70	0.94
98	4.90	0.95	0.00	0.00	9.80	0.96
99	4.95	0.97	0.00	0.00	9.90	0.98
100	5.00	1.00	0.00	0.00	10.00	1.00

Parameter

3	4	5	6	7	8
5	1				
3	1	4	0		
3	0				

Parameter

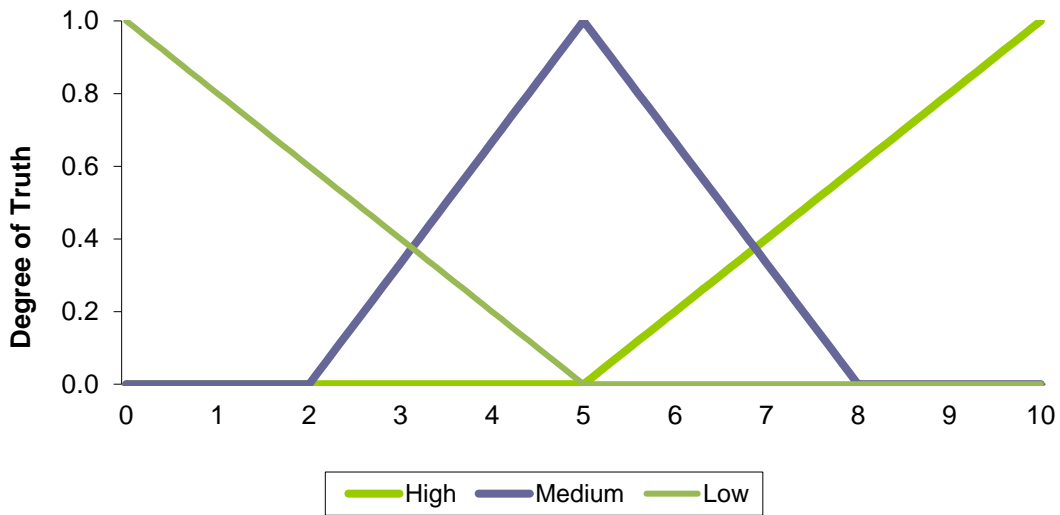
3	4	5	6	7	8
10	1				
5	1	8	0		
5	0				

Parameter 3	Parameter 4	Parameter 5	Parameter 6	Parameter 7	Parameter 8
Ending Position	Ending Value	NA	NA	NA	NA
2nd Vertex Position	2nd Vertex Value	rd Vertex Positio	3rd Vertex Value	NA	NA
2nd Vertex Position	2nd Vertex Value	rd Vertex Positio	3rd Vertex Value	th Vertex Positio	4th Vertex Value
Normalize or Not	NA	NA	NA	NA	NA
Normalize or Not	Shifted or Not	NA	NA	NA	NA

st:  $g(x) = f(2x/3 + \text{higher end}/3)$

st:  $g(x) = f(x - (\text{higher end} - x)/2)$

### membership Function of Default Risk



<i>Medium</i>	<i>Low</i>
0.00	1.00
0.00	0.98
0.00	0.96
0.00	0.94
0.00	0.92
0.00	0.90
0.00	0.88
0.00	0.86
0.00	0.84
0.00	0.82
0.00	0.80
0.00	0.78
0.00	0.76
0.00	0.74
0.00	0.72
0.00	0.70
0.00	0.68
0.00	0.66
0.00	0.64
0.00	0.62
0.00	0.60
0.03	0.58
0.07	0.56
0.10	0.54
0.13	0.52
0.17	0.50
0.20	0.48
0.23	0.46
0.27	0.44
0.30	0.42
0.33	0.40
0.37	0.38
0.40	0.36
0.43	0.34







**Sets**

High

Medium

Low

NOT High

NOT Medium

NOT Low

Credit Score High

Credit Score Mec

Credit Score Low

**Defuzzification Method**

Average of Maximum

Centroid

Average





'Appendix B - Setu'Appendix B - Setu 'Appendix B - Setup'!D6  
'Appendix B - Setu'Appendix B - Setu 'Appendix B - Setup'!D6  
'Appendix B - Setu'Appendix B - Setu 'Appendix B - Setup'!D6

# Appendix B Use Experience Data

## I. Single Case

<u>NO.</u>	<u>Name</u>	<u>Value</u>	<u>Hardcoded</u>	<u>Record No.</u> 1000
1	Credit Score	4.10	3	4.10 ed on Experience Data Record No.

### Reference Rules

1. IF Credit Score is High Then Default Risk is Low

### True Value Calculation

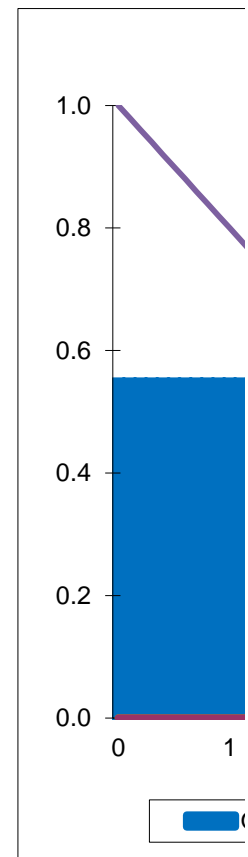
Rule 1	<i>Credit Score</i>	High
True Values	0.55	

### Min-Max Implication Rule

High	0.00
Medium	0.00
Low	0.55

### Output Set - Misconduct Risk - High

<i>X</i>	<i>Output Set</i>	<i>Original Set - High</i>	<i>Original Set - Medium</i>	<i>Original Set - Low</i>
0.00	0.55	0.00	0.00	1.00
0.10	0.55	0.00	0.00	0.98
0.20	0.55	0.00	0.00	0.96
0.30	0.55	0.00	0.00	0.94
0.40	0.55	0.00	0.00	0.92
0.50	0.55	0.00	0.00	0.90
0.60	0.55	0.00	0.00	0.88
0.70	0.55	0.00	0.00	0.86
0.80	0.55	0.00	0.00	0.84
0.90	0.55	0.00	0.00	0.82
1.00	0.55	0.00	0.00	0.80
1.10	0.55	0.00	0.00	0.78
1.20	0.55	0.00	0.00	0.76
1.30	0.55	0.00	0.00	0.74
1.40	0.55	0.00	0.00	0.72
1.50	0.55	0.00	0.00	0.70
1.60	0.55	0.00	0.00	0.68
1.70	0.55	0.00	0.00	0.66
1.80	0.55	0.00	0.00	0.64
1.90	0.55	0.00	0.00	0.62
2.00	0.55	0.00	0.00	0.60
2.10	0.55	0.00	0.03	0.58
2.20	0.55	0.00	0.07	0.56
2.30	0.54	0.00	0.10	0.54
2.40	0.52	0.00	0.13	0.52
2.50	0.50	0.00	0.17	0.50
2.60	0.48	0.00	0.20	0.48
2.70	0.46	0.00	0.23	0.46
2.80	0.44	0.00	0.27	0.44





2.90	0.42	0.00	0.30	0.42
3.00	0.40	0.00	0.33	0.40
3.10	0.38	0.00	0.37	0.38
3.20	0.36	0.00	0.40	0.36
3.30	0.34	0.00	0.43	0.34
3.40	0.32	0.00	0.47	0.32
3.50	0.30	0.00	0.50	0.30
3.60	0.28	0.00	0.53	0.28
3.70	0.26	0.00	0.57	0.26
3.80	0.24	0.00	0.60	0.24
3.90	0.22	0.00	0.63	0.22
4.00	0.20	0.00	0.67	0.20
4.10	0.18	0.00	0.70	0.18
4.20	0.16	0.00	0.73	0.16
4.30	0.14	0.00	0.77	0.14
4.40	0.12	0.00	0.80	0.12
4.50	0.10	0.00	0.83	0.10
4.60	0.08	0.00	0.87	0.08
4.70	0.06	0.00	0.90	0.06
4.80	0.04	0.00	0.93	0.04
4.90	0.02	0.00	0.97	0.02
5.00	0.00	0.00	1.00	0.00
5.10	0.00	0.02	0.97	0.00
5.20	0.00	0.04	0.93	0.00
5.30	0.00	0.06	0.90	0.00
5.40	0.00	0.08	0.87	0.00
5.50	0.00	0.10	0.83	0.00
5.60	0.00	0.12	0.80	0.00
5.70	0.00	0.14	0.77	0.00
5.80	0.00	0.16	0.73	0.00
5.90	0.00	0.18	0.70	0.00
6.00	0.00	0.20	0.67	0.00
6.10	0.00	0.22	0.63	0.00
6.20	0.00	0.24	0.60	0.00
6.30	0.00	0.26	0.57	0.00
6.40	0.00	0.28	0.53	0.00
6.50	0.00	0.30	0.50	0.00
6.60	0.00	0.32	0.47	0.00
6.70	0.00	0.34	0.43	0.00
6.80	0.00	0.36	0.40	0.00
6.90	0.00	0.38	0.37	0.00
7.00	0.00	0.40	0.33	0.00
7.10	0.00	0.42	0.30	0.00
7.20	0.00	0.44	0.27	0.00
7.30	0.00	0.46	0.23	0.00
7.40	0.00	0.48	0.20	0.00
7.50	0.00	0.50	0.17	0.00
7.60	0.00	0.52	0.13	0.00
7.70	0.00	0.54	0.10	0.00
7.80	0.00	0.56	0.07	0.00
7.90	0.00	0.58	0.03	0.00
8.00	0.00	0.60	0.00	0.00
8.10	0.00	0.62	0.00	0.00

8.20	0.00	0.64	0.00	0.00
8.30	0.00	0.66	0.00	0.00
8.40	0.00	0.68	0.00	0.00
8.50	0.00	0.70	0.00	0.00
8.60	0.00	0.72	0.00	0.00
8.70	0.00	0.74	0.00	0.00
8.80	0.00	0.76	0.00	0.00
8.90	0.00	0.78	0.00	0.00
9.00	0.00	0.80	0.00	0.00
9.10	0.00	0.82	0.00	0.00
9.20	0.00	0.84	0.00	0.00
9.30	0.00	0.86	0.00	0.00
9.40	0.00	0.88	0.00	0.00
9.50	0.00	0.90	0.00	0.00
9.60	0.00	0.92	0.00	0.00
9.70	0.00	0.94	0.00	0.00
9.80	0.00	0.96	0.00	0.00
9.90	0.00	0.98	0.00	0.00
10.00	0.00	1.00	0.00	0.00

### Defuzzification

Default Risk

1.13

## II. Experience

No. of Records

1000

No.	Input Variables Credit Score	Output Variable Default Risk	Low Default Risk Degree of Truth	Experience Default?
1	4.76	0.30	94%	No
2	3.45	1.93	61%	Yes
3	3.99	1.26	75%	No
4	3.43	1.96	61%	No
5	3.54	1.82	64%	No
6	4.04	1.20	76%	No
7	4.62	0.48	91%	No
8	4.05	1.19	76%	No
9	4.02	1.23	76%	No
10	3.08	2.40	52%	Yes
11	4.64	0.45	0.91	
12	4.16	1.05	0.79	
13	3.94	1.33	0.74	
14	4.47	0.66	0.87	
15	4.28	0.90	0.82	
16	3.86	1.43	0.72	
17	3.32	2.10	0.58	
18	3.78	1.53	0.70	
19	4.50	0.63	0.88	
20	4.64	0.45	0.91	
21	4.36	0.80	0.84	
22	4.26	0.93	0.82	
23	3.82	1.48	0.71	
24	3.09	2.38	0.52	

25	4.07	1.16	0.77
26	3.36	2.05	0.59
27	4.45	0.69	0.86
28	3.56	1.80	0.64
29	4.54	0.58	0.89
30	4.55	0.56	0.89
31	3.28	2.15	0.57
32	3.40	2.00	0.60
33	4.00	1.25	0.75
34	4.11	1.11	0.78
35	3.65	1.68	0.66
36	3.91	1.36	0.73
37	3.43	1.96	0.61
38	3.62	1.72	0.66
39	3.36	2.05	0.59
40	4.63	0.46	0.91
41	4.58	0.53	0.90
42	3.84	1.45	0.71
43	3.41	1.98	0.60
44	3.46	1.92	0.62
45	4.57	0.54	0.89
46	4.56	0.55	0.89
47	4.62	0.48	0.91
48	4.55	0.56	0.89
49	3.13	2.33	0.53
50	4.83	0.21	0.96
51	3.51	1.86	0.63
52	4.44	0.70	0.86
53	4.00	1.25	0.75
54	4.36	0.80	0.84
55	4.41	0.74	0.85
56	4.46	0.68	0.87
57	4.70	0.38	0.93
58	3.07	2.41	0.52
59	4.83	0.21	0.96
60	4.37	0.79	0.84
61	3.80	1.50	0.70
62	4.59	0.51	0.90
63	4.48	0.65	0.87
64	3.98	1.28	0.75
65	4.84	0.20	0.96
66	4.00	1.25	0.75
67	4.15	1.06	0.79
68	4.27	0.91	0.82
69	3.42	1.97	0.61
70	3.85	1.44	0.71
71	4.40	0.75	0.85
72	3.41	1.98	0.60
73	4.75	0.31	0.94
74	3.32	2.10	0.58
75	3.60	1.75	0.65
76	3.19	2.26	0.55
77	4.60	0.50	0.90

78	4.52	0.60	0.88
79	4.02	1.23	0.76
80	3.48	1.90	0.62
81	3.09	2.38	0.52
82	4.67	0.41	0.92
83	3.82	1.48	0.71
84	4.76	0.30	0.94
85	3.52	1.85	0.63
86	3.12	2.35	0.53
87	3.54	1.82	0.64
88	4.24	0.95	0.81
89	4.01	1.24	0.75
90	4.40	0.75	0.85
91	4.08	1.15	0.77
92	3.89	1.39	0.72
93	4.70	0.38	0.93
94	4.86	0.18	0.97
95	4.39	0.76	0.85
96	4.03	1.21	0.76
97	4.78	0.28	0.95
98	4.02	1.23	0.76
99	3.80	1.50	0.70
100	3.20	2.25	0.55
101	3.98	1.28	0.75
102	3.14	2.32	0.54
103	3.32	2.10	0.58
104	4.16	1.05	0.79
105	4.61	0.49	0.90
106	3.89	1.39	0.72
107	3.65	1.68	0.66
108	3.41	1.98	0.60
109	3.12	2.35	0.53
110	4.10	1.13	0.78
111	4.39	0.76	0.85
112	4.82	0.23	0.96
113	3.63	1.71	0.66
114	4.06	1.18	0.77
115	3.56	1.80	0.64
116	3.94	1.33	0.74
117	4.53	0.59	0.88
118	3.60	1.75	0.65
119	4.29	0.89	0.82
120	3.45	1.93	0.61
121	4.01	1.24	0.75
122	3.74	1.58	0.69
123	3.18	2.27	0.55
124	3.80	1.50	0.70
125	4.04	1.20	0.76
126	4.89	0.14	0.97
127	3.33	2.08	0.58
128	3.10	2.37	0.53
129	4.96	0.05	0.99
130	3.21	2.23	0.55

131	4.58	0.53	0.90
132	3.68	1.65	0.67
133	4.52	0.60	0.88
134	3.20	2.25	0.55
135	4.97	0.04	0.99
136	4.28	0.90	0.82
137	4.52	0.60	0.88
138	3.39	2.01	0.60
139	3.87	1.41	0.72
140	4.24	0.95	0.81
141	3.64	1.70	0.66
142	4.26	0.93	0.82
143	4.47	0.66	0.87
144	3.49	1.88	0.62
145	3.80	1.50	0.70
146	4.69	0.39	0.92
147	3.87	1.41	0.72
148	3.23	2.21	0.56
149	3.95	1.31	0.74
150	4.36	0.80	0.84
151	3.89	1.39	0.72
152	4.62	0.48	0.91
153	3.21	2.23	0.55
154	3.97	1.29	0.74
155	4.49	0.64	0.87
156	3.95	1.31	0.74
157	4.96	0.05	0.99
158	3.99	1.26	0.75
159	3.31	2.11	0.58
160	4.93	0.09	0.98
161	4.81	0.24	0.95
162	4.52	0.60	0.88
163	4.75	0.31	0.94
164	4.82	0.23	0.96
165	4.08	1.15	0.77
166	4.85	0.19	0.96
167	3.52	1.85	0.63
168	3.99	1.26	0.75
169	3.67	1.66	0.67
170	3.93	1.34	0.73
171	4.57	0.54	0.89
172	4.67	0.41	0.92
173	4.64	0.45	0.91
174	4.13	1.09	0.78
175	4.68	0.40	0.92
176	4.24	0.95	0.81
177	3.39	2.01	0.60
178	3.91	1.36	0.73
179	4.71	0.36	0.93
180	4.51	0.61	0.88
181	3.05	2.43	0.51
182	4.45	0.69	0.86
183	4.10	1.13	0.78

184	4.77	0.29	0.94
185	4.18	1.03	0.80
186	3.74	1.58	0.69
187	3.70	1.63	0.68
188	3.18	2.27	0.55
189	3.25	2.18	0.56
190	4.10	1.13	0.78
191	3.65	1.68	0.66
192	4.04	1.20	0.76
193	4.70	0.38	0.93
194	4.87	0.16	0.97
195	3.88	1.40	0.72
196	4.05	1.19	0.76
197	4.06	1.18	0.77
198	3.69	1.64	0.67
199	4.15	1.06	0.79
200	4.34	0.83	0.84
201	4.72	0.35	0.93
202	3.09	2.38	0.52
203	4.53	0.59	0.88
204	3.92	1.35	0.73
205	4.26	0.93	0.82
206	4.77	0.29	0.94
207	3.06	2.42	0.52
208	3.22	2.22	0.56
209	3.16	2.30	0.54
210	3.47	1.91	0.62
211	3.13	2.33	0.53
212	4.69	0.39	0.92
213	3.81	1.49	0.70
214	4.17	1.04	0.79
215	4.23	0.96	0.81
216	4.26	0.93	0.82
217	4.34	0.83	0.84
218	3.03	2.46	0.51
219	4.75	0.31	0.94
220	3.79	1.51	0.70
221	4.99	0.01	1.00
222	4.71	0.36	0.93
223	3.47	1.91	0.62
224	4.67	0.41	0.92
225	4.79	0.26	0.95
226	3.80	1.50	0.70
227	3.34	2.07	0.59
228	3.77	1.54	0.69
229	4.55	0.56	0.89
230	3.57	1.78	0.64
231	3.07	2.41	0.52
232	4.08	1.15	0.77
233	4.53	0.59	0.88
234	3.93	1.34	0.73
235	3.54	1.82	0.64
236	4.96	0.05	0.99

237	4.45	0.69	0.86
238	4.27	0.91	0.82
239	3.95	1.31	0.74
240	3.61	1.73	0.65
241	3.39	2.01	0.60
242	4.46	0.68	0.87
243	3.71	1.61	0.68
244	3.86	1.43	0.72
245	3.85	1.44	0.71
246	4.49	0.64	0.87
247	4.14	1.08	0.79
248	4.53	0.59	0.88
249	3.08	2.40	0.52
250	4.02	1.23	0.76
251	3.93	1.34	0.73
252	3.23	2.21	0.56
253	4.77	0.29	0.94
254	4.51	0.61	0.88
255	4.26	0.93	0.82
256	3.33	2.08	0.58
257	4.31	0.86	0.83
258	4.06	1.18	0.77
259	4.01	1.24	0.75
260	3.31	2.11	0.58
261	4.86	0.18	0.97
262	4.37	0.79	0.84
263	4.54	0.58	0.89
264	4.47	0.66	0.87
265	3.04	2.45	0.51
266	3.37	2.03	0.59
267	3.05	2.43	0.51
268	4.77	0.29	0.94
269	3.42	1.97	0.61
270	3.52	1.85	0.63
271	3.51	1.86	0.63
272	4.91	0.11	0.98
273	3.08	2.40	0.52
274	4.84	0.20	0.96
275	4.19	1.01	0.80
276	3.46	1.92	0.62
277	3.02	2.47	0.51
278	4.56	0.55	0.89
279	3.37	2.03	0.59
280	4.59	0.51	0.90
281	4.10	1.13	0.78
282	4.80	0.25	0.95
283	4.34	0.83	0.84
284	3.50	1.87	0.63
285	4.28	0.90	0.82
286	3.65	1.68	0.66
287	3.51	1.86	0.63
288	4.03	1.21	0.76
289	3.37	2.03	0.59

290	3.26	2.17	0.57
291	4.43	0.71	0.86
292	4.64	0.45	0.91
293	4.96	0.05	0.99
294	4.30	0.88	0.83
295	3.83	1.46	0.71
296	3.24	2.20	0.56
297	3.43	1.96	0.61
298	4.91	0.11	0.98
299	4.51	0.61	0.88
300	3.43	1.96	0.61
301	4.27	0.91	0.82
302	3.26	2.17	0.57
303	3.56	1.80	0.64
304	3.79	1.51	0.70
305	4.33	0.84	0.83
306	3.40	2.00	0.60
307	4.59	0.51	0.90
308	4.68	0.40	0.92
309	4.61	0.49	0.90
310	4.21	0.99	0.80
311	4.98	0.03	1.00
312	3.23	2.21	0.56
313	4.42	0.73	0.86
314	4.58	0.53	0.90
315	3.94	1.33	0.74
316	4.84	0.20	0.96
317	3.55	1.81	0.64
318	3.58	1.77	0.65
319	4.08	1.15	0.77
320	3.91	1.36	0.73
321	3.16	2.30	0.54
322	4.37	0.79	0.84
323	3.14	2.32	0.54
324	3.58	1.77	0.65
325	3.49	1.88	0.62
326	4.77	0.29	0.94
327	3.50	1.87	0.63
328	4.56	0.55	0.89
329	4.48	0.65	0.87
330	4.53	0.59	0.88
331	4.42	0.73	0.86
332	4.01	1.24	0.75
333	4.90	0.13	0.98
334	3.65	1.68	0.66
335	4.19	1.01	0.80
336	4.60	0.50	0.90
337	4.64	0.45	0.91
338	4.90	0.13	0.98
339	4.14	1.08	0.79
340	4.49	0.64	0.87
341	4.22	0.98	0.81
342	4.30	0.88	0.83



343	4.64	0.45	0.91
344	4.22	0.98	0.81
345	3.76	1.55	0.69
346	4.52	0.60	0.88
347	4.81	0.24	0.95
348	4.59	0.51	0.90
349	3.86	1.43	0.72
350	3.04	2.45	0.51
351	4.40	0.75	0.85
352	3.25	2.18	0.56
353	3.04	2.45	0.51
354	4.28	0.90	0.82
355	4.64	0.45	0.91
356	4.54	0.58	0.89
357	3.47	1.91	0.62
358	3.59	1.76	0.65
359	4.26	0.93	0.82
360	4.75	0.31	0.94
361	4.71	0.36	0.93
362	3.05	2.43	0.51
363	4.81	0.24	0.95
364	3.01	2.48	0.50
365	3.88	1.40	0.72
366	3.05	2.43	0.51
367	3.46	1.92	0.62
368	3.87	1.41	0.72
369	4.10	1.13	0.78
370	4.94	0.08	0.99
371	4.51	0.61	0.88
372	4.34	0.83	0.84
373	3.58	1.77	0.65
374	4.94	0.08	0.99
375	3.54	1.82	0.64
376	3.79	1.51	0.70
377	4.47	0.66	0.87
378	3.11	2.36	0.53
379	3.16	2.30	0.54
380	4.39	0.76	0.85
381	4.79	0.26	0.95
382	4.10	1.13	0.78
383	3.66	1.67	0.67
384	4.02	1.23	0.76
385	4.50	0.63	0.88
386	3.58	1.77	0.65
387	4.17	1.04	0.79
388	3.90	1.38	0.73
389	4.96	0.05	0.99
390	3.51	1.86	0.63
391	4.35	0.81	0.84
392	3.71	1.61	0.68
393	4.50	0.63	0.88
394	4.57	0.54	0.89
395	3.98	1.28	0.75

396	3.12	2.35	0.53
397	4.95	0.06	0.99
398	3.78	1.53	0.70
399	4.54	0.58	0.89
400	4.67	0.41	0.92
401	4.38	0.78	0.85
402	4.00	1.25	0.75
403	3.14	2.32	0.54
404	3.38	2.02	0.60
405	4.11	1.11	0.78
406	3.62	1.72	0.66
407	3.78	1.53	0.70
408	3.55	1.81	0.64
409	4.78	0.28	0.95
410	4.99	0.01	1.00
411	3.83	1.46	0.71
412	3.39	2.01	0.60
413	4.36	0.80	0.84
414	4.71	0.36	0.93
415	4.10	1.13	0.78
416	4.06	1.18	0.77
417	4.24	0.95	0.81
418	4.55	0.56	0.89
419	3.88	1.40	0.72
420	3.43	1.96	0.61
421	3.82	1.48	0.71
422	4.00	1.25	0.75
423	3.02	2.47	0.51
424	3.14	2.32	0.54
425	4.03	1.21	0.76
426	3.25	2.18	0.56
427	4.41	0.74	0.85
428	3.69	1.64	0.67
429	4.01	1.24	0.75
430	4.58	0.53	0.90
431	3.63	1.71	0.66
432	3.55	1.81	0.64
433	4.50	0.63	0.88
434	4.65	0.44	0.91
435	3.43	1.96	0.61
436	4.18	1.03	0.80
437	3.88	1.40	0.72
438	4.34	0.83	0.84
439	4.02	1.23	0.76
440	4.53	0.59	0.88
441	3.92	1.35	0.73
442	4.32	0.85	0.83
443	4.70	0.38	0.93
444	4.33	0.84	0.83
445	4.33	0.84	0.83
446	3.59	1.76	0.65
447	3.48	1.90	0.62
448	4.27	0.91	0.82

449	3.12	2.35	0.53
450	4.11	1.11	0.78
451	3.97	1.29	0.74
452	3.51	1.86	0.63
453	4.85	0.19	0.96
454	4.14	1.08	0.79
455	4.58	0.53	0.90
456	4.84	0.20	0.96
457	4.29	0.89	0.82
458	3.32	2.10	0.58
459	4.70	0.38	0.93
460	3.68	1.65	0.67
461	3.26	2.17	0.57
462	3.86	1.43	0.72
463	3.65	1.68	0.66
464	3.69	1.64	0.67
465	3.25	2.18	0.56
466	3.76	1.55	0.69
467	3.73	1.59	0.68
468	4.62	0.48	0.91
469	4.00	1.25	0.75
470	4.78	0.28	0.95
471	3.31	2.11	0.58
472	3.54	1.82	0.64
473	4.76	0.30	0.94
474	3.02	2.47	0.51
475	3.00	5.00	0.00
476	4.99	0.01	1.00
477	4.50	0.63	0.88
478	3.17	2.28	0.54
479	5.00	0.00	1.00
480	3.70	1.63	0.68
481	4.02	1.23	0.76
482	3.62	1.72	0.66
483	3.88	1.40	0.72
484	3.27	2.16	0.57
485	3.91	1.36	0.73
486	4.72	0.35	0.93
487	3.81	1.49	0.70
488	3.38	2.02	0.60
489	4.43	0.71	0.86
490	3.26	2.17	0.57
491	3.11	2.36	0.53
492	3.25	2.18	0.56
493	4.25	0.94	0.81
494	3.23	2.21	0.56
495	4.95	0.06	0.99
496	3.62	1.72	0.66
497	3.88	1.40	0.72
498	3.80	1.50	0.70
499	4.94	0.08	0.99
500	3.41	1.98	0.60
501	4.75	0.31	0.94

502	4.31	0.86	0.83
503	3.82	1.48	0.71
504	4.99	0.01	1.00
505	3.96	1.30	0.74
506	3.35	2.06	0.59
507	4.61	0.49	0.90
508	3.70	1.63	0.68
509	3.66	1.67	0.67
510	3.34	2.07	0.59
511	4.19	1.01	0.80
512	3.27	2.16	0.57
513	4.23	0.96	0.81
514	3.91	1.36	0.73
515	3.48	1.90	0.62
516	4.38	0.78	0.85
517	4.89	0.14	0.97
518	3.17	2.28	0.54
519	3.08	2.40	0.52
520	4.18	1.03	0.80
521	4.19	1.01	0.80
522	3.95	1.31	0.74
523	3.85	1.44	0.71
524	3.19	2.26	0.55
525	3.78	1.53	0.70
526	4.38	0.78	0.85
527	4.72	0.35	0.93
528	3.18	2.27	0.55
529	4.31	0.86	0.83
530	3.74	1.58	0.69
531	4.46	0.68	0.87
532	3.31	2.11	0.58
533	4.26	0.93	0.82
534	4.10	1.13	0.78
535	4.55	0.56	0.89
536	3.04	2.45	0.51
537	4.51	0.61	0.88
538	4.22	0.98	0.81
539	3.62	1.72	0.66
540	4.85	0.19	0.96
541	4.22	0.98	0.81
542	3.61	1.73	0.65
543	4.69	0.39	0.92
544	4.05	1.19	0.76
545	4.69	0.39	0.92
546	3.04	2.45	0.51
547	3.79	1.51	0.70
548	4.93	0.09	0.98
549	4.90	0.13	0.98
550	3.91	1.36	0.73
551	3.85	1.44	0.71
552	4.78	0.28	0.95
553	3.75	1.56	0.69
554	4.83	0.21	0.96

555	3.40	2.00	0.60
556	4.40	0.75	0.85
557	3.69	1.64	0.67
558	4.64	0.45	0.91
559	3.08	2.40	0.52
560	3.74	1.58	0.69
561	4.72	0.35	0.93
562	4.86	0.18	0.97
563	3.08	2.40	0.52
564	4.36	0.80	0.84
565	3.02	2.47	0.51
566	4.09	1.14	0.77
567	4.78	0.28	0.95
568	4.74	0.33	0.94
569	3.05	2.43	0.51
570	3.60	1.75	0.65
571	3.12	2.35	0.53
572	3.06	2.42	0.52
573	4.07	1.16	0.77
574	4.87	0.16	0.97
575	3.05	2.43	0.51
576	3.71	1.61	0.68
577	3.99	1.26	0.75
578	3.84	1.45	0.71
579	4.99	0.01	1.00
580	3.42	1.97	0.61
581	3.09	2.38	0.52
582	4.89	0.14	0.97
583	4.99	0.01	1.00
584	4.79	0.26	0.95
585	4.69	0.39	0.92
586	4.17	1.04	0.79
587	4.20	1.00	0.80
588	3.45	1.93	0.61
589	4.99	0.01	1.00
590	4.61	0.49	0.90
591	3.83	1.46	0.71
592	4.25	0.94	0.81
593	4.79	0.26	0.95
594	4.57	0.54	0.89
595	3.85	1.44	0.71
596	4.58	0.53	0.90
597	3.88	1.40	0.72
598	3.51	1.86	0.63
599	3.49	1.88	0.62
600	3.95	1.31	0.74
601	3.84	1.45	0.71
602	3.86	1.43	0.72
603	4.59	0.51	0.90
604	4.57	0.54	0.89
605	3.40	2.00	0.60
606	4.03	1.21	0.76
607	3.08	2.40	0.52

608	4.70	0.38	0.93
609	3.40	2.00	0.60
610	4.23	0.96	0.81
611	4.99	0.01	1.00
612	3.98	1.28	0.75
613	4.57	0.54	0.89
614	3.82	1.48	0.71
615	4.82	0.23	0.96
616	4.74	0.33	0.94
617	4.88	0.15	0.97
618	4.98	0.03	1.00
619	3.34	2.07	0.59
620	4.29	0.89	0.82
621	4.17	1.04	0.79
622	4.19	1.01	0.80
623	3.34	2.07	0.59
624	4.78	0.28	0.95
625	3.97	1.29	0.74
626	3.89	1.39	0.72
627	4.90	0.13	0.98
628	4.50	0.63	0.88
629	4.64	0.45	0.91
630	3.59	1.76	0.65
631	3.40	2.00	0.60
632	4.73	0.34	0.93
633	3.89	1.39	0.72
634	4.59	0.51	0.90
635	3.44	1.95	0.61
636	3.87	1.41	0.72
637	4.40	0.75	0.85
638	4.95	0.06	0.99
639	3.14	2.32	0.54
640	3.85	1.44	0.71
641	3.62	1.72	0.66
642	3.25	2.18	0.56
643	3.53	1.83	0.63
644	4.59	0.51	0.90
645	4.46	0.68	0.87
646	3.60	1.75	0.65
647	4.13	1.09	0.78
648	3.43	1.96	0.61
649	3.91	1.36	0.73
650	3.91	1.36	0.73
651	3.94	1.33	0.74
652	3.84	1.45	0.71
653	4.06	1.18	0.77
654	3.72	1.60	0.68
655	4.37	0.79	0.84
656	4.87	0.16	0.97
657	4.52	0.60	0.88
658	4.19	1.01	0.80
659	4.72	0.35	0.93
660	4.26	0.93	0.82

661	4.01	1.24	0.75
662	4.43	0.71	0.86
663	4.50	0.63	0.88
664	3.12	2.35	0.53
665	3.82	1.48	0.71
666	3.49	1.88	0.62
667	3.11	2.36	0.53
668	3.67	1.66	0.67
669	3.99	1.26	0.75
670	4.11	1.11	0.78
671	3.55	1.81	0.64
672	3.10	2.37	0.53
673	3.51	1.86	0.63
674	3.01	2.48	0.50
675	4.46	0.68	0.87
676	4.06	1.18	0.77
677	3.27	2.16	0.57
678	4.97	0.04	0.99
679	4.82	0.23	0.96
680	4.99	0.01	1.00
681	3.75	1.56	0.69
682	3.12	2.35	0.53
683	3.62	1.72	0.66
684	4.24	0.95	0.81
685	3.95	1.31	0.74
686	4.82	0.23	0.96
687	3.41	1.98	0.60
688	3.09	2.38	0.52
689	3.75	1.56	0.69
690	4.32	0.85	0.83
691	4.95	0.06	0.99
692	3.57	1.78	0.64
693	3.49	1.88	0.62
694	3.67	1.66	0.67
695	3.17	2.28	0.54
696	3.10	2.37	0.53
697	3.92	1.35	0.73
698	3.97	1.29	0.74
699	3.44	1.95	0.61
700	4.29	0.89	0.82
701	3.00	5.00	0.00
702	3.42	1.97	0.61
703	3.89	1.39	0.72
704	4.01	1.24	0.75
705	3.77	1.54	0.69
706	3.09	2.38	0.52
707	3.20	2.25	0.55
708	3.59	1.76	0.65
709	3.50	1.87	0.63
710	3.21	2.23	0.55
711	3.37	2.03	0.59
712	3.05	2.43	0.51
713	3.84	1.45	0.71

714	3.49	1.88	0.62
715	4.12	1.10	0.78
716	3.86	1.43	0.72
717	4.16	1.05	0.79
718	4.96	0.05	0.99
719	4.11	1.11	0.78
720	3.80	1.50	0.70
721	3.23	2.21	0.56
722	3.98	1.28	0.75
723	4.61	0.49	0.90
724	4.49	0.64	0.87
725	4.63	0.46	0.91
726	3.62	1.72	0.66
727	3.29	2.13	0.57
728	4.75	0.31	0.94
729	4.38	0.78	0.85
730	4.71	0.36	0.93
731	3.72	1.60	0.68
732	3.09	2.38	0.52
733	3.29	2.13	0.57
734	3.80	1.50	0.70
735	3.42	1.97	0.61
736	3.10	2.37	0.53
737	3.83	1.46	0.71
738	3.78	1.53	0.70
739	4.18	1.03	0.80
740	4.39	0.76	0.85
741	4.18	1.03	0.80
742	3.25	2.18	0.56
743	4.74	0.33	0.94
744	3.28	2.15	0.57
745	4.31	0.86	0.83
746	4.49	0.64	0.87
747	4.73	0.34	0.93
748	4.55	0.56	0.89
749	3.10	2.37	0.53
750	3.78	1.53	0.70
751	4.02	1.23	0.76
752	3.46	1.92	0.62
753	4.06	1.18	0.77
754	4.40	0.75	0.85
755	3.96	1.30	0.74
756	4.92	0.10	0.98
757	4.30	0.88	0.83
758	3.44	1.95	0.61
759	4.69	0.39	0.92
760	3.55	1.81	0.64
761	3.33	2.08	0.58
762	4.07	1.16	0.77
763	4.93	0.09	0.98
764	4.54	0.58	0.89
765	4.70	0.38	0.93
766	4.07	1.16	0.77



767	3.30	2.12	0.58
768	4.30	0.88	0.83
769	3.67	1.66	0.67
770	3.15	2.31	0.54
771	3.96	1.30	0.74
772	4.21	0.99	0.80
773	4.90	0.13	0.98
774	4.09	1.14	0.77
775	4.73	0.34	0.93
776	4.65	0.44	0.91
777	3.57	1.78	0.64
778	3.51	1.86	0.63
779	3.53	1.83	0.63
780	3.36	2.05	0.59
781	3.27	2.16	0.57
782	3.15	2.31	0.54
783	3.22	2.22	0.56
784	3.19	2.26	0.55
785	3.19	2.26	0.55
786	4.75	0.31	0.94
787	4.92	0.10	0.98
788	4.65	0.44	0.91
789	3.60	1.75	0.65
790	3.42	1.97	0.61
791	4.29	0.89	0.82
792	3.70	1.63	0.68
793	4.44	0.70	0.86
794	3.27	2.16	0.57
795	5.00	0.00	1.00
796	4.73	0.34	0.93
797	3.60	1.75	0.65
798	4.11	1.11	0.78
799	3.08	2.40	0.52
800	3.61	1.73	0.65
801	3.39	2.01	0.60
802	4.60	0.50	0.90
803	3.18	2.27	0.55
804	4.57	0.54	0.89
805	4.04	1.20	0.76
806	3.91	1.36	0.73
807	3.14	2.32	0.54
808	3.37	2.03	0.59
809	4.88	0.15	0.97
810	3.71	1.61	0.68
811	3.20	2.25	0.55
812	4.82	0.23	0.96
813	3.98	1.28	0.75
814	4.57	0.54	0.89
815	4.16	1.05	0.79
816	3.81	1.49	0.70
817	3.77	1.54	0.69
818	3.05	2.43	0.51
819	3.83	1.46	0.71

820	3.03	2.46	0.51
821	4.31	0.86	0.83
822	4.02	1.23	0.76
823	4.58	0.53	0.90
824	3.74	1.58	0.69
825	3.42	1.97	0.61
826	3.29	2.13	0.57
827	4.62	0.48	0.91
828	4.70	0.38	0.93
829	4.01	1.24	0.75
830	3.84	1.45	0.71
831	3.84	1.45	0.71
832	3.10	2.37	0.53
833	3.11	2.36	0.53
834	4.34	0.83	0.84
835	3.00	5.00	0.00
836	3.21	2.23	0.55
837	4.89	0.14	0.97
838	4.55	0.56	0.89
839	4.57	0.54	0.89
840	3.52	1.85	0.63
841	3.43	1.96	0.61
842	4.72	0.35	0.93
843	4.50	0.63	0.88
844	3.90	1.38	0.73
845	4.31	0.86	0.83
846	4.74	0.33	0.94
847	3.20	2.25	0.55
848	3.39	2.01	0.60
849	4.23	0.96	0.81
850	3.68	1.65	0.67
851	3.50	1.87	0.63
852	4.96	0.05	0.99
853	3.85	1.44	0.71
854	4.83	0.21	0.96
855	4.37	0.79	0.84
856	3.27	2.16	0.57
857	3.69	1.64	0.67
858	3.69	1.64	0.67
859	4.61	0.49	0.90
860	3.19	2.26	0.55
861	3.06	2.42	0.52
862	3.22	2.22	0.56
863	3.59	1.76	0.65
864	3.39	2.01	0.60
865	4.66	0.43	0.92
866	4.70	0.38	0.93
867	3.91	1.36	0.73
868	4.35	0.81	0.84
869	4.25	0.94	0.81
870	4.12	1.10	0.78
871	4.48	0.65	0.87
872	4.59	0.51	0.90

873	3.50	1.87	0.63
874	4.84	0.20	0.96
875	3.64	1.70	0.66
876	4.86	0.18	0.97
877	4.76	0.30	0.94
878	3.33	2.08	0.58
879	3.92	1.35	0.73
880	3.39	2.01	0.60
881	4.60	0.50	0.90
882	3.90	1.38	0.73
883	4.76	0.30	0.94
884	3.57	1.78	0.64
885	4.89	0.14	0.97
886	4.83	0.21	0.96
887	3.23	2.21	0.56
888	3.35	2.06	0.59
889	4.48	0.65	0.87
890	4.76	0.30	0.94
891	3.79	1.51	0.70
892	4.71	0.36	0.93
893	4.81	0.24	0.95
894	3.33	2.08	0.58
895	4.55	0.56	0.89
896	4.05	1.19	0.76
897	3.59	1.76	0.65
898	4.27	0.91	0.82
899	4.25	0.94	0.81
900	4.51	0.61	0.88
901	4.70	0.38	0.93
902	3.46	1.92	0.62
903	3.08	2.40	0.52
904	3.19	2.26	0.55
905	3.34	2.07	0.59
906	4.89	0.14	0.97
907	3.80	1.50	0.70
908	3.70	1.63	0.68
909	3.71	1.61	0.68
910	4.16	1.05	0.79
911	4.14	1.08	0.79
912	4.56	0.55	0.89
913	4.18	1.03	0.80
914	4.91	0.11	0.98
915	3.64	1.70	0.66
916	3.19	2.26	0.55
917	3.29	2.13	0.57
918	4.40	0.75	0.85
919	4.44	0.70	0.86
920	3.81	1.49	0.70
921	4.22	0.98	0.81
922	4.38	0.78	0.85
923	3.08	2.40	0.52
924	4.86	0.18	0.97
925	3.81	1.49	0.70

926	4.04	1.20	0.76
927	3.35	2.06	0.59
928	4.12	1.10	0.78
929	4.34	0.83	0.84
930	3.09	2.38	0.52
931	3.41	1.98	0.60
932	3.53	1.83	0.63
933	4.56	0.55	0.89
934	4.04	1.20	0.76
935	3.38	2.02	0.60
936	3.81	1.49	0.70
937	3.36	2.05	0.59
938	4.74	0.33	0.94
939	3.08	2.40	0.52
940	3.43	1.96	0.61
941	3.13	2.33	0.53
942	4.80	0.25	0.95
943	3.73	1.59	0.68
944	3.89	1.39	0.72
945	3.95	1.31	0.74
946	4.39	0.76	0.85
947	3.08	2.40	0.52
948	4.01	1.24	0.75
949	4.50	0.63	0.88
950	3.14	2.32	0.54
951	4.75	0.31	0.94
952	3.96	1.30	0.74
953	4.07	1.16	0.77
954	3.69	1.64	0.67
955	4.83	0.21	0.96
956	4.09	1.14	0.77
957	4.55	0.56	0.89
958	4.60	0.50	0.90
959	4.87	0.16	0.97
960	4.74	0.33	0.94
961	4.69	0.39	0.92
962	4.48	0.65	0.87
963	4.43	0.71	0.86
964	3.19	2.26	0.55
965	3.22	2.22	0.56
966	4.76	0.30	0.94
967	3.01	2.48	0.50
968	4.29	0.89	0.82
969	4.75	0.31	0.94
970	3.14	2.32	0.54
971	4.17	1.04	0.79
972	4.35	0.81	0.84
973	4.20	1.00	0.80
974	4.03	1.21	0.76
975	4.07	1.16	0.77
976	3.82	1.48	0.71
977	3.08	2.40	0.52
978	4.03	1.21	0.76

979	4.06	1.18	0.77
980	4.24	0.95	0.81
981	4.12	1.10	0.78
982	3.32	2.10	0.58
983	4.66	0.43	0.92
984	3.15	2.31	0.54
985	3.49	1.88	0.62
986	3.52	1.85	0.63
987	3.24	2.20	0.56
988	3.67	1.66	0.67
989	4.99	0.01	1.00
990	3.47	1.91	0.62
991	3.71	1.61	0.68
992	3.43	1.96	0.61
993	4.03	1.21	0.76
994	3.25	2.18	0.56
995	3.76	1.55	0.69
996	4.98	0.03	1.00
997	3.35	2.06	0.59
998	3.66	1.67	0.67
999	4.01	1.24	0.75
1000	4.10	1.13	0.78

Yes  
1000

