SYSC 4005
3rd Deliverable: Milestone #3
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Group: Simulating Discretely

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Verification

To verify our model, our group first started by getting a fellow student to review our model. We walked them through the steps we took, and why we chose our design. They were able to agree without design as well as confirm our choices and did not recommend any changes.

Flow Diagram

The creation of flow diagrams for the major components in the system was used to verify that the functionalities were as we presumed and helped to give a better understanding of the processes occurring in the system.

Workstation Flow Diagram

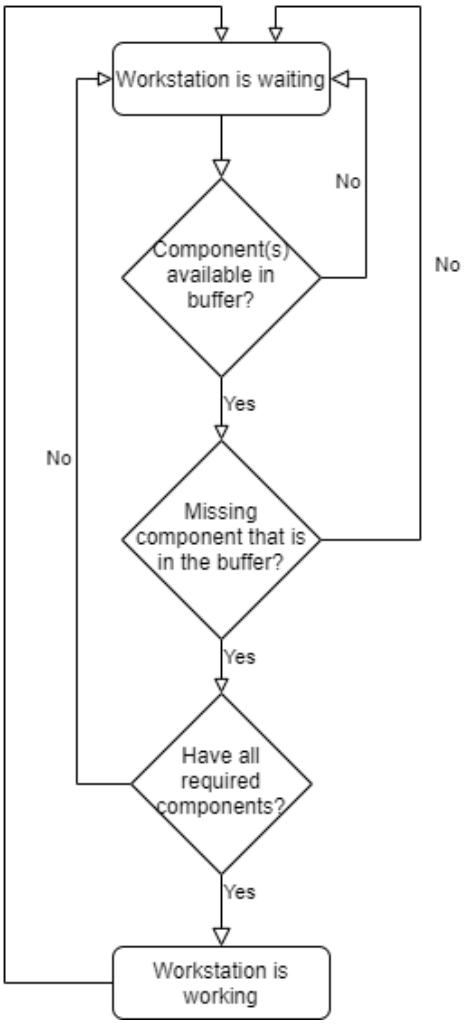

Figure 1: Flow diagram representation of the functionalities of the workstations in the system.

Inspector Flow Diagram

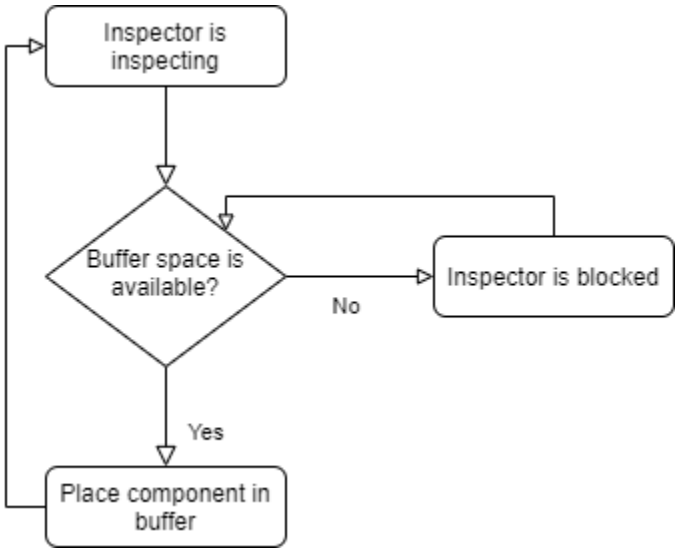

Figure 2: Flow diagram representation of the functionalities of the inspectors in the system.

Input Parameters

After going through the model design we began doing test runs to examine the model outputs and inputs. The inputs were written to a file for each simulation class (inspectors and workstations). The inputs, when compared to the samples provided, followed a similar distribution. When inspecting the outputs, we concluded the model was behaving as expected.

We went through the entire model one more time, properly documenting as we checked the components. This acted as our 5th and final check to verify the model was built correctly.

Validation

Face Validity

From the observed data that was produced we are able to confirm that all the inputs and outputs matched up as expected. By manually calculating what they should be for a few cycles, we confirmed the model was working correctly.

Validate Model Assumptions

Structural Assumption: We assumed the model ran for 2 hours since the data provided showed the total run times were between 1 hour and 2 hours. Therefore, each of our trials ran for 7200 seconds equivalent to 2 hours.

Data Assumption: By analyzing the sample data provided in the .dat files, we found the mean time for the inputs for each simulation object (Inspector1, Inspector2, Workstation1, Ect.). The average for the inputs were the following:

	Insp 1	Insp 2 C2	Insp 2 C3	WS1	WS 2	WS 3	Total
Mean	10.357	15.53690	20.63275	4.6044166	11.092606	8.79558	11.8367
Lambda	0.0965	0.064362	0.048466	0.2171827	0.0901501	0.1136934	0.084483

Table 1: Average input mean and lambda for the sample data

Additionally, when plotting the provided inputs, we discovered they all followed an exponential distribution.

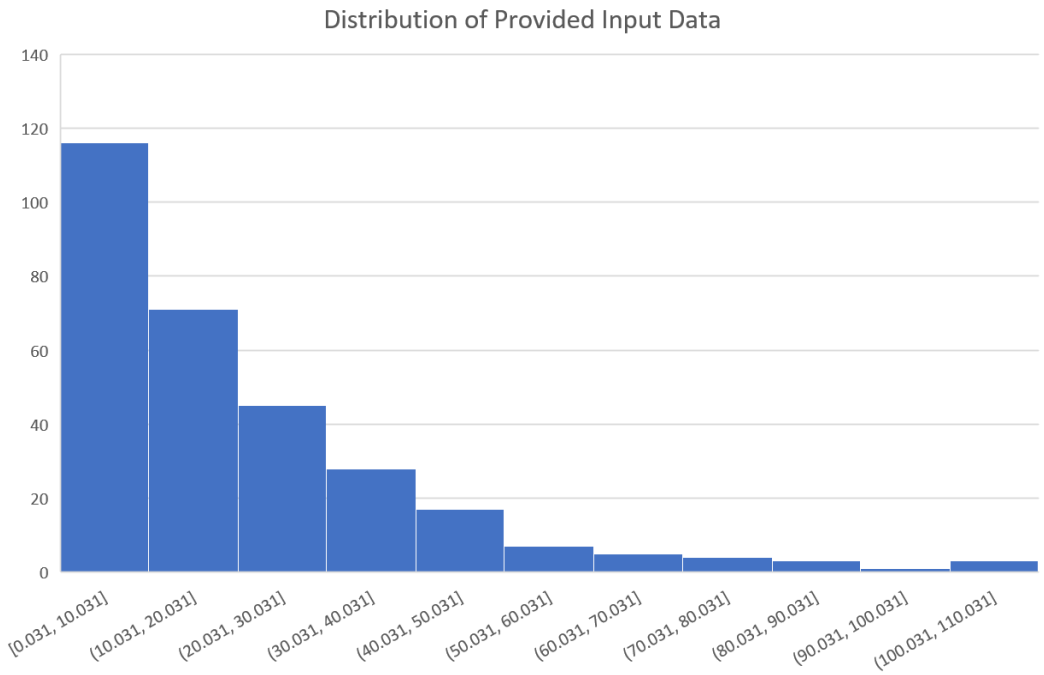

Figure 3: Distribution plot for the provided input data

Using the mean for each provided input data, and Equation 1 for the distribution of an exponential equation. We created the proper formulas for generating the inputs for each simulation model.

$$x_i \simeq \frac{-1}{\lambda} ln(r_i) \qquad (1)$$

λis equal to 1/the mean

$r_i$is a generated random value

This formula was used every time a simulation object needed a new time for either inspecting or working.

```
/**
 * Gets the next random number.
 *
 * @return the random number
 */
public float getRandomNumber() {
    float randomTime = this.randomNumber.nextFloat() ;
    randomTime = (float) ((-1 / lambda) * (Math.log(randomTime)));
    return randomTime;
}
```

Figure 4: Code used to implement the random number equation

To validate the inputs we generated were correct we ran 5 trials and gathered data from all the inputs generated. Shown in Table 2, the mean value of the generated inputs for each simulation object.

	Insp 1	Insp 2 C2	Insp 2 C3	WS1	WS 2	WS 3
1	10.27527	14.54219	16.83981	4.703893764	10.28869	10.0869
2	10.51939	16.73446	20.24589	4.591713762	11.41955	9.840753
3	10.3907	20.36956	22.96274	4.604693053	8.676378	12.38443
4	10.50459	14.76534	21.02882	4.145667131	11.20464	7.966175
5	10.21949	11.50723	18.98501	4.544909726	9.677508	8.101089

Table 2: Shows the trials ran to validate the inputs and the mean values that were generated for each simulation

Using a 2-tailed T-test, and a confidence interval of 95%, we compared the generated inputs to the provided ones.

2-tailed T-test Inspector 1 Example

Inspector 1			
Replication	Rn Generated	Total Time	Average Rn value
1	1430	7200	10.27526808
2	1410	7200	10.51938616
3	1309	7200	10.39070304
4	1339	7200	10.50458511
5	1406	7200	10.21948792
Sample Mean			10.38188606
Sample Variance			0.133958598

Table 3: Comparison of generated inputs to ones provided using 2-Tailed T-test for inspector 1

H_0	E(Y2) =	10.35791	95 Confidence Interval
H_1	E(Y2) !=	10.35791	
$\overline{y}$	10.38188606		$t_0 = (\overline{y} - \overline{x})/(S/\sqrt{N})$
S	0.133958598		0.400213978
$t_{0.025,4}$	2.776		
0.400213978	<	2.776	Fail to reject H_0

Table 4: Hypothesis testing to verify validation input generation

For all 5 simulation objects, we failed to reject the H_0 hypothesis proving our inputs generation was valid.

**Since there is no output data available we are not able to do the error evaluation tests

Production Runs and Analysis

As mentioned above, each of our simulations ran for a simulated time of 7200 seconds (2 hours).

The confidence interval we will be using is 95%, as mentioned in the project outline.

We ran each simulation 5 times and gathered the results from each. To analyze the data, we compared the time each simulation object was blocked in each trial.

$t_{0.025,4}$	2.776

Time Blocked

	Inspector 1	Inspector 2	Workstation 1	Workstation 2	Workstation 3
1	0	5826.24	1731.09	6587.3	6751.25
2	0	5855.25	1669.18	6835.95	6804.94
3	0	5582.41	1757.13	6790.75	6734.89
4	0	5996.42	1583.87	6806.35	6882.15
5	0	6120.21	1682.54	6723.52	6915.09
W_Q	0	5876.106	1684.762	6748.774	6817.664
SE	0	202.0155641	66.72769792	99.23236937	79.17468712
$t_{0.025,4} \times \frac{SE}{\sqrt{N}}$	0	250.7952404	82.84009757	123.1935076	98.29259828
	0 $\pm$0	5876.106 $\pm$ 250.7952404	1684.762 $\pm$ 82.84009757	6748.774 $\pm$ 123.1935076	6817.664 $\pm$ 98.29259828

Table 5: Average time blocked for each simulation run

Since all 5 simulation objects have a plus or minus range less than 5%, we can say with 95% certainty that the number of simulation replications we have chosen provides adequate data for proper analysis.

Appendix

Provided Inputs

	Insp 1	Insp 2 C2	Insp 2 C3	WS 1	WS 2	WS 3	Total	
Total Time	3104.347	4656.531	6180.868	1376.48	3316.024	2625.23		11.83669556
Average	10.35791	15.536903	20.632757	4.60442	11.09261	8.79558		11.83669556
Lambda	0.0965446	0.0643629	0.0484666	0.21718	0.09015	0.113693469		

Generated Inputs

Replication	Insp 1	Insp 2 C2	Insp 2 C3	WS 1	WS 2	WS 3
1	10.275268	14.542185	16.839813	4.70389	10.28869	10.08690037
2	10.519386	16.734455	20.245886	4.59171	11.41955	9.840752827
3	10.390703	20.369555	22.96274	4.60469	8.676378	12.38442704
4	10.504585	14.76534	21.028818	4.14567	11.20464	7.966174598
5	10.219488	11.507227	18.985011	4.54491	9.677508	8.101089153

Inspector 1 T-Test

Replication	Total Time	Average Rn value
1	7200	10.275268
2	7200	10.519386
3	7200	10.390703
4	7200	10.504585
5	7200	10.219488
Sample Mean		10.381886
Sample Variance		0.1339586

H0	E(Y2) = 11.8	10.35791	95 Confiedence Interval
H1	E(Y2) != 11.8	10.35791	

y-bar	10.381886	t0 = y-bar - mean / (S / sqrt(N)
S	0.1339586	0.400214
t,0.025,4	2.776	

0.400214	<	2.776	Fail to reject H0

Inspector 2 C2 T-Test

Replication	Rn Generate	Total Time	Average Rn value
1	1430	7200	14.542185
2	1410	7200	16.734455
3	1309	7200	20.369555
4	1339	7200	14.76534
5	1406	7200	11.507227
Sample Mean			15.583753
			3.2634625

H0	E(Y2) =	#REF!	95 Confiedence Interval
H1	E(Y2) !=	#REF!	
y-bar	15.583753		t0 = y-bar - mean / (S / sqrt(N)
S	3.2634625		#REF!
t,0.025,4	2.776		
#REF!	<	2.776	Fail to reject H0

Inspector 2 C3 T-Test

Replication	Rn Generate	Total Time	Average Rn value
1	1430	7200	16.839813
2	1410	7200	20.245886
3	1309	7200	22.96274
4	1339	7200	21.028818
5	1406	7200	18.985011
Sample Mean			20.012454
Sample Variance			2.2865347

H0	E(Y2) =	20.632757	95 Confiedence Interval
H1	E(Y2) !=	20.632757	
y-bar	20.012454		t0 = y-bar - mean / (S / sqrt(N)
S	2.2865347		-0.606612
t,0.025,4	2.776		
0.6066122	<	2.776	Fail to reject H0

WorkStation 1 T-Test

Replication	Rn Generate	Total Time	Average Rn value
1	1430	7200	4.7038938
2	1410	7200	4.5917138
3	1309	7200	4.6046931
4	1339	7200	4.1456671
5	1406	7200	4.5449097
Sample Mean			4.5181755
Sample Variance			0.2161375

H0	E(Y2) =	4.6044167	95 Confiedence Interval
H1	E(Y2) !=	4.6044167	

y-bar	4.5181755	t0 = y-bar - mean / (S / sqrt(N)
S	0.2161375	-0.892215
t,0.025,4	2.776	

0.8922152	<	2.776	Fail to reject H0

WorkStation 2 T-Test

Replication	Rn Generate	Total Time	Average Rn value
1	1430	7200	10.288685
2	1410	7200	11.419552
3	1309	7200	8.6763777
4	1339	7200	11.204638
5	1406	7200	9.6775083
Sample Mean			10.253352
Sample Variance			1.1274596

H0	E(Y2) =	11.092607	95 Confiedence Interval
H1	E(Y2) !=	11.092607	

y-bar	10.253352	t0 = y-bar - mean / (S / sqrt(N)
S	1.1274596	-1.664476
t,0.025,4	2.776	

1.6644762	<	2.776	Fail to reject H0

WorkStation 3 T-Test

Replication	Rn Generat	Total Time	Average Rn value
1	1430	7200	10.0869
2	1410	7200	9.8407528
3	1309	7200	12.384427
4	1339	7200	7.9661746
5	1406	7200	8.1010892
Sample Mean			9.6758688
Sample Variance			1.7982913

H0	E(Y2) =	8.79558	95 Confiedence Interval
H1	E(Y2) !=	8.79558	

y-bar	9.6758688	t0 = y-bar - mean / (S / sqrt(N)
S	1.7982913	1.0945866
t,0.025,4	2.776	

1.0945866	<	2.776	Fail to reject H0

Gathered Data from replications

			BLOCKED TIME		
Replication	Insp 1	Insp2	WS 1	WS 2	WS 3
1	0	5826.24	1731.09	6587.3	6751.25
2	0	5855.25	1669.18	6835.95	6804.94
3	0	5582.41	1757.13	6790.75	6734.89
4	0	5996.42	1583.87	6806.35	6882.15
5	0	6120.21	1682.54	6723.52	6915.09
WQ	0	5876.106	1684.762	6748.77	6817.664
SE	0	202.01556	66.727698	99.2324	79.17469
	0	250.79524	82.840098	123.194	98.2926

t,0.025,4	2.776

Insp 1	Insp2C2	Insp2C3	WS 1	WS 2	WS 3
10.16	15.24	102.108	0.85	13.43	23.858
13.508	20.262	3.819	0.476	6.808	9.536
1.586	2.38	6.617	3.016	0.32	2.397
16.705	25.057	48.184	7.33	49.324	7.597
4.552	6.828	18.066	0.956	1.872	13.63
5.818	8.727	4.097	4.197	5.728	4.384
0.362	0.543	41.307	0.951	13.989	3.936
7.095	10.642	22.029	0.242	8.321	3.637
8.989	13.484	0.302	3.259	14.654	9.539
0.358	0.537	38.12	3.342	0.863	34.879
2.256	3.384	8.254	10.956	2.131	1.801
33.691	50.537	35.57	7.002	7.884	0.844
12.34	18.511	1.608	1.746	0.282	6.604
28.015	42.023	15.311	0.289	6.586	10.283
3.853	5.78	30.442	3.514	10.234	15.847
14.182	21.273	19.292	2.495	2.114	6.015
5.869	8.804	39.723	1.823	1.202	0.102
16.519	24.779	8.781	6.069	4.513	45.125
1.221	1.832	18.919	1.44	5.831	0.494
32.107	48.16	14.258	4.102	2.692	5.717
6.876	10.314	18.074	8.803	40.362	3.249
24.597	36.896	69.159	0.619	3.767	7.275
7.583	11.374	26.52	6.377	4.769	4.28
14.206	21.309	33.306	0.394	5.21	24.111
8.532	12.798	10.838	3.517	0.913	8.471
0.6	0.899	3.861	1.351	9.361	1.895
2.937	4.406	68.786	7.333	12.917	19.723
4.889	7.334	25.303	6.832	0.468	27.434
7.721	11.581	14.965	17.956	6.871	2.578
1.638	2.457	5.801	0.479	2.613	6.778
5.4	8.1	5.687	8.436	0.835	14.256
1.532	2.298	9.703	1.403	1.434	9.297
9.969	14.953	8.384	1.13	1.472	5.791
19.93	29.895	2.913	4.808	1.37	15.673
8.47	12.706	12.134	2.528	20.132	0.872
7.11	10.665	29.083	12.246	4.545	17.318
32.939	49.409	24.11	3.237	13.503	6.868
37.381	56.072	40.541	9.86	0.116	18.198
2.844	4.266	58.456	0.282	31.963	19.103
10.466	15.698	5.895	3.049	2.543	2.725
12.92	19.38	5.523	1.078	10.428	9.514
3.921	5.882	52.122	1.038	42.376	1.32
11.574	17.361	2.321	9.927	9.878	1.832
14.925	22.388	9.171	8.828	7.949	8.646
17.833	26.749	12.484	16.311	16.226	20.592

6.555	9.832	8.126	2.621	38.964	7.676
8.242	12.363	15.015	1.075	17.119	3.899
1.934	2.901	0.137	8.524	3.93	1.51
27.983	41.974	3.142	5.665	12.838	1.241
8.259	12.389	24.17	14.579	5.791	8.924
15.521	23.281	17.23	3.924	5.005	3.891
23.239	34.859	1.216	0.453	6.047	4.94
0.502	0.752	1.502	4.059	23.69	5.76
16.238	24.358	17.055	2.947	14.942	5.501
12.832	19.249	15.432	3.425	10.895	7.236
4.911	7.366	8.463	5.891	20.084	0.69
1.612	2.418	7.142	1.738	11.664	0.505
15.423	23.135	26.639	3.072	12.347	4.872
4.344	6.516	15.69	0.789	40.806	15.329
7.25	10.874	4.166	2.167	1.643	4.01
8.925	13.388	9.604	9.226	1.247	21.526
6.403	9.605	8.978	0.55	5.545	2.714
3.426	5.139	62.322	4.293	51.228	34.657
22.305	33.458	2.465	16.603	4.792	3.917
1.745	2.617	6.302	3.226	6.404	3.065
5.432	8.148	3.182	8.873	28.775	9.16
10.79	16.185	75.712	1.106	1.117	0.271
4.411	6.617	12.432	0.85	5.735	1.636
0.475	0.712	39.431	0.62	4.852	15.85
17.275	25.912	34.526	5.811	10.506	16.911
2.193	3.29	18.217	0.25	1.227	8.62
36.744	55.117	43.444	10.273	6.06	10.159
1.679	2.519	8.746	0.636	8.746	2.592
3.389	5.084	22.568	6.62	0.982	22.304
1.504	2.256	4.171	2.23	7.661	9.31
0.496	0.745	1.299	1.519	6.672	6.716
6.426	9.639	49.281	16.522	9.506	7.885
6.051	9.076	104.019	3.289	14.441	5.488
13.76	20.641	7.975	23.085	12.769	0.861
22.71	34.065	1.769	2.557	1.2	4.761
5.981	8.971	7.546	4.119	2.12	0.808
20.618	30.927	15.39	3.56	15.451	20.673
7.257	10.885	23.819	3.856	1.01	3.759
5.562	8.343	7.487	4.378	12.118	23.791
8.296	12.444	14.585	0.732	6.873	3.59
14.946	22.418	12.345	5.092	52.283	0.138
5.481	8.221	1.829	1.212	13.81	9.034
14.266	21.399	24.685	1.335	0.861	6.154
8.506	12.76	10.785	10.089	21.159	1.434
9.848	14.772	7.703	1.934	1.232	17.485
14.857	22.285	48.552	8.563	48.12	5.192
5.656	8.484	49.729	5.604	9.56	0.917

1.248	1.872	3.489	7.104	4.596	4.673
9.05	13.575	0.68	0.582	29.771	6.526
6.866	10.299	25.754	2.272	0.791	17.151
26.176	39.264	17.911	1.621	1.77	20.613
10.272	15.408	30.82	2.878	0.927	13.729
4.258	6.387	67.928	2.37	2.591	3.65
26.898	40.347	19.987	1.234	0.693	3.532
8.334	12.501	28.748	7.469	8.917	31.206
18.29	27.434	2.319	8.894	5.476	0.338
15.151	22.726	14.25	5.259	8.489	5.472
6.448	9.672	21.105	8.227	27.815	3.465
0.1	0.151	5.253	6.546	7.517	9.102
0.694	1.041	1.434	12.889	13.188	5.211
9.621	14.432	32.336	1.222	25.369	18.582
10.043	15.065	8.469	1.299	8.907	10.98
23.592	35.388	6.481	2.801	33.727	2.585
5.811	8.716	80.815	0.288	1.926	3.785
37.309	55.964	13.217	10.838	15.997	3.726
4.043	6.064	7.389	2.134	14.847	35.377
5.412	8.118	4.056	6.66	4.375	3.869
8.159	12.239	10.789	3.044	0.376	0.775
3.747	5.621	19.74	0.255	0.97	14.523
7.855	11.782	8.673	1.079	3.996	9.583
11.665	17.498	8.699	5.23	39.487	6.642
0.556	0.834	19.832	17.517	7.842	9.691
4.97	7.455	5.091	2.841	0.106	2.491
8.482	12.722	11.378	7.085	6.189	3.954
6.326	9.489	0.384	4.384	4.137	5.364
5.909	8.863	29.602	1.012	0.106	22.692
1.691	2.537	43.01	0.931	0.314	0.638
8.324	12.486	23.743	3.376	0.742	6.12
6.002	9.003	36.02	5.37	25.352	22.695
33.024	49.536	8.023	2.491	10.734	1.685
10.328	15.492	19.18	0.518	14.061	5.184
0.981	1.472	3.344	0.589	1.304	7.643
0.651	0.977	36.394	3.231	4.331	15.424
3.877	5.815	12.914	0.688	32.313	5.298
4.336	6.504	40.394	2.75	10.595	1.603
19.641	29.461	46.984	3.688	5.56	5.535
13.311	19.967	16.809	1.056	51.207	4.078
10.311	15.466	7.381	1.023	11.17	17.802
10.983	16.475	3.475	0.643	14.561	0.839
20.949	31.424	43.325	13.661	17.072	2.018
25.267	37.901	8.668	9.763	26.206	0.835
37.728	56.592	3.964	2.188	0.091	14.1
3.214	4.822	0.327	6.766	11.769	0.73
11.744	17.615	16.183	3.692	4.26	2.122

4.421	6.631	0.214	2.126	0.578	4.074
1.223	1.835	15.894	1.961	4.816	13.383
11.393	17.089	0.686	3.385	2.441	51.418
6.435	9.653	0.941	0.94	10.366	21.207
4.733	7.1	14.902	1.876	3.411	5.444
11.113	16.669	1.644	2.908	0.149	4.544
2.477	3.715	5.871	6.719	7.162	3.809
0.74	1.11	20.016	0.987	1.015	1.211
2.665	3.998	10.353	0.11	4.448	4.224
9.424	14.136	53.824	1.685	5.359	7.802
2.551	3.826	5.168	2.012	2.78	4.848
3.835	5.752	17.382	15.429	3.808	21.256
13.873	20.809	30.482	0.069	18.683	0.736
11.943	17.915	11.945	1.626	4.378	36.023
2.425	3.638	10.235	2.306	4.491	1.27
2.562	3.843	25.383	0.33	8.539	5.056
15.129	22.693	14.417	11.125	1.074	11.569
7.995	11.992	23.294	6.78	8.139	5.649
3	4.5	25.965	1.972	9.927	24.622
18.311	27.466	7.124	1.094	1.385	2.645
2.993	4.49	29.565	6.806	3.2	0.414
3.162	4.744	14.045	0.906	1.954	16.67
23.558	35.337	20.36	5.206	44.032	4.56
20.274	30.41	83.199	10.389	1.837	1.14
19.603	29.404	51.818	16.168	26.801	0.91
18.189	27.283	3.206	4.239	7.338	3.638
3.761	5.642	29.055	1.32	11.243	4.748
5.104	7.655	0.577	23.28	18.625	23.168
7.148	10.721	24.111	3.214	4.146	18.546
12.976	19.464	16.317	1.341	5.117	5.454
6.599	9.898	1.053	2.807	4.866	1.116
3.392	5.088	103.123	3.417	4.83	11.108
3.643	5.465	47.315	5.569	2.11	7.916
6.144	9.216	34.535	1.001	38.008	3.21
12.528	18.791	3.088	2.897	2.265	31.8
0.351	0.526	16.92	8.599	1.505	10.997
8.044	12.067	5.029	3.553	27.452	8.207
0.266	0.4	14.024	0.951	2.428	4.358
11.942	17.913	4.842	1.54	1.414	7.381
2.873	4.309	7.96	9.882	0.74	14.058
76.284	114.426	35.529	4.373	8.316	3.215
5.126	7.689	30.409	0.766	0.281	6.876
20.11	30.165	18.156	4.582	8.973	0.794
0.114	0.171	13.253	4.462	8.578	23.236
6.546	9.819	45.269	1.035	0.15	4.874
8.726	13.089	18.805	1.535	14.074	6.636
24.455	36.682	39.179	1.775	11.214	9.192

12.358	18.537	0.256	5.184	10.721	4.564
7.217	10.826	3.611	4.61	8.99	7.078
21.171	31.757	8.811	0.726	13.489	4.298
9.1	13.65	5.625	1.885	6.556	10.297
2.208	3.311	22.087	3.053	4.12	30.01
9.486	14.229	4.5	0.833	46.078	20.158
4.98	7.47	19.096	6.837	2.966	8.758
2.787	4.181	17.611	1.402	8.631	3.493
4.102	6.152	28.846	6.894	32.205	1.917
3.819	5.729	0.34	7.72	3.672	7.151
21.227	31.84	3.163	1.193	28.432	14.822
8.41	12.615	1.868	10.825	2.329	3.825
2.803	4.204	28.901	3.319	20.006	8.364
2.591	3.886	2.561	1.033	7.181	11.39
6.675	10.013	3.317	3.171	4.643	1.53
13.2	19.8	21.16	2.704	18.603	0.856
19.175	28.762	0.903	4.664	1.391	5.429
7.801	11.702	5.637	6.067	1.084	13.194
0.121	0.181	8.361	2.291	42.999	1.72
13.595	20.393	17.135	0.717	22.356	7.555
8.589	12.884	9.167	0.572	5.896	1.713
19.933	29.9	6.505	4.485	25.156	0.436
11.684	17.526	12.852	10.919	35.546	5.866
9.539	14.309	34.494	8.888	10.993	6.016
2.037	3.055	54.195	1.876	3.582	19.72
3.746	5.619	2.965	2.174	3.41	12.604
11.178	16.767	8.889	2.752	59.078	3.143
25.288	37.931	5.074	1.594	6.729	0.52
2.265	3.398	1.135	2.583	0.527	6.324
1.934	2.901	20.923	0.856	9.641	4.491
11.581	17.371	13.492	2.043	39.473	3.282
9.746	14.619	6.102	2.174	4.753	10.925
5.466	8.2	33.044	3.947	8.79	2.593
10.267	15.401	20.554	5.36	36.736	7.384
7.54	11.31	30.954	1.279	24.477	15.846
4.016	6.025	7.65	9.485	2.195	1.115
4.066	6.099	5.003	0.999	0.734	11.479
4.534	6.801	34.84	5.534	3.055	0.708
5.342	8.013	2.748	5.125	37.883	6.331
4.59	6.885	15.016	13.089	11.66	2.431
9.058	13.587	36.348	1.893	16.891	13.2
21.477	32.216	3.708	3.557	0.092	12.298
3.662	5.493	20.96	0.849	8.706	32.321
3.506	5.259	21.246	6.861	25.086	0.862
16.874	25.311	26.128	10.744	5.225	15.185
1.74	2.611	37.202	26.34	3.831	2.526
14.117	21.175	99.448	0.197	5.976	2.034

15.15	22.725	17.484	9.771	9.246	8.654
3.141	4.712	6.796	3.65	0.924	4.55
13.825	20.738	60.781	2.378	0.203	22.042
22.239	33.359	72.038	15.196	6.005	5.827
29.293	43.94	8.934	1.396	5.407	17.749
4.58	6.87	9.351	1.772	12.696	0.507
4.621	6.932	17.591	6.415	7.003	5.488
8.043	12.065	8.587	2.528	0.498	1.941
9.351	14.026	46.647	0.845	15.218	1.869
27.073	40.609	20.69	1.844	2.204	17.868
22.131	33.197	70.617	3.388	2.044	15.891
13.903	20.854	22.473	9.261	5.565	29.36
0.087	0.13	29.259	0.807	26.642	4.719
10.441	15.661	3.381	0.444	8.201	1.935
51.216	76.825	25.398	2.306	1.811	15.344
25.395	38.092	10.56	7.154	16.63	10.198
40.25	60.375	19.995	14.138	12.715	26.243
2.486	3.729	15.576	1.632	7.447	7.062
0.418	0.628	11.519	4.185	8.394	0.816
10.701	16.051	28.6	29.375	26.098	7.306
10.406	15.609	8.841	21.555	15.258	5.305
1.24	1.86	9.289	0.587	0.368	6.164
22.454	33.682	5.254	0.789	4.317	10.604
22.374	33.561	57.425	1.151	8.628	3.128
0.486	0.729	32.438	12.69	51.425	5.529
26.75	40.125	14.051	3.013	1.014	1.421
12.721	19.081	37.688	0.581	31.048	3.9
13.121	19.681	35.654	1.649	6.683	16.606
4.676	7.014	27.942	1.421	14.155	0.991
12.675	19.012	14.38	4.616	12.319	7.727
0.334	0.501	13.748	1.701	20.112	29.885
4.484	6.726	4.079	0.007	22.997	5.808
10.404	15.607	19.278	12.599	27.177	15.971
20.623	30.935	14.382	0.497	11.596	1.991
6.949	10.424	17.793	1.627	9.257	1.529
15.821	23.731	48.002	2.017	4.639	1.117
0.2	0.299	31.458	6.107	27.847	10.459
4.749	7.124	76.847	0.582	5.702	0.45
3.172	4.759	52.816	15.017	8.152	18.491
4.125	6.188	1.39	0.486	8.846	1.145
0.785	1.178	32.426	3.204	9.211	11.916
7.095	10.643	8.983	1.976	15.882	4.014
18.493	27.739	2.463	1.807	15.407	2.735
0.387	0.58	16.793	14.344	21.882	29.739
14.618	21.927	21.209	7.875	6.239	5.92
3.651	5.477	18.408	1.634	2.632	41.553
13.202	19.803	3.889	5.368	12.538	4.602

7.52	11.279	28.82	10.995	8.503	7.414
22.654	33.981	0.031	3.363	9.156	6.408
5.423	8.134	37.815	4.101	9.336	6.94
6.544	9.816	23.175	3.269	14.754	7.88
58.309	87.463	9.712	7.148	11.351	1.318
2.859	4.289	0.844	0.216	0.143	9.166
1.249	1.874	85.454	2.907	0.257	2.182
12.806	19.209	45.981	1.991	2.388	2.402
2.431	3.646	15.413	2.302	5.359	18.161
16.852	25.277	6.036	17.322	9.803	3.482
8.682	13.024	29.098	6.738	21.304	15.414
4.793	7.19	21.576	6.203	14.675	10.087
18.618	27.926	23.828	1.73	5.34	12.787
11.929	17.894	11.632	4.403	1.605	1.047
14.481	21.722	21.43	0.071	11.259	4.09
2.432	3.649	1.959	9.408	3.639	2.918
6.11	9.165	48.46	3.419	20.747	5.181
9.665	14.498	16.119	7.687	34.767	4.266
6.007	9.01	24.632	2.589	1.171	2.222
3.026	4.54	8.959	4.845	11.758	13.444