



Assignement 1

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As part of the course

ADM 3305 Business simulation analytics

Partial requirement of course **ADM 3305**

Wednesday September 29, 2021

Question 1:

Input Data	
A	5
M	128
Z_0	71
C	9
Mean	0.444270833
Variance	0.073932834

i	$5 \times (Z_{i-1} + 9)$	Z_i	U_i
0	0	71	0
1	364	108	0.84375
2	549	37	0.2890625
3	194	66	0.515625
4	339	83	0.6484375
5	424	40	0.3125
6	209	81	0.6328125
7	414	30	0.234375
8	159	31	0.2421875
9	164	36	0.28125
10	189	61	0.4765625
11	314	58	0.453125
12	299	43	0.3359375
13	224	96	0.75
14	489	105	0.8203125
15	534	22	0.171875
16	119	119	0.9296875
17	604	92	0.71875
18	469	85	0.6640625
19	434	50	0.390625
20	259	3	0.0234375
21	24	24	0.1875
22	129	1	0.0078125
23	14	14	0.109375
24	79	79	0.6171875
25	404	20	0.15625
26	109	109	0.8515625
27	554	42	0.328125
28	219	91	0.7109375
29	464	80	0.625

A)

#	5 Zi-1 + 9	Zi	Ui	Uniform Rand.
0	0	71	0	0.637268055
1	364	108	0.84375	0.169977816
2	549	37	0.2890625	0.603647109
3	194	66	0.515625	0.048192745
4	339	83	0.6484375	0.044927633
5	424	40	0.3125	0.839061832
6	209	81	0.6328125	0.882683126
7	414	30	0.234375	0.497109544
8	159	31	0.2421875	0.27199587
9	164	36	0.28125	0.353794879
10	189	61	0.4765625	0.064293889
11	314	58	0.453125	0.854217706
12	299	43	0.3359375	0.085742881
13	224	96	0.75	0.187535625
14	489	105	0.8203125	0.804875146
15	534	22	0.171875	0.006555603
16	119	119	0.9296875	0.487481827
17	604	92	0.71875	0.82283484
18	469	85	0.6640625	0.934209262
19	434	50	0.390625	0.25467582
20	259	3	0.0234375	0.362586628
21	24	24	0.1875	0.440419781
22	129	1	0.0078125	0.171816912
23	14	14	0.109375	0.978882916
24	79	79	0.6171875	0.133292717
25	404	20	0.15625	0.4206711
26	109	109	0.8515625	0.910593452
27	554	42	0.328125	0.782668189
28	219	91	0.7109375	0.362978442
29	464	80	0.625	0.272080901

Uniform Distribution Mean = 0.45235742

Uniform Distribution Variance = 0.097352446

The mean found using the linear congruential generator is very similar. No significant differences are found between the mean of both sets of values (0.45235742 and 0.444270833). However, the variance produced by the random uniform numbers is significantly higher (0.097352446) than the variance of the previous numbers (0.073932834). The difference is of 0.023419612 which represents an overall 31.68% increase from the previous variance to the variance found in the uniformly distributed values.

B)

#	5 Zi-1 + 9	Zi	Ui	Uniform Rand.	Interest Rate
0	0	71	0	0.637268055	0.039118042
1	364	108	0.84375	0.169977816	0.025099334
2	549	37	0.2890625	0.603647109	0.038109413
3	194	66	0.515625	0.048192745	0.021445782
4	339	83	0.6484375	0.044927633	0.021347829
5	424	40	0.3125	0.839061832	0.045171855
6	209	81	0.6328125	0.882683126	0.046480494
7	414	30	0.234375	0.497109544	0.034913286
8	159	31	0.2421875	0.27199587	0.028159876
9	164	36	0.28125	0.353794879	0.030613846
10	189	61	0.4765625	0.064293889	0.021928817
11	314	58	0.453125	0.854217706	0.045626531
12	299	43	0.3359375	0.085742881	0.022572286
13	224	96	0.75	0.187535625	0.025626069
14	489	105	0.8203125	0.804875146	0.044146254
15	534	22	0.171875	0.006555603	0.020196668
16	119	119	0.9296875	0.487481827	0.034624455
17	604	92	0.71875	0.82283484	0.044685045
18	469	85	0.6640625	0.934209262	0.048026278
19	434	50	0.390625	0.25467582	0.027640275
20	259	3	0.0234375	0.362586628	0.030877599
21	24	24	0.1875	0.440419781	0.033212593
22	129	1	0.0078125	0.171816912	0.025154507
23	14	14	0.109375	0.978882916	0.049366487
24	79	79	0.6171875	0.133292717	0.023998782
25	404	20	0.15625	0.4206711	0.032620133
26	109	109	0.8515625	0.910593452	0.047317804
27	554	42	0.328125	0.782668189	0.043480046
28	219	91	0.7109375	0.362978442	0.030889353
29	464	80	0.625	0.272080901	0.028162427

Interest Rate = $0.02 + ((0.05 - 0.02) * \text{Uniform Rand.})$

Question 2:

A)

Mean	70.8717949
Stand. Dev.	2.34443681

Mass Probability Function (PMF) = NORM.DIST(Request, Mean, Stand. Dev., FALSE)

Cumulative Probability Function (CDF) = NORM.DIST(Request, Mean, Stand. Dev., FALSE)

Date	Requests	PMF	CDF
3/23/2020	68	0.080361267	0.110298878
3/30/2020	73	0.11270232	0.817999642
4/6/2020	74	0.069866072	0.908948835
4/13/2020	72	0.151560073	0.684822237
4/20/2020	69	0.123723773	0.212319632
4/27/2020	71	0.169911264	0.521805222
5/4/2020	69	0.123723773	0.212319632
5/11/2020	69	0.123723773	0.212319632
5/18/2020	75	0.036106485	0.960868232
5/25/2020	68	0.080361267	0.110298878
6/1/2020	74	0.069866072	0.908948835
6/8/2020	71	0.169911264	0.521805222
6/15/2020	70	0.158797973	0.354999719
6/22/2020	71	0.169911264	0.521805222
6/29/2020	68	0.080361267	0.110298878
7/6/2020	71	0.169911264	0.521805222
7/13/2020	73	0.11270232	0.817999642
7/20/2020	71	0.169911264	0.521805222
7/27/2020	71	0.169911264	0.521805222
8/3/2020	70	0.158797973	0.354999719
8/10/2020	74	0.069866072	0.908948835
8/17/2020	67	0.04351368	0.049320111
8/24/2020	73	0.11270232	0.817999642
8/31/2020	73	0.11270232	0.817999642
9/7/2020	72	0.151560073	0.684822237
9/14/2020	69	0.123723773	0.212319632
9/21/2020	73	0.11270232	0.817999642
9/28/2020	74	0.069866072	0.908948835
10/5/2020	72	0.151560073	0.684822237
10/12/2020	72	0.151560073	0.684822237
10/19/2020	72	0.151560073	0.684822237
10/26/2020	72	0.151560073	0.684822237
11/2/2020	66	0.019642206	0.018853596
11/9/2020	72	0.151560073	0.684822237
11/16/2020	66	0.019642206	0.018853596
11/23/2020	75	0.036106485	0.960868232

11/30/2020	67	0.04351368	0.049320111
12/7/2020	72	0.151560073	0.684822237
12/14/2020	71	0.169911264	0.521805222
12/21/2020	74	0.069866072	0.908948835
12/28/2020	69	0.123723773	0.212319632
1/4/2021	69	0.123723773	0.212319632
1/11/2021	71	0.169911264	0.521805222
1/18/2021	71	0.169911264	0.521805222
1/25/2021	67	0.04351368	0.049320111
2/1/2021	68	0.080361267	0.110298878
2/8/2021	68	0.080361267	0.110298878
2/15/2021	75	0.036106485	0.960868232
2/22/2021	70	0.158797973	0.354999719
3/1/2021	67	0.04351368	0.049320111
3/8/2021	72	0.151560073	0.684822237
3/15/2021	71	0.169911264	0.521805222
3/22/2021	68	0.080361267	0.110298878
3/29/2021	73	0.11270232	0.817999642
4/5/2021	74	0.069866072	0.908948835
4/12/2021	72	0.151560073	0.684822237
4/19/2021	69	0.123723773	0.212319632
4/26/2021	71	0.169911264	0.521805222
5/3/2021	69	0.123723773	0.212319632
5/10/2021	69	0.123723773	0.212319632
5/17/2021	75	0.036106485	0.960868232
5/24/2021	68	0.080361267	0.110298878
5/31/2021	74	0.069866072	0.908948835
6/7/2021	71	0.169911264	0.521805222
6/14/2021	70	0.158797973	0.354999719
6/21/2021	71	0.169911264	0.521805222
6/28/2021	68	0.080361267	0.110298878
7/5/2021	71	0.169911264	0.521805222
7/12/2021	73	0.11270232	0.817999642
7/19/2021	71	0.169911264	0.521805222
7/26/2021	71	0.169911264	0.521805222
8/2/2021	70	0.158797973	0.354999719
8/9/2021	74	0.069866072	0.908948835
8/16/2021	67	0.04351368	0.049320111
8/23/2021	73	0.11270232	0.817999642
8/30/2021	73	0.11270232	0.817999642
9/6/2021	72	0.151560073	0.684822237
9/13/2021	69	0.123723773	0.212319632

B)

Approximately **75 rooms** should be protected from sale at a discount price on Mondays to best respond to the simulated demand. This number offers the highest revenue potential and significantly losses compared to most other simulated intervals. Thus, returning the greatest profits to the Hotel.

The Monte Carlo simulation:

Input Data		
Available Rooms		150
Full Price	\$	200.00
Discount Price	\$	120.00
Demand Mean		70.87179487
Demand Stand. Dev.		2.34443681

				Protect = 60	
				Sold	Revenue
RAND Mean 0.466677895 RAND Stand. Dev. 0.278902681	#	RAND	Probability	Demand	
	1	0.145993095	0.125111283	68	60 \$ 12,000.00
	2	0.470026159	0.50478924	71	60 \$ 12,000.00
	3	0.183842749	0.155267573	68	60 \$ 12,000.00
	4	0.05728059	0.071067613	67	60 \$ 12,000.00
	5	0.00230468	0.047956288	67	60 \$ 12,000.00
	6	0.788179377	0.875490857	74	60 \$ 12,000.00
	7	0.607747703	0.693502518	72	60 \$ 12,000.00
	8	0.648469846	0.742738582	72	60 \$ 12,000.00
	9	0.071665193	0.078342356	68	60 \$ 12,000.00
	10	0.502618398	0.551267352	71	60 \$ 12,000.00
	11	0.833795421	0.905962068	74	60 \$ 12,000.00
	12	0.430005642	0.447694786	71	60 \$ 12,000.00
	13	0.639628686	0.732407847	72	60 \$ 12,000.00
	14	0.521296632	0.577630105	71	60 \$ 12,000.00
	15	0.809374179	0.890413603	74	60 \$ 12,000.00
	16	0.324564773	0.305185565	70	60 \$ 12,000.00
	17	0.220873296	0.189070296	69	60 \$ 12,000.00
	18	0.369065594	0.363174243	70	60 \$ 12,000.00
	19	0.264704919	0.234480664	69	60 \$ 12,000.00
	20	0.202983734	0.17220945	69	60 \$ 12,000.00
	21	0.531682574	0.592147633	71	60 \$ 12,000.00
	22	0.980557806	0.967299428	75	60 \$ 12,000.00
	23	0.880455033	0.931041095	74	60 \$ 12,000.00
	24	0.253744349	0.222591877	69	60 \$ 12,000.00
	25	0.650639443	0.745241662	72	60 \$ 12,000.00
	26	0.736325994	0.833182458	73	60 \$ 12,000.00
	27	0.172903924	0.146097015	68	60 \$ 12,000.00
	28	0.20233371	0.171615436	69	60 \$ 12,000.00
	29	0.721779495	0.819815372	73	60 \$ 12,000.00
	30	0.757218894	0.851231321	73	60 \$ 12,000.00
	31	0.193361014	0.163549914	69	60 \$ 12,000.00
	32	0.923213924	0.949174404	75	60 \$ 12,000.00
	33	0.780985843	0.870117107	74	60 \$ 12,000.00
	34	0.406711943	0.414881038	70	60 \$ 12,000.00
	35	0.513601742	0.56680454	71	60 \$ 12,000.00
	36	0.861810863	0.921720723	74	60 \$ 12,000.00
	37	0.274733727	0.245659648	69	60 \$ 12,000.00
	38	0.1752728	0.14805143	68	60 \$ 12,000.00
	39	0.433896066	0.453216631	71	60 \$ 12,000.00

40	0.866107287	0.923948997	74	60	\$ 12,000.00
41	0.788710788	0.875881576	74	60	\$ 12,000.00
42	0.598474915	0.681734863	72	60	\$ 12,000.00
43	0.763198376	0.856147176	73	60	\$ 12,000.00
44	0.356306411	0.346150358	70	60	\$ 12,000.00
45	0.71013221	0.808641368	73	60	\$ 12,000.00
46	0.164392239	0.139218052	68	60	\$ 12,000.00
47	0.287468365	0.260257355	69	60	\$ 12,000.00
48	0.084557166	0.085329989	68	60	\$ 12,000.00
49	0.667093305	0.763801812	73	60	\$ 12,000.00
50	0.299668017	0.274649601	69	60	\$ 12,000.00
51	0.733525568	0.830660091	73	60	\$ 12,000.00
52	0.152878118	0.130268491	68	60	\$ 12,000.00
53	0.672978269	0.770254691	73	60	\$ 12,000.00
54	0.981670081	0.967589761	75	60	\$ 12,000.00
55	0.153679114	0.130877891	68	60	\$ 12,000.00
56	0.000398351	0.047278332	67	60	\$ 12,000.00
57	0.172318146	0.145616409	68	60	\$ 12,000.00
58	0.466760783	0.500118563	71	60	\$ 12,000.00
59	0.255587401	0.224566644	69	60	\$ 12,000.00
60	0.279118963	0.250636281	69	60	\$ 12,000.00

E(Rev./Day)	\$ 12,000.00
E(Loss/Day)	
E(Profit/Day)	

Bin Tops	Cum.	Freq.
\$ 9,000.00	0	0
\$ 10,000.00	32	32
\$ 11,000.00	60	28
\$ 12,000.00	60	0
\$ 13,000.00	60	0
\$ 14,000.00	60	0
\$ 15,000.00	60	0

		Protect = 65				Protect = 70	
Loss	Profit	Sold	Revenue	Loss	Profit	Sold	Revenue
\$ 1,600.00	\$ 10,400.00	65	\$ 13,000.00	\$ 600.00	\$ 12,400.00	68	\$ 13,600.00
\$ 2,200.00	\$ 9,800.00	65	\$ 13,000.00	\$ 1,200.00	\$ 11,800.00	70	\$ 14,000.00
\$ 1,600.00	\$ 10,400.00	65	\$ 13,000.00	\$ 600.00	\$ 12,400.00	68	\$ 13,600.00
\$ 1,400.00	\$ 10,600.00	65	\$ 13,000.00	\$ 400.00	\$ 12,600.00	67	\$ 13,400.00
\$ 1,400.00	\$ 10,600.00	65	\$ 13,000.00	\$ 400.00	\$ 12,600.00	67	\$ 13,400.00
\$ 2,800.00	\$ 9,200.00	65	\$ 13,000.00	\$ 1,800.00	\$ 11,200.00	70	\$ 14,000.00
\$ 2,400.00	\$ 9,600.00	65	\$ 13,000.00	\$ 1,400.00	\$ 11,600.00	70	\$ 14,000.00
\$ 2,400.00	\$ 9,600.00	65	\$ 13,000.00	\$ 1,400.00	\$ 11,600.00	70	\$ 14,000.00
\$ 1,600.00	\$ 10,400.00	65	\$ 13,000.00	\$ 600.00	\$ 12,400.00	68	\$ 13,600.00
\$ 2,200.00	\$ 9,800.00	65	\$ 13,000.00	\$ 1,200.00	\$ 11,800.00	70	\$ 14,000.00
\$ 2,800.00	\$ 9,200.00	65	\$ 13,000.00	\$ 1,800.00	\$ 11,200.00	70	\$ 14,000.00
\$ 2,200.00	\$ 9,800.00	65	\$ 13,000.00	\$ 1,200.00	\$ 11,800.00	70	\$ 14,000.00
\$ 2,400.00	\$ 9,600.00	65	\$ 13,000.00	\$ 1,400.00	\$ 11,600.00	70	\$ 14,000.00
\$ 2,200.00	\$ 9,800.00	65	\$ 13,000.00	\$ 1,200.00	\$ 11,800.00	70	\$ 14,000.00
\$ 2,800.00	\$ 9,200.00	65	\$ 13,000.00	\$ 1,800.00	\$ 11,200.00	70	\$ 14,000.00
\$ 2,000.00	\$ 10,000.00	65	\$ 13,000.00	\$ 1,000.00	\$ 12,000.00	70	\$ 14,000.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00
\$ 2,000.00	\$ 10,000.00	65	\$ 13,000.00	\$ 1,000.00	\$ 12,000.00	70	\$ 14,000.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00
\$ 2,200.00	\$ 9,800.00	65	\$ 13,000.00	\$ 1,200.00	\$ 11,800.00	70	\$ 14,000.00
\$ 3,000.00	\$ 9,000.00	65	\$ 13,000.00	\$ 2,000.00	\$ 11,000.00	70	\$ 14,000.00
\$ 2,800.00	\$ 9,200.00	65	\$ 13,000.00	\$ 1,800.00	\$ 11,200.00	70	\$ 14,000.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00
\$ 2,400.00	\$ 9,600.00	65	\$ 13,000.00	\$ 1,400.00	\$ 11,600.00	70	\$ 14,000.00
\$ 2,600.00	\$ 9,400.00	65	\$ 13,000.00	\$ 1,600.00	\$ 11,400.00	70	\$ 14,000.00
\$ 1,600.00	\$ 10,400.00	65	\$ 13,000.00	\$ 600.00	\$ 12,400.00	68	\$ 13,600.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00
\$ 2,600.00	\$ 9,400.00	65	\$ 13,000.00	\$ 1,600.00	\$ 11,400.00	70	\$ 14,000.00
\$ 2,600.00	\$ 9,400.00	65	\$ 13,000.00	\$ 1,600.00	\$ 11,400.00	70	\$ 14,000.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00
\$ 3,000.00	\$ 9,000.00	65	\$ 13,000.00	\$ 2,000.00	\$ 11,000.00	70	\$ 14,000.00
\$ 2,800.00	\$ 9,200.00	65	\$ 13,000.00	\$ 1,800.00	\$ 11,200.00	70	\$ 14,000.00
\$ 2,000.00	\$ 10,000.00	65	\$ 13,000.00	\$ 1,000.00	\$ 12,000.00	70	\$ 14,000.00
\$ 2,200.00	\$ 9,800.00	65	\$ 13,000.00	\$ 1,200.00	\$ 11,800.00	70	\$ 14,000.00
\$ 2,800.00	\$ 9,200.00	65	\$ 13,000.00	\$ 1,800.00	\$ 11,200.00	70	\$ 14,000.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00
\$ 1,600.00	\$ 10,400.00	65	\$ 13,000.00	\$ 600.00	\$ 12,400.00	68	\$ 13,600.00
\$ 2,200.00	\$ 9,800.00	65	\$ 13,000.00	\$ 1,200.00	\$ 11,800.00	70	\$ 14,000.00

\$ 2,800.00	\$ 9,200.00	65	\$ 13,000.00	\$ 1,800.00	\$ 11,200.00	70	\$ 14,000.00
\$ 2,800.00	\$ 9,200.00	65	\$ 13,000.00	\$ 1,800.00	\$ 11,200.00	70	\$ 14,000.00
\$ 2,400.00	\$ 9,600.00	65	\$ 13,000.00	\$ 1,400.00	\$ 11,600.00	70	\$ 14,000.00
\$ 2,600.00	\$ 9,400.00	65	\$ 13,000.00	\$ 1,600.00	\$ 11,400.00	70	\$ 14,000.00
\$ 2,000.00	\$ 10,000.00	65	\$ 13,000.00	\$ 1,000.00	\$ 12,000.00	70	\$ 14,000.00
\$ 2,600.00	\$ 9,400.00	65	\$ 13,000.00	\$ 1,600.00	\$ 11,400.00	70	\$ 14,000.00
\$ 1,600.00	\$ 10,400.00	65	\$ 13,000.00	\$ 600.00	\$ 12,400.00	68	\$ 13,600.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00
\$ 1,600.00	\$ 10,400.00	65	\$ 13,000.00	\$ 600.00	\$ 12,400.00	68	\$ 13,600.00
\$ 2,600.00	\$ 9,400.00	65	\$ 13,000.00	\$ 1,600.00	\$ 11,400.00	70	\$ 14,000.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00
\$ 2,600.00	\$ 9,400.00	65	\$ 13,000.00	\$ 1,600.00	\$ 11,400.00	70	\$ 14,000.00
\$ 1,600.00	\$ 10,400.00	65	\$ 13,000.00	\$ 600.00	\$ 12,400.00	68	\$ 13,600.00
\$ 2,600.00	\$ 9,400.00	65	\$ 13,000.00	\$ 1,600.00	\$ 11,400.00	70	\$ 14,000.00
\$ 3,000.00	\$ 9,000.00	65	\$ 13,000.00	\$ 2,000.00	\$ 11,000.00	70	\$ 14,000.00
\$ 1,600.00	\$ 10,400.00	65	\$ 13,000.00	\$ 600.00	\$ 12,400.00	68	\$ 13,600.00
\$ 1,400.00	\$ 10,600.00	65	\$ 13,000.00	\$ 400.00	\$ 12,600.00	67	\$ 13,400.00
\$ 1,600.00	\$ 10,400.00	65	\$ 13,000.00	\$ 600.00	\$ 12,400.00	68	\$ 13,600.00
\$ 2,200.00	\$ 9,800.00	65	\$ 13,000.00	\$ 1,200.00	\$ 11,800.00	70	\$ 14,000.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00
\$ 1,800.00	\$ 10,200.00	65	\$ 13,000.00	\$ 800.00	\$ 12,200.00	69	\$ 13,800.00

\$ 2,163.33	\$ 9,836.67	E(Rev./Day)	\$ 13,000.00	E(Rev./Day)	\$ 13,866.67
		E(Loss/Day)	\$ 1,163.33	E(Loss/Day)	
		E(Profit/Day)	\$ 11,836.67	E(Profit/Day)	

	Cum.	Freq.		Cum.	Freq.
		0	0		0
		0	0		0
		0	0		0
		0	0		0
		32	32		0
		60	28		56
		60	0		60
					4

		Protect = 75				Protect = 80	
Loss	Profit	Sold	Revenue	Loss	Profit	Sold	Revenue
\$ 240.00	\$ 13,360.00	68	\$ 13,600.00	\$ 840.00	\$ 12,760.00	68	\$ 13,600.00
\$ 200.00	\$ 13,800.00	71	\$ 14,200.00	\$ 480.00	\$ 13,720.00	71	\$ 14,200.00
\$ 240.00	\$ 13,360.00	68	\$ 13,600.00	\$ 840.00	\$ 12,760.00	68	\$ 13,600.00
\$ 360.00	\$ 13,040.00	67	\$ 13,400.00	\$ 960.00	\$ 12,440.00	67	\$ 13,400.00
\$ 360.00	\$ 13,040.00	67	\$ 13,400.00	\$ 960.00	\$ 12,440.00	67	\$ 13,400.00
\$ 800.00	\$ 13,200.00	74	\$ 14,800.00	\$ 120.00	\$ 14,680.00	74	\$ 14,800.00
\$ 400.00	\$ 13,600.00	72	\$ 14,400.00	\$ 360.00	\$ 14,040.00	72	\$ 14,400.00
\$ 400.00	\$ 13,600.00	72	\$ 14,400.00	\$ 360.00	\$ 14,040.00	72	\$ 14,400.00
\$ 240.00	\$ 13,360.00	68	\$ 13,600.00	\$ 840.00	\$ 12,760.00	68	\$ 13,600.00
\$ 200.00	\$ 13,800.00	71	\$ 14,200.00	\$ 480.00	\$ 13,720.00	71	\$ 14,200.00
\$ 800.00	\$ 13,200.00	74	\$ 14,800.00	\$ 120.00	\$ 14,680.00	74	\$ 14,800.00
\$ 200.00	\$ 13,800.00	71	\$ 14,200.00	\$ 480.00	\$ 13,720.00	71	\$ 14,200.00
\$ 400.00	\$ 13,600.00	72	\$ 14,400.00	\$ 360.00	\$ 14,040.00	72	\$ 14,400.00
\$ 200.00	\$ 13,800.00	71	\$ 14,200.00	\$ 480.00	\$ 13,720.00	71	\$ 14,200.00
\$ 800.00	\$ 13,200.00	74	\$ 14,800.00	\$ 120.00	\$ 14,680.00	74	\$ 14,800.00
\$ -	\$ 14,000.00	70	\$ 14,000.00	\$ 600.00	\$ 13,400.00	70	\$ 14,000.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00
\$ -	\$ 14,000.00	70	\$ 14,000.00	\$ 600.00	\$ 13,400.00	70	\$ 14,000.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00
\$ 200.00	\$ 13,800.00	71	\$ 14,200.00	\$ 480.00	\$ 13,720.00	71	\$ 14,200.00
#####	\$ 13,000.00	75	\$ 15,000.00	\$ -	\$ 15,000.00	75	\$ 15,000.00
\$ 800.00	\$ 13,200.00	74	\$ 14,800.00	\$ 120.00	\$ 14,680.00	74	\$ 14,800.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00
\$ 400.00	\$ 13,600.00	72	\$ 14,400.00	\$ 360.00	\$ 14,040.00	72	\$ 14,400.00
\$ 600.00	\$ 13,400.00	73	\$ 14,600.00	\$ 240.00	\$ 14,360.00	73	\$ 14,600.00
\$ 240.00	\$ 13,360.00	68	\$ 13,600.00	\$ 840.00	\$ 12,760.00	68	\$ 13,600.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00
\$ 600.00	\$ 13,400.00	73	\$ 14,600.00	\$ 240.00	\$ 14,360.00	73	\$ 14,600.00
\$ 600.00	\$ 13,400.00	73	\$ 14,600.00	\$ 240.00	\$ 14,360.00	73	\$ 14,600.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00
#####	\$ 13,000.00	75	\$ 15,000.00	\$ -	\$ 15,000.00	75	\$ 15,000.00
\$ 800.00	\$ 13,200.00	74	\$ 14,800.00	\$ 120.00	\$ 14,680.00	74	\$ 14,800.00
\$ -	\$ 14,000.00	70	\$ 14,000.00	\$ 600.00	\$ 13,400.00	70	\$ 14,000.00
\$ 200.00	\$ 13,800.00	71	\$ 14,200.00	\$ 480.00	\$ 13,720.00	71	\$ 14,200.00
\$ 800.00	\$ 13,200.00	74	\$ 14,800.00	\$ 120.00	\$ 14,680.00	74	\$ 14,800.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00
\$ 240.00	\$ 13,360.00	68	\$ 13,600.00	\$ 840.00	\$ 12,760.00	68	\$ 13,600.00
\$ 200.00	\$ 13,800.00	71	\$ 14,200.00	\$ 480.00	\$ 13,720.00	71	\$ 14,200.00

\$ 800.00	\$ 13,200.00	74	\$ 14,800.00	\$ 120.00	\$ 14,680.00	74	\$ 14,800.00
\$ 800.00	\$ 13,200.00	74	\$ 14,800.00	\$ 120.00	\$ 14,680.00	74	\$ 14,800.00
\$ 400.00	\$ 13,600.00	72	\$ 14,400.00	\$ 360.00	\$ 14,040.00	72	\$ 14,400.00
\$ 600.00	\$ 13,400.00	73	\$ 14,600.00	\$ 240.00	\$ 14,360.00	73	\$ 14,600.00
\$ -	\$ 14,000.00	70	\$ 14,000.00	\$ 600.00	\$ 13,400.00	70	\$ 14,000.00
\$ 600.00	\$ 13,400.00	73	\$ 14,600.00	\$ 240.00	\$ 14,360.00	73	\$ 14,600.00
\$ 240.00	\$ 13,360.00	68	\$ 13,600.00	\$ 840.00	\$ 12,760.00	68	\$ 13,600.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00
\$ 240.00	\$ 13,360.00	68	\$ 13,600.00	\$ 840.00	\$ 12,760.00	68	\$ 13,600.00
\$ 600.00	\$ 13,400.00	73	\$ 14,600.00	\$ 240.00	\$ 14,360.00	73	\$ 14,600.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00
\$ 600.00	\$ 13,400.00	73	\$ 14,600.00	\$ 240.00	\$ 14,360.00	73	\$ 14,600.00
\$ 240.00	\$ 13,360.00	68	\$ 13,600.00	\$ 840.00	\$ 12,760.00	68	\$ 13,600.00
\$ 600.00	\$ 13,400.00	73	\$ 14,600.00	\$ 240.00	\$ 14,360.00	73	\$ 14,600.00
#####	\$ 13,000.00	75	\$ 15,000.00	\$ -	\$ 15,000.00	75	\$ 15,000.00
\$ 240.00	\$ 13,360.00	68	\$ 13,600.00	\$ 840.00	\$ 12,760.00	68	\$ 13,600.00
\$ 360.00	\$ 13,040.00	67	\$ 13,400.00	\$ 960.00	\$ 12,440.00	67	\$ 13,400.00
\$ 240.00	\$ 13,360.00	68	\$ 13,600.00	\$ 840.00	\$ 12,760.00	68	\$ 13,600.00
\$ 200.00	\$ 13,800.00	71	\$ 14,200.00	\$ 480.00	\$ 13,720.00	71	\$ 14,200.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00
\$ 120.00	\$ 13,680.00	69	\$ 13,800.00	\$ 720.00	\$ 13,080.00	69	\$ 13,800.00

\$ 376.67	E(Rev./Day)	\$ 14,163.33	E(Rev./Day)	\$ 14,163.33
	E(Loss/Day)	\$ 502.00	E(Loss/Day)	
	E(Profit/Day)	\$ 13,661.33	E(Profit/Day)	
\$ 13,490.00				

	Cum.	Freq.		Cum.	Freq.
		0		0	0
		0		0	0
		0		0	0
		0		3	3
	13	13		28	25
	36	23		49	21
	57	21		60	11

Loss	Profit
\$ 1,440.00	\$ 12,160.00
\$ 1,080.00	\$ 13,120.00
\$ 1,440.00	\$ 12,160.00
\$ 1,560.00	\$ 11,840.00
\$ 1,560.00	\$ 11,840.00
\$ 720.00	\$ 14,080.00
\$ 960.00	\$ 13,440.00
\$ 960.00	\$ 13,440.00
\$ 1,440.00	\$ 12,160.00
\$ 1,080.00	\$ 13,120.00
\$ 720.00	\$ 14,080.00
\$ 1,080.00	\$ 13,120.00
\$ 960.00	\$ 13,440.00
\$ 1,080.00	\$ 13,120.00
\$ 720.00	\$ 14,080.00
\$ 1,200.00	\$ 12,800.00
\$ 1,320.00	\$ 12,480.00
\$ 1,200.00	\$ 12,800.00
\$ 1,320.00	\$ 12,480.00
\$ 1,320.00	\$ 12,480.00
\$ 1,080.00	\$ 13,120.00
\$ 600.00	\$ 14,400.00
\$ 720.00	\$ 14,080.00
\$ 1,320.00	\$ 12,480.00
\$ 960.00	\$ 13,440.00
\$ 840.00	\$ 13,760.00
\$ 1,440.00	\$ 12,160.00
\$ 1,320.00	\$ 12,480.00
\$ 840.00	\$ 13,760.00
\$ 840.00	\$ 13,760.00
\$ 1,320.00	\$ 12,480.00
\$ 600.00	\$ 14,400.00
\$ 720.00	\$ 14,080.00
\$ 1,200.00	\$ 12,800.00
\$ 1,080.00	\$ 13,120.00
\$ 720.00	\$ 14,080.00
\$ 1,320.00	\$ 12,480.00
\$ 1,440.00	\$ 12,160.00
\$ 1,080.00	\$ 13,120.00

\$ 720.00	\$ 14,080.00
\$ 720.00	\$ 14,080.00
\$ 960.00	\$ 13,440.00
\$ 840.00	\$ 13,760.00
\$ 1,200.00	\$ 12,800.00
\$ 840.00	\$ 13,760.00
\$ 1,440.00	\$ 12,160.00
\$ 1,320.00	\$ 12,480.00
\$ 1,440.00	\$ 12,160.00
\$ 840.00	\$ 13,760.00
\$ 1,320.00	\$ 12,480.00
\$ 840.00	\$ 13,760.00
\$ 1,440.00	\$ 12,160.00
\$ 840.00	\$ 13,760.00
\$ 600.00	\$ 14,400.00
\$ 1,440.00	\$ 12,160.00
\$ 1,560.00	\$ 11,840.00
\$ 1,440.00	\$ 12,160.00
\$ 1,080.00	\$ 13,120.00
\$ 1,320.00	\$ 12,480.00
\$ 1,320.00	\$ 12,480.00

\$ 1,102.00
\$ 13,061.33

--

C) Considering the results of the previous simulation that approximately 75 rooms should be protected from sale at a discount price on Mondays to best respond to the simulated demand, the remainder of available rooms should be available for sale at a discount price of 120\$. With a total of 150 rooms, said remainder would be approximately **75 rooms on Monday nights**.

D) If the forecast is too high and fewer business customers appear on average, incoming revenue will decline on average due to the missed opportunities that could have been generated with leisure travellers instead of protecting rooms from a discount price.

E) If the forecast is too low and more business customers appear on average, incoming revenue will decline on average due to the missed opportunities that could have been generated by accommodating the entire demand of business customers at a full price.

F)

Mean: 70.8717949

Stand Dev: 2.34443681

Critical Fractile:

- Probability of Underage Cost: **cost of not protecting enough rooms to respond to Business Demand ->**
 - Amount missed out on business sale 200\$ + 0\$ due to room availability (insufficient data to determine whether there would be a potential 120\$ leisure sale or not) = **200\$**
- Probability of Overage Cost: **cost of protecting too many rooms to respond to Business Demand ->**
 - Amount missed out on business sale 200\$ + known potential revenue missed due to protection 120\$ = **320\$**
- Probability continuous distribution: $Fd(q) = \text{underage cost} / (\text{overage cost} - \text{underage cost}) \rightarrow$
 - $\Rightarrow 200\$ / (320\$ - 200\$) \Rightarrow 200\$ / 120\$ \Rightarrow 1.6666 \Rightarrow \mathbf{1.666667\%}$
- $\text{NORM.INV}(0.0166667, 70.8717949, 2.34443681) \Rightarrow 65.88273 = \mathbf{66}$

While the condition for lost profit was very similar to the Monte Carlo simulation, the generation of random demand values seems to have impacted the most favorable number of protected rooms. The quantification of cost was significantly easier to establish using the critical fractile. The difference found is of approximately 9 protected rooms from the simulation to the critical fractile (75, 66).

Attestation of Personal Ethics

Individual work:

By signing this statement, I certify that I have reviewed the attached work in its entirety and that I have followed all relevant citation and bibliographic reference rules in effect at the Telfer School of Management at the University of Ottawa and the University's Academic Fraud Policy as set out in the University's Undergraduate Yearbook. University of Ottawa Fraud and Plagiarism Webpage.

First name: ____ Simon ____

Name (in moulded letters): ____ Brunet ____

Signature (initials): ____ S.B. ____

Student number: __300065963__

Date: 09/29/2021