

# A MATHEMATICAL PROGRAMMING APPROACH TO APPLICANT SELECTION FOR A DEGREE PROGRAM

## Appendix A: Final Results of Selection Processes: 2007, 2008, and 2009.

Table 4 displays the final results for the 2007 selection process, with the applicants arranged by descending order of scores. As the “selected” column indicates, applicants in positions 44, 45, 50, and 52 are the four applicants (of the top-ranked 53) who are not among the 53 candidates on the definitive admissions list (i.e., after application of the equity criteria); applicants in positions 54, 55, 57, and 64 are their replacements.

Ranking	Score	Gender	Non- Santiago region	Lower-income quintiles (definition 2)	Selected
1	77.3967	Male	Yes	Yes	Yes
2	74.6663	Male	No	Yes	Yes
3	73.1412	Female	No	Yes	Yes
4	70.9622	Male	No	Yes	Yes
5	70.2533	Male	Yes	Yes	Yes
6	70.0854	Male	Yes	Yes	Yes
7	68.9846	Male	No	Yes	Yes
8	68.3338	Male	Yes	Yes	Yes
9	68.2611	Male	No	Yes	Yes
10	68.2314	Female	Yes	Yes	Yes
11	67.7061	Male	No	No	Yes
12	67.5873	Male	Yes	Yes	Yes

13	67.4197	Male	Yes	Yes	Yes
14	67.3683	Female	No	Yes	Yes
15	67.336	Male	Yes	Yes	Yes
16	67.148	Male	No	No	Yes
17	65.7685	Male	No	Yes	Yes
18	65.3751	Female	Yes	Yes	Yes
19	65.0443	Male	No	Yes	Yes
20	64.495	Female	No	Yes	Yes
21	64.2388	Female	Yes	Yes	Yes
22	63.8693	Male	No	Yes	Yes
23	63.4154	Male	No	Yes	Yes
24	63.3793	Male	No	Yes	Yes
25	63.0156	Male	Yes	Yes	Yes
26	62.8584	Male	No	Yes	Yes
27	62.7446	Male	No	Yes	Yes
28	62.6285	Male	Yes	Yes	Yes
29	62.2127	Male	Yes	Yes	Yes
30	62.1483	Male	Yes	Yes	Yes
31	62.1481	Male	Yes	Yes	Yes
32	62.0838	Female	Yes	Yes	Yes
33	62.0832	Male	No	Yes	Yes
34	62.0342	Male	No	Yes	Yes
35	61.9296	Female	No	Yes	Yes
36	61.7264	Male	Yes	Yes	Yes

37	61.4523	Male	Yes	No	Yes
38	61.1665	Male	Yes	Yes	Yes
39	60.8406	Male	No	Yes	Yes
40	60.8082	Male	Yes	Yes	Yes
41	60.6791	Male	No	Yes	Yes
42	60.6263	Male	Yes	Yes	Yes
43	60.4522	Male	Yes	No	Yes
44	60.3994	Male	No	Yes	No
45	60.0838	Male	No	Yes	No
46	59.9693	Female	Yes	Yes	Yes
47	59.8533	Male	Yes	No	Yes
48	59.4615	Female	Yes	Yes	Yes
49	59.4572	Female	Yes	Yes	Yes
50	59.4336	Male	No	Yes	No
51	59.2239	Female	Yes	Yes	Yes
52	58.7673	Male	No	Yes	No
53	58.659	Female	Yes	Yes	Yes
54	58.6414	Female	Yes	Yes	Yes
55	58.5681	Male	Yes	Yes	Yes
56	57.7766	Male	No	Yes	No
57	57.7504	Female	Yes	Yes	Yes
58	57.5946	Male	No	Yes	No
59	57.5842	Male	No	Yes	No
60	57.5556	Male	No	Yes	No

61	57.5294	Male	Yes	Yes	No
62	57.3431	Male	Yes	Yes	No
63	57.2793	Male	No	No	No
64	56.9899	Female	Yes	Yes	Yes
65	56.5452	Male	Yes	Yes	No
66	56.5313	Female	No	Yes	No
67	56.4444	Male	Yes	Yes	No
68	56.421	Male	Yes	No	No
69	56.2399	Male	No	Yes	No
70	56.1681	Male	No	Yes	No
71	55.9509	Female	No	Yes	No
72	55.821	Male	Yes	Yes	No
73	55.6551	Male	No	Yes	No
74	55.4727	Female	No	Yes	No
75	55.4646	Female	No	Yes	No
76	55.4358	Male	Yes	Yes	No
77	55.2457	Male	No	Yes	No
78	55.2024	Male	No	Yes	No
79	55.0265	Female	No	Yes	No
80	55.0064	Male	No	Yes	No
81	55.0007	Male	Yes	Yes	No
82	54.9741	Female	No	Yes	No
83	54.9328	Male	Yes	Yes	No
84	54.59	Male	No	No	No

85	54.4713	Male	Yes	Yes	No
86	54.3639	Female	Yes	No	No
87	54.1758	Male	No	Yes	No

**Table 4: The table shows the final results of 2007 selection process.**

Table 5 displays the final results for the 2008 selection process. As with the preceding table, the applicants are arranged by descending order of scores. The “selected” column indicates that those ranked in positions 39 and 51 are the two candidates of the top-ranked 51 who are not among the 51 on the definitive admissions list (i.e., after application of the equity criteria); applicants in positions 53 and 59 are their replacements.

			<b>Non-Santiago region</b>	<b>Lower-income quintile</b>	
<b>Ranking</b>	<b>Score</b>	<b>Gender</b>			<b>Selected</b>
1	74.80	Female	Yes	No	Yes
2	74.45	Male	Yes	Yes	Yes
3	73.60	Male	No	No	Yes
4	70.85	Male	Yes	Yes	Yes
5	69.45	Female	Yes	Yes	Yes
6	69.10	Male	Yes	Yes	Yes
7	69.10	Male	No	Yes	Yes
8	68.15	Male	Yes	Yes	Yes
9	68.15	Female	No	Yes	Yes

10	68.00	Male	No	Yes	Yes
11	67.65	Male	No	No	Yes
12	67.40	Male	Yes	No	Yes
13	67.35	Male	Yes	Yes	Yes
14	67.35	Male	Yes	Yes	Yes
15	67.05	Male	Yes	No	Yes
16	66.90	Male	Yes	Yes	Yes
17	66.30	Male	Yes	Yes	Yes
18	66.10	Male	No	Yes	Yes
19	66.10	Male	No	No	Yes
20	65.55	Male	No	No	Yes
21	65.40	Female	No	Yes	Yes
22	65.30	Female	Yes	Yes	Yes
23	65.00	Male	No	Yes	Yes
24	64.50	Female	No	Yes	Yes
25	64.40	Male	No	Yes	Yes
26	64.05	Male	No	No	Yes
27	63.90	Male	Yes	No	Yes
28	63.90	Male	No	No	Yes
29	63.85	Male	No	Yes	Yes
30	63.85	Male	Yes	No	Yes
31	63.60	Male	Yes	Yes	Yes
32	63.60	Female	No	No	Yes
33	63.55	Male	Yes	Yes	Yes

34	63.25	Female	No	No	Yes
35	63.00	Male	Yes	Yes	Yes
36	62.65	Female	Yes	Yes	Yes
37	62.65	Female	No	No	Yes
38	62.50	Female	Yes	No	Yes
39	62.50	Male	No	No	No
40	62.45	Female	No	Yes	Yes
41	62.35	Male	No	Yes	Yes
42	62.25	Female	No	Yes	Yes
43	62.20	Male	Yes	Yes	Yes
44	62.15	Male	Yes	Yes	Yes
45	61.70	Female	Yes	Yes	Yes
46	61.60	Female	Yes	Yes	Yes
47	61.45	Male	No	Yes	Yes
48	61.40	Male	Yes	Yes	Yes
49	61.40	Female	No	Yes	Yes
50	60.80	Male	Yes	Yes	Yes
51	60.80	Male	Yes	No	No
52	60.75	Female	Yes	No	No
53	60.60	Male	Yes	Yes	Yes
54	60.60	Female	No	No	No
55	60.40	Male	No	Yes	No
56	60.40	Male	Yes	No	No
57	60.35	Male	No	No	No

58	60.10	Male	No	Yes	No
59	59.95	Female	Yes	Yes	Yes
60	59.90	Male	Yes	Yes	No
61	59.90	Male	No	Yes	No
62	59.70	Male	Yes	No	No
63	59.50	Male	No	Yes	No
64	59.50	Male	No	No	No
65	59.45	Female	Yes	Yes	No
66	59.45	Female	No	No	No
67	59.25	Female	No	Yes	No
68	59.00	Male	No	No	No
69	58.95	Male	No	No	No
70	58.80	Male	No	Yes	No
71	58.75	Male	Yes	Yes	No
72	58.75	Female	No	Yes	No
73	58.35	Male	Yes	No	No
74	57.90	Male	Yes	Yes	No
75	57.90	Male	No	Yes	No
76	57.65	Female	No	Yes	No
77	57.60	Male	No	No	No
78	57.55	Female	Yes	No	No
79	57.30	Female	Yes	Yes	No
80	57.00	Male	Yes	Yes	No
81	56.95	Male	No	Yes	No

82	56.90	Male	Yes	Yes	No
83	56.75	Male	No	Yes	No

**Table 5: The table shows the final results of 2008 selection process.**

Table 6 displays the final results for the 2009 selection process. As with the preceding table, the applicants are arranged by descending order of scores. In this case, however, the score is the average of the six scenarios. The “is an engineer” column reflects the engineering-profession constraint, which was not present in 2007 and 2008. The right column gives the number of scenarios in which an applicant is selected in the final solution. The “selected” column indicates the 14 candidates who were among the best 47 scorers, but who were replaced in the final admissions list by 14 others who were not originally among those 47. Note, for example, that the eighth-ranked applicant is not on the final list because of his status as a male engineer from the Santiago region in the top-income quintile.

	<b>Weighted scores</b>	<b>Gender</b>	<b>Non-Santiago region</b>	<b>Lower - income quintiles</b>	<b>Is an engineer</b>	<b>Selected</b>	<b>No. of scenarios</b>
<b>Ranking</b>							
1	72.13	Male	No	Yes	True	Yes	6
2	70.14	Female	Yes	No	True	Yes	6
3	68.97	Male	No	Yes	True	Yes	6
4	68.68	Male	Yes	No	True	Yes	6
5	67.51	Male	No	No	True	Yes	6
6	67.18	Male	Yes	Yes	True	Yes	6

7	66.98	Male	Yes	No	True	Yes	4
8	66.26	Male	Yes	No	True	No	2
9	65.57	Male	No	Yes	True	Yes	6
10	65.46	Female	Yes	Yes	False	Yes	6
11	65.27	Male	No	Yes	True	Yes	6
12	64.74	Male	Yes	Yes	False	Yes	6
13	64.49	Male	No	No	True	Yes	6
14	64.15	Male	No	Yes	True	Yes	6
15	63.54	Female	No	Yes	True	Yes	6
16	63.22	Male	No	No	True	Yes	6
17	62.96	Male	Yes	Yes	False	Yes	6
18	62.86	Male	Yes	Yes	True	Yes	6
19	62.60	Male	Yes	Yes	False	Yes	6
20	61.35	Male	Yes	No	True	No	
21	61.30	Female	Yes	No	True	Yes	5
22	61.26	Male	No	No	True	No	1
23	61.21	Male	Yes	Yes	False	Yes	6
24	61.11	Male	No	No	True	No	2
25	60.66	Male	No	No	True	No	
26	60.62	Male	No	Yes	False	Yes	6
27	60.56	Male	No	Yes	True	Yes	6
28	60.47	Male	Yes	No	True	No	
29	60.41	Male	No	No	True	No	
30	60.24	Male	Yes	No	True	No	

31	59.96	Male	Yes	No	True	No	
32	59.75	Male	No	No	True	No	
33	59.63	Male	Yes	No	False	No	1
34	59.61	Male	No	Yes	True	Yes	6
35	59.53	Male	Yes	No	True	No	
36	59.39	Male	Yes	Yes	True	Yes	6
37	59.35	Male	No	Yes	True	Yes	6
38	59.14	Male	No	Yes	True	Yes	6
39	59.13	Male	Yes	Yes	True	Yes	6
40	59.10	Male	Yes	Yes	True	Yes	6
41	58.66	Male	Yes	No	True	No	
42	58.37	Female	Yes	Yes	False	Yes	6
43	58.15	Male	No	No	False	Yes	6
44	57.64	Female	Yes	No	True	No	
45	57.37	Female	No	Yes	True	Yes	6
46	57.26	Female	No	No	True	Yes	3
47	56.97	Male	No	Yes	False	Yes	6
48	56.88	Male	Yes	No	True	No	
49	56.14	Male	No	Yes	False	Yes	6
50	56.11	Male	No	Yes	True	Yes	6
51	56.07	Female	Yes	No	True	No	
52	55.71	Male	Yes	No	True	No	
53	55.53	Female	Yes	Yes	False	Yes	6
54	55.42	Female	No	No	True	No	

55	55.22	Female	No	Yes	False	Yes	6
56	54.99	Male	Yes	Yes	True	No	
57	54.90	Female	No	Yes	True	Yes	6
58	54.62	Male	Yes	Yes	True	No	
59	54.53	Female	No	Yes	True	Yes	6
60	54.49	Female	Yes	No	True	No	
61	53.96	Female	No	Yes	True	Yes	6
62	53.63	Male	No	Yes	True	Yes	3
63	53.43	Female	No	Yes	True	Yes	6
64	53.29	Male	No	Yes	True	No	3
65	53.22	Male	No	Yes	True	No	
66	53.16	Male	No	No	True	No	
67	53.14	Male	No	No	True	No	
68	53.12	Male	No	Yes	True	No	
69	53.11	Female	Yes	Yes	True	Yes	6
70	53.08	Female	No	No	True	No	
71	53.07	Male	No	Yes	False	Yes	6
72	52.84	Female	No	Yes	True	Yes	6
73	52.25	Male	No	Yes	True	No	
74	51.54	Female	No	No	True	No	
75	51.01	Male	No	Yes	False	Yes	6
76	50.81	Male	Yes	Yes	True	No	
77	50.36	Female	Yes	No	False	No	
78	50.16	Male	Yes	No	False	No	

79	49.94	Male	Yes	Yes	True	No	
80	49.38	Male	Yes	No	True	No	
81	49.03	Male	No	No	True	No	
82	48.98	Female	Yes	Yes	False	Yes	6
83	48.17	Male	Yes	Yes	True	No	
84	47.60	Male	Yes	Yes	True	No	
85	47.40	Male	Yes	No	True	No	
86	47.04	Male	Yes	No	True	No	

**Table 6: The table shows the final results of 2009 selection process.**

### **Appendix B: Application of Selection Algorithm to 2008 Process**

In this section, we illustrate the functioning of the selection algorithm as it was applied to the 2008 selection process. Table 7 contains all the applicants who appear in at least one best solution of any model; it also indicates the solution (of nine) by which they were selected. The listing is ordered by the candidates' personal ID numbers (see the leftmost column), which were assigned to ensure anonymity.

Note that model 2 has two second-best solutions, denoted 2a and 2b. In case of a tie between any solutions of a given model, the technique for assigning the general weighting coefficient is generalized. Thus, if one best solution and two second-best solutions exist (as in this case), the best solution is assigned a value of 1 as usual, while the two second-best solutions are each assigned one-half of the sum of the second- and third-best coefficients ( $((0.6 + 0.3) / 2 = 0.45)$ ), thus maintaining the condition that the sum of the coefficients equals 1.9.

Table 8 shows the successful applicants' progress through the stages of the selection process, indicating in the various columns whether they were immediately selected for admission in Step 1, advanced to the following steps (in which case their weighting coefficients are also given), selected for admission in Step 3, or placed on the waiting list.

In Tables 7 and 8, if applicant  $i$  possesses attribute  $j$ , component  $i,j$  in the table is marked with an X.

<b>Applicant</b>	<b>BS1</b>	<b>BS2</b>	<b>BS3</b>	<b>BS1</b>	<b>BS2a</b>	<b>BS2a</b>	<b>BS1</b>	<b>BS2</b>	<b>BS3</b>
<b>ID</b>	<b>Mod 1</b>	<b>Mod 1</b>	<b>Mod 1</b>	<b>Mod 2</b>	<b>Mod 2</b>	<b>Mod 2</b>	<b>Mod 3</b>	<b>Mod 3</b>	<b>Mod 3</b>
13			X		X				
21	X	X	X	X	X	X	X	X	X
42	X	X	X	X	X	X	X	X	X
49	X	X	X	X	X	X	X	X	X
62	X	X	X	X	X	X	X	X	X
66	X	X	X	X	X	X	X	X	X
139	X	X	X	X	X	X	X	X	X
169	X	X	X	X	X	X	X	X	X
175	X	X	X	X	X	X	X	X	X
176							X	X	X
198	X	X	X	X	X	X	X	X	X
241	X	X	X	X	X	X	X	X	X
249							X	X	X
250	X	X	X	X	X	X	X	X	X
258	X	X	X	X	X	X	X	X	X
261	X	X	X	X	X	X	X	X	X

290	X	X	X	X	X	X	X	X	X
291	X	X	X	X	X	X	X	X	X
302	X	X	X	X	X	X	X	X	X
314	X	X	X	X	X	X	X	X	X
315	X	X	X	X	X	X	X	X	X
325	X	X	X	X	X	X	X		X
371	X	X	X	X	X	X	X	X	X
372	X	X	X	X	X	X	X	X	X
382	X	X	X	X	X	X	X	X	X
392	X	X	X	X	X	X	X	X	X
398	X	X	X	X	X	X	X	X	X
402	X	X	X	X	X	X	X	X	X
413	X	X	X	X	X	X	X	X	X
444	X	X	X	X	X	X	X	X	X
456	X	X	X	X	X	X	X	X	X
469	X	X	X	X	X	X	X	X	
485	X	X	X	X	X	X	X	X	X
499	X	X	X	X	X	X	X	X	X
510	X	X	X	X	X	X	X	X	X
517	X	X	X	X	X	X	X	X	X
531	X	X	X	X	X	X	X	X	X
538	X	X	X	X	X	X	X	X	X
544	X	X	X	X	X	X	X	X	X
548	X	X	X	X	X	X	X	X	X

567	X		X	X	X				
577	X	X	X	X	X	X	X	X	X
593	X	X	X	X	X	X	X	X	X
635	X	X	X	X	X	X	X	X	X
647	X	X		X		X		X	X
663	X	X	X	X	X	X	X	X	X
669	X	X	X	X	X	X	X	X	X
710	X	X	X	X	X	X	X	X	X
756	X	X	X	X	X	X	X	X	X
757	X	X	X	X	X	X	X	X	X
784	X	X	X	X	X	X	X	X	X
808	X	X	X	X	X	X	X	X	X
818		X				X			
868	X	X	X	X	X	X	X	X	X
882	X	X	X	X	X	X	X	X	X

**Table 7: The table shows the applicants selected in best solutions, by model and solution (2008 selection process). BS: best solution; MOD: model.**

<b>Applicant ID</b>	<b>Selected (Step 1)</b>	<b>Applicants advancing to following steps (weighting)</b>	<b>Selected (Step 3)</b>	<b>Waiting list (Step 5)</b>
13		X (0.75)		X
21	X			
35				X

42	X			
49	X			
62	X			
66	X			
116				X
139	X			
144				X
169	X			
175	X			
176		X (1.9)		X
198	X			
208				X
228				X
241	X			
249		X (1.9)		X
250	X			
258	X			
261	X			
290	X			
291	X			
297				X
302	X			
314	X			
315	X			

325	X			
371	X			
372	X			
382	X			
387				X
392	X			
398	X			
400				X
402	X			
407				X
412				X
413	X			
444	X			
456	X			
459				X
469	X			
485	X			
499	X			
510	X			
517	X			
531	X			
538	X			
544	X			
548	X			

567		X (2.75)	X	
577	X			
593	X			
613				X
628				X
635	X			
647		X (3.95)	X	
658				X
663	X			
669	X			
710	X			
729				X
756	X			
757	X			
758				X
762				X
784	X			
808	X			
818		X (1.05)		X
868	X			
882	X			

**Table 8: The table shows the successful applicants' progress through the stages of the selection algorithm (2008 selection process).**