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**Quantitative Management Modeling Final Exam**

1. The factors that affect the success of the groups include GPA, number of late/incomplete assignments, and number of missed classes.
2. These factors combine to define how successful a student will be on the project because GPA shows how committed a student is to achieving high grades, number of late/incomplete assignments shows how reliable a student is, and number of missed classes shows if a student will be able to know exactly what is going on and will be there to work on the class project as a team. I would say these factors take an equal weight on potential performance because a student can have a high GPA, miss a handful of homework, but do well on tests and does not show up to class. A student can also have a bad GPA, but turn in all of their assignments on time and show up everyday and still be considered more likely to have success on this project than someone who just has a high GPA. One factor does not out weight another because every student has unique circumstances. For example, a student may have a bad GPA from pervious years of poor performance, however, this semester they have turned a new leaf and has put in more effort than before. A student may have many late/incomplete assignments because of having COVID-19 and will make up the assignment as they go throughout the semester. Poor attendance could also be because of an illness or maybe the student has been out of town for the beginning of the semester and it has weighed down on their overall attendance even though they have not missed a class in the last month.
3. In theory, I would pull the data about each student’s GPA, number of late/incomplete assignments, and number of missed classes, however for this assignment I am going to have to determine that data another way. I will choose some arbitrary numbers for all variables that I see as realistic for our scenario.
4. Decision Variables: x11, x12, x13, x14, x21, x22, x23, x24, x31, x32, x33, x34, x41, x42, x43, x44, x51, x52, x53, x54, x61, x62, x63, x64, x71, x72, x73, x74, x81, x82, x83, x84, x91, x92, x93, x94, x101, x102, x103, x104, x111, x112, x113, x114, x121, x122, x123, x124;
5. Objective Function: max: 2.7 x11 + 2.7 x12 + 2.7 x13 + 2.7 x14 + 3.2 x21 + 3.2 x22 + 3.2 x23 + 3.2 x24 + 3.8 x31 + 3.8 x32 + 3.8 x33 + 3.8 x34 + 2.5 x41 + 2.5 x42 + 2.5 x43 + 2.5 x44 + 2.9 x51 + 2.9 x52 + 2.9 x53 + 2.9 x54 + 3.0 x61 + 3.0 x62 + 3.0 x63 + 3.0 x64 + 3.6 x71 + 3.6 x72 + 3.6 x73 + 3.6 x74 + 3.4 x81 + 3.4 x82 + 3.4 x83 + 3.4 x84 + 2.9 x91 + 2.9 x92 + 2.9 x93 + 2.9 x94 + 3.1 x101 + 3.1 x102 + 3.1 x103 + 3.1 x104 + 2.4 x111 + 2.4 x112 + 2.4 x113 + 2.4 x114 + 3.0 x121 + 3.0 x122 + 3.0 x123 + 3.0 x124;
6. Constraints:

Each student must be in exactly 1 group.

x11 + x12 + x13 + x14 = 1;

x21 + x22 + x23 + x24 = 1;

x31 + x32 + x33 + x34 = 1;

x41 + x42 + x43 + x44 = 1;

x51 + x52 + x53 + x54 = 1;

x61 + x62 + x63 + x64 = 1;

x71 + x72 + x73 + x74 = 1;

x81 + x82 + x83 + x84 = 1;

x91 + x92 + x93 + x94 = 1;

x101 + x102 + x103 + x104 = 1;

x111 + x112 + x113 + x114 = 1;

x121 + x122 + x123 + x124 = 1;

Each group must have exactly 3 students.

x11 + x21 + x31 + x41 + x51 + x61 + x71 + x81 + x91 + x101 + x111 + x121 = 3;

x12 + x22 + x32 + x42 + x52 + x62 + x72 + x82 + x92 + x102 + x112 + x122 = 3;

x13 + x23 + x33 + x43 + x53 + x63 + x73 + x83 + x93 + x103 + x113 + x123 = 3;

x14 + x24 + x34 + x44 + x54 + x64 + x74 + x84 + x94 + x104 + x114 + x124 = 3;

Each group must have at least a total GPA of 8.5.

2.7 x11 + 3.2 x21 + 3.8 x31 + 2.5 x41 + 2.9 x51 + 3.0 x61 + 3.6 x71 + 3.4 x81 + 2.9 x91 + 3.1 x101 + 2.4 x111 + 3.0 x121 >= 8.5;

2.7 x12 + 3.2 x22 + 3.8 x32 + 2.5 x42 + 2.9 x52 + 3.0 x62 + 3.6 x72 + 3.4 x82 + 2.9 x92 + 3.1 x102 + 2.4 x112 + 3.0 x122 >= 8.5;

2.7 x13 + 3.2 x23 + 3.8 x33 + 2.5 x43 + 2.9 x53 + 3.0 x63 + 3.6 x73 + 3.4 x83 + 2.9 x93 + 3.1 x103 + 2.4 x113 + 3.0 x123 >= 8.5;

2.7 x14 + 3.2 x24 + 3.8 x34 + 2.5 x44 + 2.9 x54 + 3.0 x64 + 3.6 x74 + 3.4 x84 + 2.9 x94 + 3.1 x104 + 2.4 x114 + 3.0 x124 >= 8.5;

Each group must have a total number of late/incomplete assignments less than 8.5.

5.0 x11 + 3.0 x21 + 0.0 x31 + 5.0 x41 + 2.0 x51 + 2.0 x61 + 2.0 x71 + 0.0 x81 + 1.0 x91 + 0.0 x101 + 7.0 x111 + 3.0 x121 <= 8.5;

5.0 x12 + 3.0 x22 + 0.0 x32 + 5.0 x42 + 2.0 x52 + 2.0 x62 + 2.0 x72 + 0.0 x82 + 1.0 x92 + 0.0 x102 + 7.0 x112 + 3.0 x122 <= 8.5;

5.0 x13 + 3.0 x23 + 0.0 x33 + 5.0 x43 + 2.0 x53 + 2.0 x63 + 2.0 x73 + 0.0 x83 + 1.0 x93 + 0.0 x103 + 7.0 x113 + 3.0 x123 <= 8.5;

5.0 x14 + 3.0 x24 + 0.0 x34 + 5.0 x44 + 2.0 x54 + 2.0 x64 + 2.0 x74 + 0.0 x84 + 1.0 x94 + 0.0 x104 + 7.0 x114 + 3.0 x124 <= 8.5;

Each group must have a total number of missed classes less than 13.

7.0 x11 + 4.0 x21 + 1.0 x31 + 4.0 x41 + 2.0 x51 + 5.0 x61 + 0.0 x71 + 3.0 x81 + 3.0 x91 + 0.0 x101 + 10.0 x111 + 4.0 x121 <= 13.0;

7.0 x12 + 4.0 x22 + 1.0 x32 + 4.0 x42 + 2.0 x52 + 5.0 x62 + 0.0 x72 + 3.0 x82 + 3.0 x92 + 0.0 x102 + 10.0 x112 + 4.0 x122 <= 13.0;

7.0 x13 + 4.0 x23 + 1.0 x33 + 4.0 x43 + 2.0 x53 + 5.0 x63 + 0.0 x73 + 3.0 x83 + 3.0 x93 + 0.0 x103 + 10.0 x113 + 4.0 x123 <= 13.0;

7.0 x14 + 4.0 x24 + 1.0 x34 + 4.0 x44 + 2.0 x54 + 5.0 x64 + 0.0 x74 + 3.0 x84 + 3.0 x94 + 0.0 x104 + 10.0 x114 + 4.0 x124 <= 13.0;

1. Group Assignment:
   1. Group 1: Students: 3, 4, 6
   2. Group 2: Students: 2, 7, 12
   3. Group 3: Students: 1, 5, 9
   4. Group 4: Students: 8, 10, 11
2. Video Link: <https://video.kent.edu/my-media>

