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Managerial Problem Definition

Decisions to be made – Which cities should be allocated to which of the 10 districts

Objective – Maximize republican-dominated districts

<u>Restrictions</u> – District populations must be between 150k and 350k. Each city can only be assigned to one district.

Nonlinear Binary

Model Formulation

Decision Variables:

Xij, for i for each city from 1 to 18, and j for each district from 1 to 10

Objective Function:

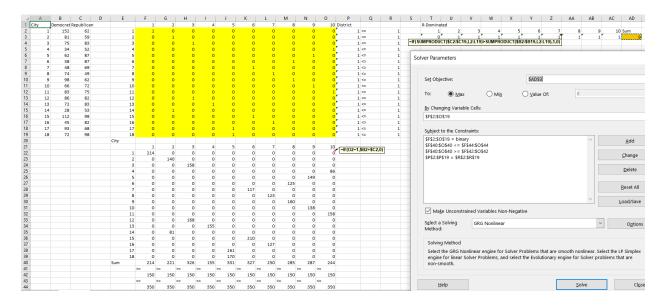
Maximize: =IF(SUMPRODUCT(Republican #s , Xij)>SUMPRODUCT(Democrat #s , Xij),1,0)

Constraints:

Total # of voters in each district > 150 and < 350

Xi = 1 (each city can only be used once)

Solution Methodology



Nonlinear with 18DVs

Model Formulation

Decision Variables:

Xi from 1 to 18 where each represents the district chosen for that particular city

Intermediate Variables

RIj Republicans in each district

DIi Democrats in reach district

1000 if M1 is less than 150,000

1000 if M2 is greater than 350,000

Objective Function:

Maximize:SUM(Xi - (M1 + M2))

Constraints:

Total dem and rep in each district > 150 and < 350

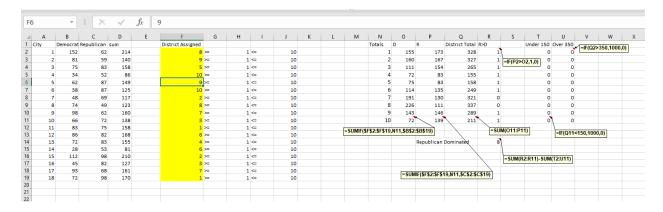
Xi = 1 (each city can only be used once)

M1 and M2 for big M

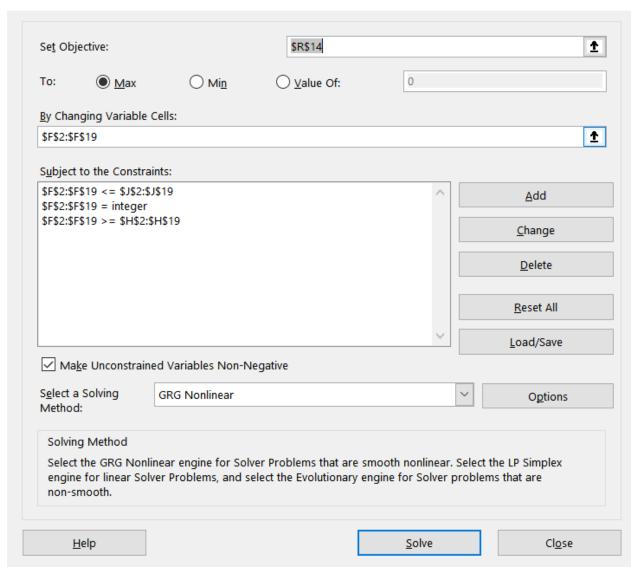
Xi >= 1

Xi <= 10

Solution Methodology



Solver Parameters X



Linear with Binary variables

Model Formulation

Decision Variables:

Xij, binary where i is each city from 1 to 18, and j is each district from 1 to 10

Yi, binary where each is if district is republican dominated

Objective Function:

Maximize: SUM(Yi)

Constraints:

Total dem and rep in each district > 150 and < 350

Xi = 1 (each city can only be used once)

D - R < M1*(1-Yi)

R - D < M2* Yi

D - R <= M1*(1- Yi) - 1

R - D <= M2* Yi - 1

M1 and M2 for big M

Solution Methodology

