SAPIENZA
UNIVERSITÀ DI ROMA

Operations research

A Linear Programming model for the

Railway Yield Management problem

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Railway REVENUE MANAGEMENT

A railway company sells tickets for a train going from city A (Napoli) to city B (Milano). During the route the train makes three intermediate stops: Roma, Firenze, Bologna.

The sales prices of the tickets for each Origin-Destination are set by the company and are reported in the table

	Na	Rm	Fi	Bo	Mi
Na	-	45	72	80	100
Rm	-	-	45	59	91
Fi	-	-	-	25	53
Bo	-	-	-	-	42

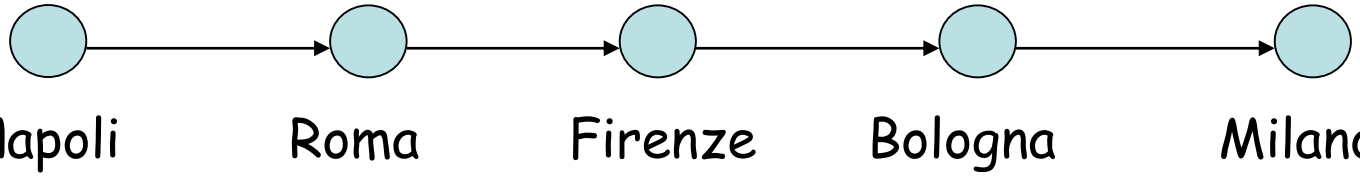
Railway REVENUE MANAGEMENT

At the beginning of the reservation period effective demand for each O-D is uncertain, but it is known a forecast demand, which mean value is reported in Table

	Na	Rm	Fi	Bo	Mi
Na	-	420	355	335	480
Rm	-	-	150	200	375
Fi	-	-	-	250	300
Bo	-	-	-	-	160

Railway REVENUE MANAGEMENT

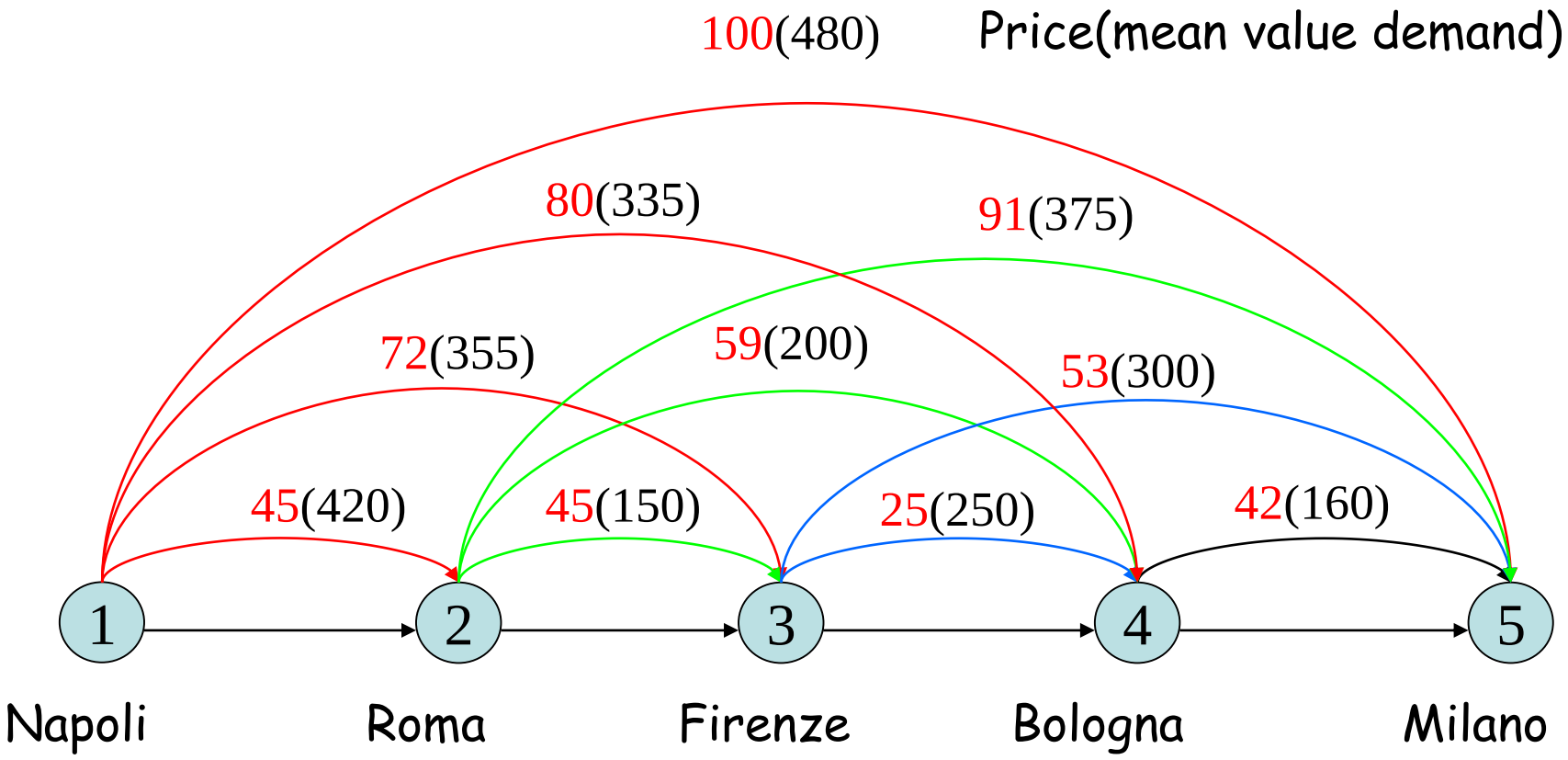
The number of seats available on the train is 700.

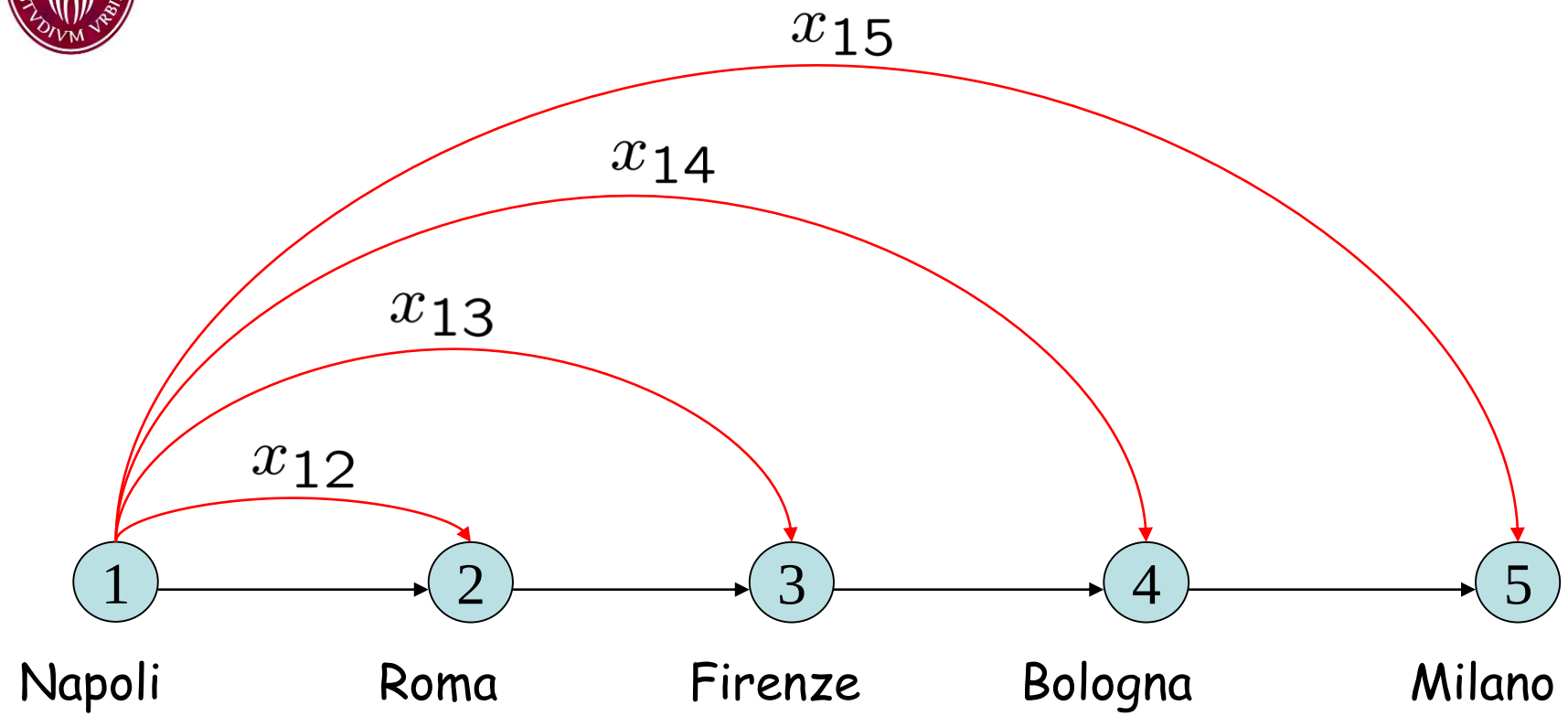


Find the optimal selling strategy for each O-D, assuming that the effective demand for each O-D will be equal the mean value.

Make a *WhatIf* ti check effects of variations of the demand

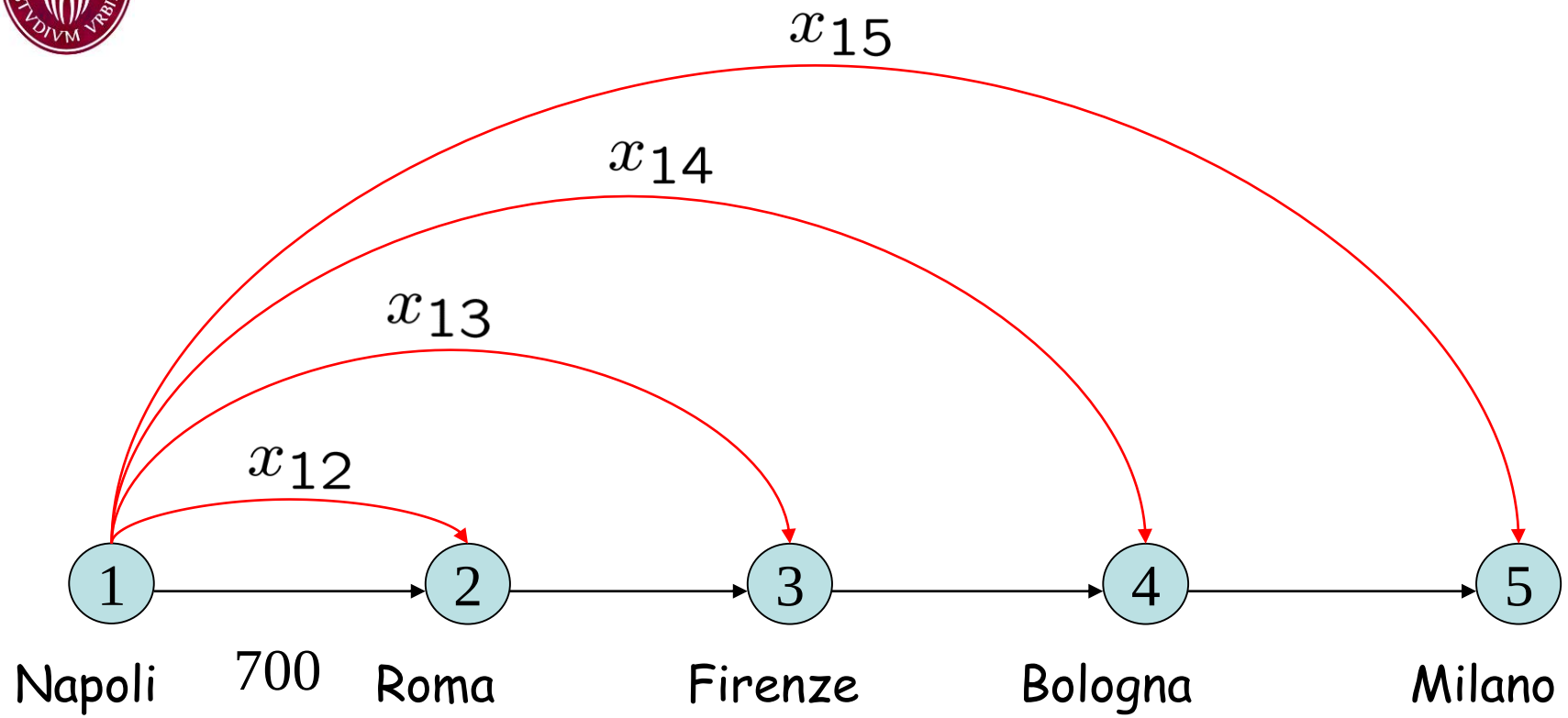
Railway REVENUE MANAGEMENT



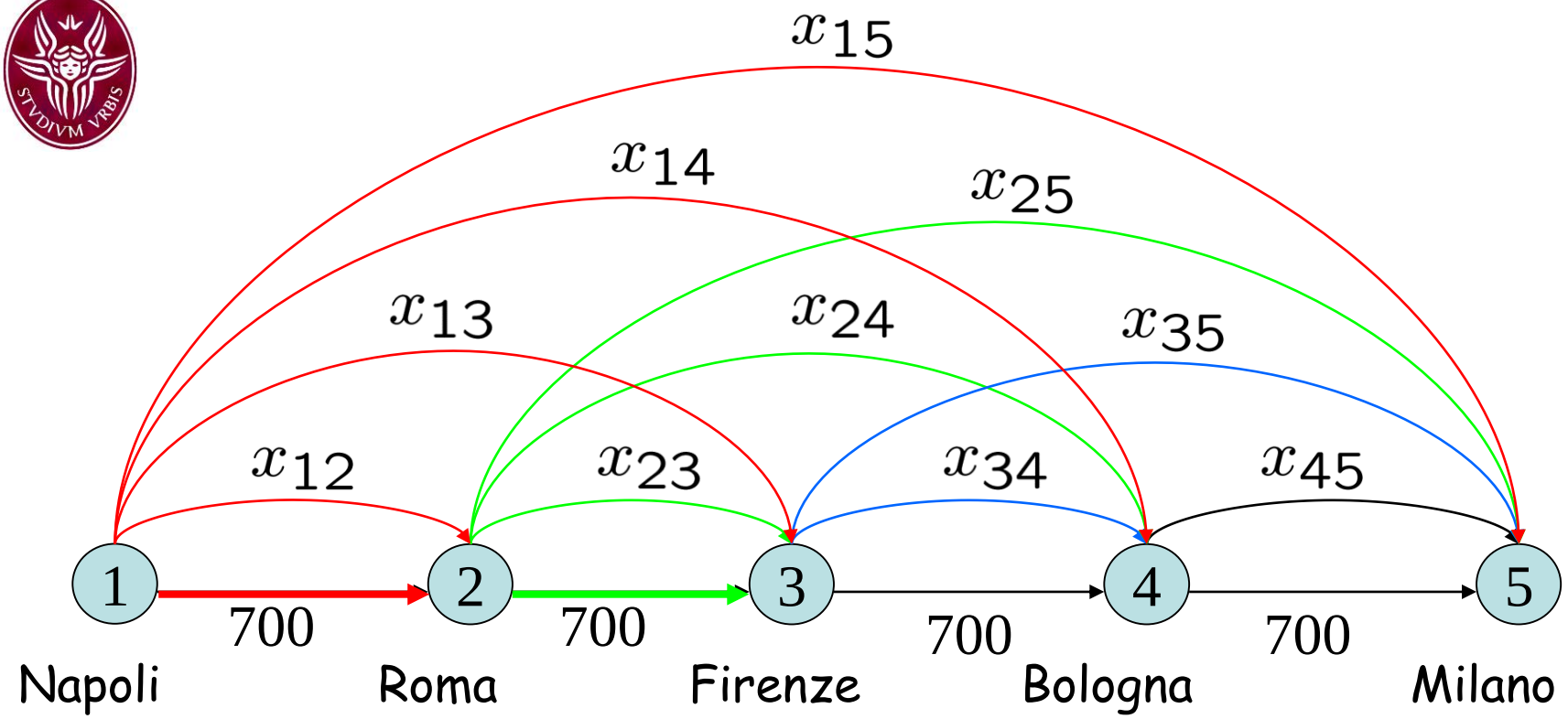


Defining decision variables

Defining constraints



$$x_{12} + x_{13} + x_{14} + x_{15} \leq 700$$



$$x_{34} + x_{35} + x_{24} + x_{25} + x_{14} + x_{15} \leq 700$$

$$x_{12} + x_{13} + x_{14} + x_{15} \leq 700$$

$$x_{45} + x_{35} + x_{25} + x_{15} \leq 700$$

$$x_{23} + x_{24} + x_{25} + x_{13} + x_{14} + x_{15} \leq 700$$

$$\max_{x} \sum_{i=1}^{5} \sum_{j=i+1}^{5} t_{ij} x_{ij}$$

$$x_{ij} \leq \mu_{ij}$$

$$x_{12} + x_{13} + x_{14} + x_{15} \leq 700$$

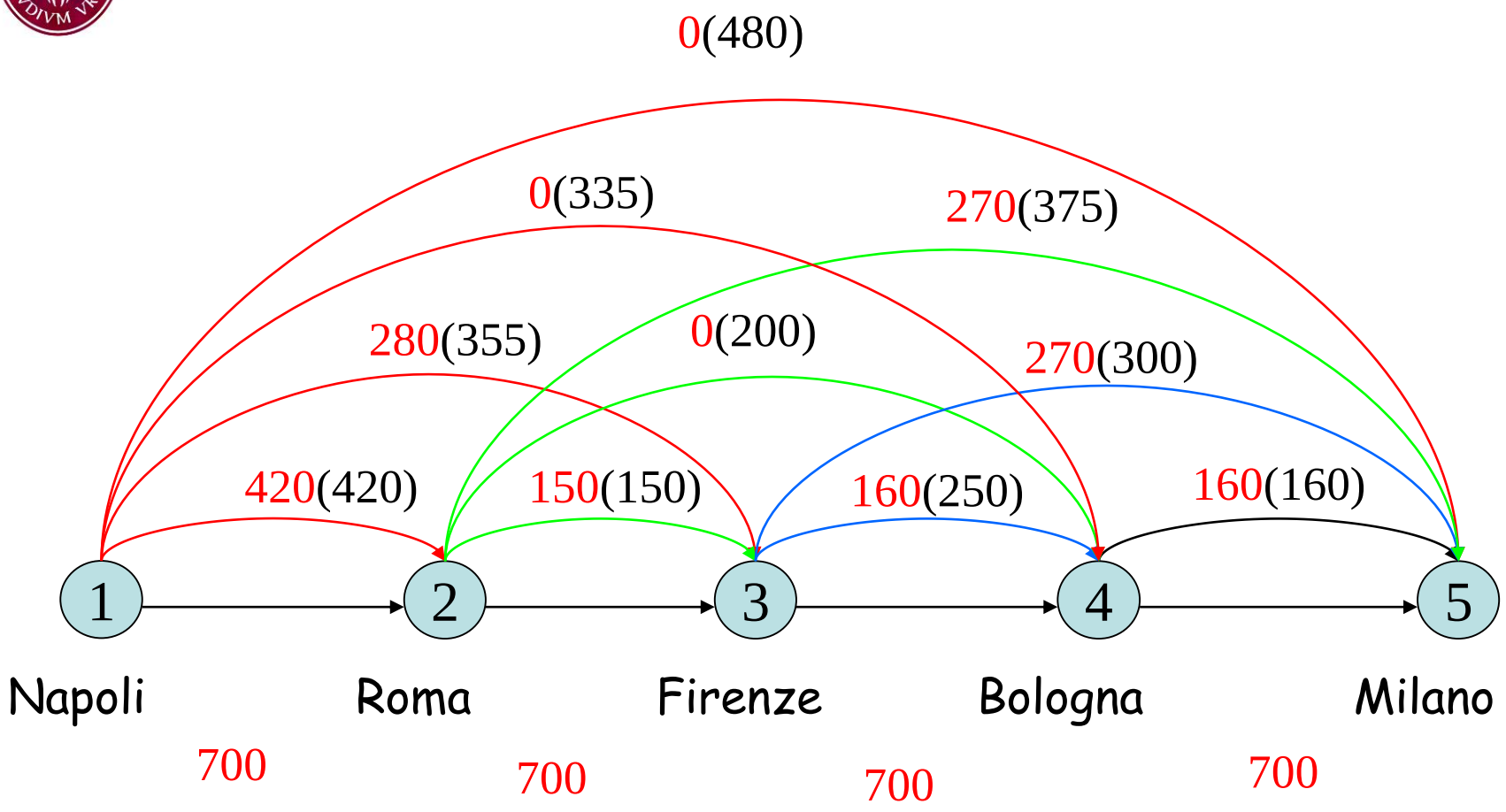
$$x_{23} + x_{24} + x_{25} + x_{13} + x_{14} + x_{15} \leq 700$$

$$x_{34} + x_{35} + x_{24} + x_{25} + x_{14} + x_{15} \leq 700$$

$$x_{45} + x_{35} + x_{25} + x_{15} \leq 700$$

$$x_{ij}\ intero$$

The optimal solution



Add constraints

Guarantee seats availablity on all the O-Ds.

	Na	Rm	Fi	Bo	Mi
Na	-	20	20	20	20
Rm	-	-	20	20	20
Fi	-	-	-	20	20
Bo	-	-	-	-	20