Densidad de árboles

June 29, 2022

1 Algoritmo para el proyecto Densidad de Homomorfismos en Árboles.

En este cuaderno se pretende mostrar el algoritmo descrito en la sección 7 del documento adjunto. Como se menciona allí, la idea es implementar el modelo de programación lineal descrito en la sección 4 para demostrar desigualdades relacionadas con la densidad de homomorfismos entre grafos. El algoritmo consta de tres partes, como se muestra a continuación:

Parte 1: Creación de la matriz de coeficientes relacionada con las restricciones del modelo.

Esta primera parte del algoritmo inicia tomando como entrada dos árboles F y T y regresando todos los posibles homomorfismos entre estos árboles. El input, es decir Los árboles F y T, se introducen como una lista de listas: $[l_1, l_2, ..., l_{|V(F)|}]$, dónde la lista l_i tiene como elementos todos los vecinos del vértice $i+1$. El output, es una lista que tiene todos los posiblles homomorfismos entre F y T; cada homomorfismo se representa como una lista $[u_1, u_2, ..., u_{|V(F)|}]$ tal que $u_i = f(i)$ para todo $i \in V(F)$.

[1]:
```
def hom(F,T):
    L = []
    f = len(F)
    t = len(T)
    for i in range(t):
        L.append([i+1])
    for i in range(2,f+1):
        m = []
        for j in range(len(L)):
            s = min(F[i-1])
            for k in range(len(T[L[j][s-1]-1])):
                m.append(L[j] + [T[L[j][s-1]-1][k]])
        L = m
    return(L)
```

Debido a que la función *hom* está pensada para arrojar homomorfimos entre árboles, es necesario que tanto F como T estén numerados como se describe en la sección 7 item 2; la importancia de este hecho se ve en la escogencia del valor de s. A continuación vemos un ejemplo si tomamos $F = P_4$ y $T = P_3$. Estos homomorfismos fueron listados en la sección 5 del documento para ilustrar cómo se puede utilizar el modelo de programación lineal para construir contraejemplos.

[2]:
```
print(hom([[2],[1,3],[2,4],[3]],[[2],[1,3],[2]]))
```

```
[[1, 2, 1, 2], [1, 2, 3, 2], [2, 1, 2, 1], [2, 1, 2, 3], [2, 3, 2, 1], [2, 3, 2,
3], [3, 2, 1, 2], [3, 2, 3, 2]]
```

La siguiente parte del algoritmo consiste en crear la matriz que guarda la información de los coeficientes relacionados a las restricciones del problema lineal. Para esto, se hace uso de la ecuación 17 del documento. Observe que la función *matrix* utiliza la función *hom* descrita anteriormente y, por cada homomorfismo, realiza el cálculo respectivo. Sin embargo, esta parte del algoritmo podría mejorarse si se observa que hay homomorfismos simétricos entre sí y con los cuales se obtendrá los mismos coeficientes.

[3]:
```python
def matrix(F,T):
    D = hom(F,T)
    t = len(T)
    d = len(D)
    H = []
    E = []
    for i in range(t):
        for j in range(len(T[i])):
            if T[i][j] > i+1:
                E.append([i+1,T[i][j]])
    e = len(E)
    for i in range(e+t):
        H.append([])
        for j in range(d):
            H[i].append(0)
        if i <= e-1:
            H[i].append(-1)
        else:
            H[i].append(0)
    H.append([])
    H.append([])
    for j in range(d):
        H[-2].append(1)
        H[-1].append(-1)
    H[-2].append(0)
    H[-1].append(0)
    for i in range(d):
        finv = []
        for j in range(1,t+1):
            finv.append([i+1 for i, x in enumerate(D[i]) if x == j])
        for x in E:
            for y in finv[x[0]-1]:
                for z in finv[x[1]-1]:
                    if z in F[y-1]:
                        H[E.index(x)][i] += 1
        for j in range(t):
            for k in finv[j]:
                H[e+j][i] -= len(F[k-1])-1
```

```
    return([H,D])
```

La función *matrix* recibe como input dos árboles, al igual que *hom* y el output es una lista con dos elementos: el primer elemento es la matriz que buscamos y, el segundo elemento, es el resultado de la función *hom*. Esto es para evitar correr la función *hom* dos veces en los algoritmos que se presentan a continuación. Como ejemplo, veamos el resultado al tomar $F = P_4$ y $T = P_3$

[5]:
```
print(matrix([[2],[1,3],[2,4],[3]],[[2],[1,3],[2]])[0])
```

```
[[3, 1, 3, 2, 1, 0, 2, 0, -1], [0, 2, 0, 1, 2, 3, 1, 3, -1], [-1, 0, -1, -1, 0,
0, -1, 0, 0], [-1, -1, -1, -1, -1, -1, -1, -1, 0], [0, -1, 0, 0, -1, -1, 0, -1,
0], [1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, 0]]
```

Parte 2: Organización y lectura apropiada de los árboles obtenidos de la base de datos https://users.cecs.anu.edu.au/~bdm/data/trees.html.

El primer código que se muestra a continuación permite leer la información obtenida en cada archivo de la base de datos. Desde ahí se puede descargar un archivo .rar que contiene varios archivos .tex con todos los posibles árboles de un tamaño determinado n. Así, la función *obt* requiere dos inputs: el tamaño del árbol y el número fil correspondiente al archivo que se desea leer. Todos los árboles del archivo fil se guardan en una lista, la cuál es el output de la función.

[6]:
```
def obt(n,fil):
    with open(r"C:\Users\57319\OneDrive\Documentos\árboles\vtx" + str(n) +␣
 ↪"s\\tree" + str(n) + str(fil) + ".txt") as f:
        c = f.readlines()
        a = []
        b = []
        for x in c:
            a.append(x.split("  "))
            b.append([])
        for i in range(len(a)):
            for x in a[i]:
                b[i].append(list(map(int,x.split(" "))))
    return(b)
```

Desafortunadamente, los árboles que se obtienen de los datos se encuentran expresados como una lista de duplas, donde cada dupla representa una arista del árbol. Recordemos que, para que se pueda aplicar la función *hom* y *matrix*, es necesario tener los árboles expresados como una lista que contiene, por cada vértice la lista de sus vecinos. Así, la siguiente función cambia el formato de los árboles que se obtuvieron con la función *obt*.

[7]:
```
def obttrees(n,fil):
    a = obt(n,fil)
    b = []
    for x in a:
        s = []
        for i in range(n):
            s.append([])
```

```
        b.append(s)
        for edge in x:
            key, value = edge[0], edge[1]
            b[-1][key].append(value + 1)
            b[-1][value].append(key + 1)
    return(b)
```

Adicionalmente, se observa que los árboles que se obtienen de la base de datos se encuentran numerados de una forma distinta a la descrita en la sección 7 item 2 la cuál es importante no solo para poder aplicar la función *hom* apropiadamente, si no también para poder definir el sistema de programación lineal. Así, la siguiente función recibe un árbol con cualquier numeración y retorna el mismo árbol numerado apropiadamente.

[8]:
```
def propnum(L):
    vtx = 2
    leng = len(L)
    for i in range(leng):
        for j in range(len(L[i])):
            x = L[i][j]
            if x > vtx:
                m = L[x-1]
                L[x-1] = L[vtx-1]
                L[vtx-1] = m
                for k in range(leng):
                    for l in range(len(L[k])):
                        if L[k][l] == x:
                            L[k][l] = vtx
                        elif L[k][l] == vtx:
                            L[k][l] = x
                vtx += 1
            elif x == vtx:
                vtx += 1
    return(L)
```

Como ejemplo de la función anterior, tomemos la estrella de 4 vértices, es decir, el árbol formado por 4 vértices, que tiene un vértice de grado 3 y los demás vértices de grado 2. Este árbol se encuentra representado en la base de datos como la lista $[[4],[4],[4],[1,2,3]]$. La numeración apropiada sería: $[[2,3,4],[1],[1],[1]]$ o, alternativamente, se puede usar la numeración $[[2],[1,3,4],[2],[2]]$. Recordemos que se desea que para todo $i > 2$, el vértice v_i tenga un único vecino en el conjunto $\{v_1, ..., v_{i-1}\}$.

[9]:
```
print(propnum([[4],[4],[4],[1,2,3]]))
```

```
[[2], [1, 3, 4], [2], [2]]
```

Parte 3: Uso de Gurobi para solucionar el problema de programación lineal.

Ya se tiene todo lo necesario para definir, solucionar y evaluar los resultados del modelo lineal asociado a este problema.

[10]:
```
import gurobipy as gp
from gurobipy import GRB
import numpy as np
import scipy.sparse as sp
```

La siguiente función toma la matriz que se construyó con la función *matrix* y define el problema de optimización lineal en el lenguaje requerido por Gurobi. Además, en esta misma función se crea el vector b del sistema $Ax \geq b$. Finalmente, Gurobi guarda la información sobre la feasibilidad de un problema en la variable *m.status*; tomando ventaja de ello, la función imprime la matriz de *matrix* y retorna (0) si el modelo es infeasible y, por otro lado, imprime los homomorfismos que dieron solución al problema de minimización, los pesos asociados a estos homomorfismos y retorna (1) si el modelo es feasible.

[26]:
```
def trees(F,T,ef,et):
    L = matrix(F,T)
    H = L[0]
    D = L[1]
    d = len(H[0])
    e = len(H)
    t = len(T)
    l = e-t-2
    m = gp.Model("matrix1")
    x = m.addMVar(shape=d, lb=0.0, ub=float(np.Infinity), vtype = GRB.
 ↪CONTINUOUS, name="x")
    obj = np.array(np.zeros(d))
    obj[d-1] = 1
    m.setObjective(obj @ x, GRB.MINIMIZE)

    val = np.array(H).flatten()
    row = np.zeros(e*d)
    for i in range(e*d):
        row[i] = i // d
    col = np.zeros(e*d)
    for i in range(e*d):
        col[i] = i % d
    A = sp.csr_matrix (( val , (row, col)) , shape = (e,d))

    #print(A)
    rh = np.zeros(e)
    for i in range(l,e-2):
        rh[i] = (-ef/et)*(len(T[i-l])-1)
    rh[e-2] = 1
    rh[e-1] = -1
    #print(rh)
    rhs = np.array(rh)

    m.addConstr(A @ x <= rhs, name="c")
```

```
    m.optimize()

    op = m.status

    if(op == 3):
        print("Matriz: ", H)
        return(0)
    else:
        print("Pesos asociados a los homomorfismos: ",x.X)
        nnz = np.nonzero(x.X)[0].tolist()
        nnz.pop(-1)

        print("Homomorfismos utilizados: ")
        for x in nnz:
            print(D[x])

        return(1)
```

Por ejemplo, veamos que el modelo es infeasible si se toma $F = P_4$ y $T = P_3$.

[27]:
```
print(trees([[2],[1,3],[2,4],[3]],[[2],[1,3],[2]],3,2))
```

```
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 9 columns and 46 nonzeros
Model fingerprint: 0xd186e1f9
Coefficient statistics:
  Matrix range     [1e+00, 3e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 2e+00]
Presolve removed 3 rows and 4 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[3, 1, 3, 2, 1, 0, 2, 0, -1], [0, 2, 0, 1, 2, 3, 1, 3, -1], [-1, 0,
-1, -1, 0, 0, -1, 0, 0], [-1, -1, -1, -1, -1, -1, -1, -1, 0], [0, -1, 0, 0, -1,
-1, 0, -1, 0], [1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, 0]]
0
```

Adicionalmente, veamos que el modelo es feasible si se toma $F = P_5$ y $T = P_3$. Este caso se estudió en el Ejemplo 3.2 del documento. El programa arroja homomorfismos distintos a los encontrados en el ejemplo.

[28]:
```
print(trees([[2],[1,3],[2,4],[3,5],[4]],[[2],[1,3],[2]],4,2))
```

```
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
```

```
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 13 columns and 72 nonzeros
Model fingerprint: 0x04c642df
Coefficient statistics:
  Matrix range     [1e+00, 4e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 2e+00]
Presolve removed 3 rows and 4 columns
Presolve time: 0.00s
Presolved: 4 rows, 9 columns, 30 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    2.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  2.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.5 2. ]
Homomorfismos utilizados:
[1, 2, 1, 2, 1]
[3, 2, 3, 2, 3]
1
```

Cabe resaltar que la última entrada de la lista que muestra los pesos asociados a los homomorfismos es siempre el valor que toma la variable t y el cuál debe coincidir con $\frac{|E(F)|}{|E(T)|}$.

Finalmente, la función *hold* toma los algoritmos descritos anteriormente y hace un recorrido por todos los posibles árboles con n números de vértices para evaluar la feasibilidad del modelo relacionado a la desigualdad $t(T,G) \geq t(P_3,G)^{|E(T)|/2}$. Observe que esta función se puede modificar si se desa evaluar $t(T,G) \geq t(F,G)^{|E(T)|/|E(F)|}$ para cualquier árbol F. Esta función retorna una lista cuya primera entrada corresponde a los árboles que están relacionados con modelos infeasibles y la segunda entrada corresponde a árboles que están relacionados con modelos feasibles.

[29]:
```python
def hold(n):
    L = []
    P = []
    for i in range(2,n):
        G = obttrees(n,i)
        F = list(map(propnum,obttrees(n,i)))
        for tree in F:
            print("\nFor F = ", F)
            if trees(tree,[[2],[1,3],[2]],n-1,2) == 0:
                L.append(tree)
            else :
                P.append(tree)
```

```
    return([L,P])
```

Veamos el resultado de evaluar $t(T,G) \geq t(P_3,G)^{|E(T)|/2}$ para todos los posibles árboles T de hasta 10 vértices.

[32]:
```
hold(4)
```

```
For F =  [[[2], [1, 3, 4], [2], [2]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 11 columns and 48 nonzeros
Model fingerprint: 0xdf4e9822
Coefficient statistics:
  Matrix range     [1e+00, 3e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 2e+00]
Presolve removed 3 rows and 4 columns
Presolve time: 0.00s
Presolved: 4 rows, 7 columns, 20 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.500000e+00   0.000000e+00      0s
       4    1.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 4 iterations and 0.01 seconds (0.00 work units)
Optimal objective  1.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.25 0.   0.
0.   0.25 1.5 ]
Homomorfismos utilizados:
[1, 2, 1, 1]
[2, 3, 2, 2]
[3, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 9 columns and 46 nonzeros
Model fingerprint: 0x2945b9f6
Coefficient statistics:
  Matrix range     [1e+00, 3e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 2e+00]
Presolve removed 3 rows and 4 columns
```

```
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[3, 2, 3, 1, 2, 0, 1, 0, -1], [0, 1, 0, 2, 1, 3, 2, 3, -1], [-1, -1,
-1, 0, -1, 0, 0, 0, 0], [-1, -1, -1, -1, -1, -1, -1, -1, 0], [0, 0, 0, -1, 0,
-1, -1, -1, 0], [1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1,
0]]
```

[32]:
```
[[[[2, 3], [1], [1, 4], [3]]], [[[2], [1, 3, 4], [2], [2]]]]
```

[31]:
```
hold(5)
```

```
For F =  [[[2], [1, 3, 4, 5], [2], [2], [2]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 19 columns and 88 nonzeros
Model fingerprint: 0x48d1b937
Coefficient statistics:
  Matrix range     [1e+00, 4e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 2e+00]
Presolve removed 3 rows and 11 columns
Presolve time: 0.00s
Presolved: 4 rows, 8 columns, 24 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.500000e+00   0.000000e+00      0s
       4    2.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 4 iterations and 0.01 seconds (0.00 work units)
Optimal objective  2.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.16666667
 2.        ]
Homomorfismos utilizados:
[1, 2, 1, 1, 1]
[2, 3, 2, 2, 2]
[3, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5], [3], [3]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
```

```
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 13 columns and 70 nonzeros
Model fingerprint: 0xf44312b7
Coefficient statistics:
  Matrix range     [1e+00, 4e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 2e+00]
Presolve removed 3 rows and 3 columns
Presolve time: 0.00s
Presolved: 4 rows, 10 columns, 34 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    2.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  2.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.5 2. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1]
[3, 2, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [5, 3], [4]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 13 columns and 72 nonzeros
Model fingerprint: 0x3a7c3c67
Coefficient statistics:
  Matrix range     [1e+00, 4e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 2e+00]
Presolve removed 3 rows and 4 columns
Presolve time: 0.00s
Presolved: 4 rows, 9 columns, 30 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.500000e+00   0.000000e+00      0s
       3    2.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  2.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.5
0.  0.  2. ]
Homomorfismos utilizados:
```

```
[2, 1, 1, 2, 1]
[2, 3, 3, 2, 3]
```

[31]:
```
[[],
 [[[2], [1, 3, 4, 5], [2], [2], [2]],
  [[2, 3], [1], [1, 4, 5], [3], [3]],
  [[2, 3], [1], [1, 4], [5, 3], [4]]]]
```

[33]:
```
hold(6)
```

```
For F =  [[[2], [1, 3, 4, 5, 6], [2], [2], [2], [2]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 35 columns and 168 nonzeros
Model fingerprint: 0xf119bc89
Coefficient statistics:
  Matrix range     [1e+00, 5e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 26 columns
Presolve time: 0.00s
Presolved: 4 rows, 9 columns, 28 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       4    2.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 4 iterations and 0.01 seconds (0.00 work units)
Optimal objective  2.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.375 0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.125 2.5  ]
Homomorfismos utilizados:
[1, 2, 1, 1, 1, 1]
[2, 3, 2, 2, 2, 2]
[3, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6], [3], [3], [3]], [[2], [1, 3, 4], [2], [5,
6, 2], [4], [4]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 21 columns and 118 nonzeros
Model fingerprint: 0xb258e08a
```

```
Coefficient statistics:
  Matrix range     [1e+00, 5e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 10 columns
Presolve time: 0.00s
Presolved: 4 rows, 11 columns, 38 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   6.250000e-01   0.000000e+00      0s
       3    2.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  2.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.25 0.   0.
 0.   0.   0.   0.   0.   0.25 2.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 2]
[3, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6], [3], [3], [3]], [[2], [1, 3, 4], [2], [5,
6, 2], [4], [4]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 17 columns and 94 nonzeros
Model fingerprint: 0xa318aa58
Coefficient statistics:
  Matrix range     [1e+00, 5e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 10 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[5, 2, 4, 1, 5, 4, 4, 3, 2, 1, 1, 0, 4, 1, 3, 0, -1], [0, 3, 1, 4, 0,
1, 1, 2, 3, 4, 4, 5, 1, 4, 2, 5, -1], [-2, 0, -2, 0, -2, -2, -2, -2, 0, 0, 0, 0,
-2, 0, -2, 0, 0], [-2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2,
-2, 0], [0, -2, 0, -2, 0, 0, 0, 0, -2, -2, -2, -2, 0, -2, 0, -2, 0], [1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5, 6], [2], [3], [3]], [[2, 3], [1], [1, 4, 5],
```

```
[6, 3], [3], [4]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 21 columns and 120 nonzeros
Model fingerprint: 0x1aff6e51
Coefficient statistics:
  Matrix range     [1e+00, 5e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 10 columns
Presolve time: 0.00s
Presolved: 4 rows, 11 columns, 38 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   6.250000e-01   0.000000e+00      0s
       3    2.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  2.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.25 0.   0.
 0.   0.   0.   0.   0.   0.25 2.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 2]
[3, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6], [2], [3], [3]], [[2, 3], [1], [1, 4, 5],
[6, 3], [3], [4]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 17 columns and 98 nonzeros
Model fingerprint: 0x3f201744
Coefficient statistics:
  Matrix range     [1e+00, 5e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 10 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[5, 4, 3, 2, 5, 4, 2, 1, 4, 3, 1, 0, 3, 2, 1, 0, -1], [0, 1, 2, 3, 0,
1, 3, 4, 1, 2, 4, 5, 2, 3, 4, 5, -1], [-2, -2, -1, -1, -2, -2, 0, 0, -2, -2, 0,
```

```
0, -1, -1, 0, 0, 0], [-2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2,
-2, -2, 0], [0, 0, -1, -1, 0, 0, -2, -2, 0, 0, -2, -2, -1, -1, -2, -2, 0], [1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [5, 3], [4, 6], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 17 columns and 102 nonzeros
Model fingerprint: 0x7b61a432
Coefficient statistics:
  Matrix range     [1e+00, 5e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 10 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[5, 4, 3, 2, 5, 3, 3, 1, 4, 2, 2, 0, 3, 2, 1, 0, -1], [0, 1, 2, 3, 0,
2, 2, 4, 1, 3, 3, 5, 2, 3, 4, 5, -1], [-2, -2, -1, -1, -2, -1, -1, 0, -2, -1,
-1, 0, -1, -1, 0, 0, 0], [-2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2,
-2, -2, -2, 0], [0, 0, -1, -1, 0, -1, -1, -2, 0, -1, -1, -2, -1, -1, -2, -2, 0],
[1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]
```

[33]:
```
[[[[2], [1, 3, 4], [2], [5, 6, 2], [4], [4]],
  [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4]],
  [[2, 3], [1], [1, 4], [5, 3], [4, 6], [5]]],
 [[[2], [1, 3, 4, 5, 6], [2], [2], [2], [2]],
  [[2, 3], [1], [1, 4, 5, 6], [3], [3], [3]],
  [[2, 3], [1, 4], [1, 5, 6], [2], [3], [3]]]]
```

[34]:
```
hold(7)
```

```
For F =  [[[2], [1, 3, 4, 5, 6, 7], [2], [2], [2], [2], [2]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 67 columns and 328 nonzeros
Model fingerprint: 0xe97a69c4
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
```

```
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 57 columns
Presolve time: 0.00s
Presolved: 4 rows, 10 columns, 32 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.125000e+00   0.000000e+00      0s
       4    3.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 4 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.4 0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.1 3. ]
Homomorfismos utilizados:
[1, 2, 1, 1, 1, 1, 1]
[2, 3, 2, 2, 2, 2, 2]
[3, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [3]], [[2], [1, 3, 4],
[2], [5, 6, 7, 2], [4], [4], [4]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 37 columns and 214 nonzeros
Model fingerprint: 0x5ae62388
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 25 columns
Presolve time: 0.00s
Presolved: 4 rows, 12 columns, 42 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    3.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.33333333 0.         0.         0.         0.
```

```
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.16666667
 3.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [3]], [[2], [1, 3, 4],
[2], [5, 6, 7, 2], [4], [4], [4]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 25 columns and 142 nonzeros
Model fingerprint: 0xaf24a8ce
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 11 columns
Presolve time: 0.00s
Presolved: 4 rows, 14 columns, 50 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    3.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.5 0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.
 0.  0.5 0.  0.  0.  0.  3. ]
Homomorfismos utilizados:
[2, 1, 2, 2, 1, 1, 1]
[2, 3, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [3]], [[2, 3], [1, 4,
5], [1, 6, 7], [2], [2], [3], [3]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3],
[3], [4]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5], [5]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 37 columns and 216 nonzeros
Model fingerprint: 0x12dc6df1
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
```

```
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 25 columns
Presolve time: 0.00s
Presolved: 4 rows, 12 columns, 42 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    3.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.33333333 0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 3.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [3]], [[2, 3], [1, 4,
5], [1, 6, 7], [2], [2], [3], [3]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3],
[3], [4]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5], [5]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 37 columns and 216 nonzeros
Model fingerprint: 0xeb09d728
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 26 columns
Presolve time: 0.00s
Presolved: 4 rows, 11 columns, 38 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    3.0000000e+00   0.000000e+00   0.000000e+00      0s
```

```
Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.33333333 0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 3.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [3]], [[2, 3], [1, 4,
5], [1, 6, 7], [2], [2], [3], [3]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3],
[3], [4]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5], [5]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 25 columns and 150 nonzeros
Model fingerprint: 0xd7f35c21
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 11 columns
Presolve time: 0.00s
Presolved: 4 rows, 14 columns, 50 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    3.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.5 3. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2]
[3, 2, 2, 3, 3, 3, 2]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [3]], [[2, 3], [1, 4,
5], [1, 6, 7], [2], [2], [3], [3]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3],
```

```
[3], [4]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5], [5]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 25 columns and 146 nonzeros
Model fingerprint: 0xf9d6173a
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 10 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    3.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.5 0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.5 0.  0.  0.  0.  3. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [3]], [[2, 3], [1, 4,
5], [1, 6, 7], [2], [2], [3], [3]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3],
[3], [4]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5], [5]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 25 columns and 148 nonzeros
Model fingerprint: 0x6f36585a
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 13 columns
Presolve time: 0.00s
Presolved: 4 rows, 12 columns, 42 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
```

```
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    3.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.5 0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.5 0.  0.  0.  0.  3. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [5]], [[2, 3], [1], [1,
4, 5], [6, 3], [3], [4, 7], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 25 columns and 154 nonzeros
Model fingerprint: 0x5a6d8658
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 10 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    3.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.5 3. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 1]
[3, 2, 2, 3, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [5]], [[2, 3], [1], [1,
4, 5], [6, 3], [3], [4, 7], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 25 columns and 154 nonzeros
Model fingerprint: 0x69e93ec6
```

```
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 10 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    3.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.5 3. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1]
[3, 2, 2, 3, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [6, 4], [7, 5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 25 columns and 156 nonzeros
Model fingerprint: 0x243af5dc
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 3e+00]
Presolve removed 3 rows and 13 columns
Presolve time: 0.00s
Presolved: 4 rows, 12 columns, 42 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    3.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.5 0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.5 0.  0.  0.  0.  3. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 1, 2, 1]
```

```
[2, 3, 3, 2, 3, 2, 3]
```

[34]:
```
[[],
 [[[2], [1, 3, 4, 5, 6, 7], [2], [2], [2], [2], [2]],
  [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [3]],
  [[2], [1, 3, 4], [2], [5, 6, 7, 2], [4], [4], [4]],
  [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [3]],
  [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [3], [3]],
  [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4]],
  [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5], [5]],
  [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [5]],
  [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [5]],
  [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7], [6]],
  [[2, 3], [1], [1, 4], [3, 5], [6, 4], [7, 5], [6]]]]
```

[35]:
```
hold(8)
```

```
For F =  [[[2], [1, 3, 4, 5, 6, 7, 8], [2], [2], [2], [2], [2], [2]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 131 columns and 648 nonzeros
Model fingerprint: 0x8baaf181
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 120 columns
Presolve time: 0.00s
Presolved: 4 rows, 11 columns, 36 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.312500e+00   0.000000e+00      0s
       4    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 4 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
```

```
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.41666667
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.08333333 3.5       ]
Homomorfismos utilizados:
[1, 2, 1, 1, 1, 1, 1, 1]
[2, 3, 2, 2, 2, 2, 2, 2]
[3, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [3]], [[2], [1,
3, 4], [2], [5, 6, 7, 8, 2], [4], [4], [4], [4]], [[2], [1, 3, 4, 5], [2], [2],
[6, 7, 8, 2], [5], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 69 columns and 406 nonzeros
Model fingerprint: 0xeab88077
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 56 columns
Presolve time: 0.00s
Presolved: 4 rows, 13 columns, 46 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
 0.    0.    0.    0.    0.    0.    0.    0.125 3.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [3]], [[2], [1,
3, 4], [2], [5, 6, 7, 8, 2], [4], [4], [4], [4]], [[2], [1, 3, 4, 5], [2], [2],
[6, 7, 8, 2], [5], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 41 columns and 238 nonzeros
Model fingerprint: 0x6ef9d817
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 26 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.25 0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.5  0.   0.   0.   0.   3.5 ]
Homomorfismos utilizados:
[1, 2, 1, 1, 2, 2, 2, 2]
[2, 1, 2, 2, 1, 1, 1, 1]
[2, 3, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [3]], [[2], [1,
3, 4], [2], [5, 6, 7, 8, 2], [4], [4], [4], [4]], [[2], [1, 3, 4, 5], [2], [2],
[6, 7, 8, 2], [5], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 33 columns and 190 nonzeros
Model fingerprint: 0x17adb467
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
```

```
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[7, 3, 6, 2, 6, 2, 5, 1, 7, 6, 6, 5, 6, 5, 5, 4, 3, 2, 2, 1, 2, 1, 1,
0, 6, 2, 5, 1, 5, 1, 4, 0, -1], [0, 4, 1, 5, 1, 5, 2, 6, 0, 1, 1, 2, 1, 2, 2, 3,
4, 5, 5, 6, 5, 6, 6, 7, 1, 5, 2, 6, 2, 6, 3, 7, -1], [-3, 0, -3, 0, -3, 0, -3,
0, -3, -3, -3, -3, -3, -3, -3, -3, 0, 0, 0, 0, 0, 0, 0, 0, -3, 0, -3, 0, -3, 0,
-3, 0, 0], [-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, 0], [0, -3, 0, -3,
0, -3, 0, -3, 0, 0, 0, 0, 0, 0, 0, 0, -3, -3, -3, -3, -3, -3, -3, -3, 0, -3, 0,
-3, 0, -3, 0, -3, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [3], [3], [3], [3]], [[2, 3],
[1, 4, 5], [1, 6, 7, 8], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5, 6,
7], [8, 3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3],
[4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6], [6]],
[[2], [1, 3, 4], [2], [5, 2, 6], [4], [7, 8, 4], [6], [6]], [[2, 3], [1], [1, 4,
5, 6], [7, 3], [8, 3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 69 columns and 408 nonzeros
Model fingerprint: 0x5b139e5b
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 56 columns
Presolve time: 0.00s
Presolved: 4 rows, 13 columns, 46 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
```

```
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.125 3.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [3], [3], [3], [3]], [[2, 3],
[1, 4, 5], [1, 6, 7, 8], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5, 6,
7], [8, 3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3],
[4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6], [6]],
[[2], [1, 3, 4], [2], [5, 2, 6], [4], [7, 8, 4], [6], [6]], [[2, 3], [1], [1, 4,
5, 6], [7, 3], [8, 3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 69 columns and 408 nonzeros
Model fingerprint: 0x1ba11e1a
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 56 columns
Presolve time: 0.00s
Presolved: 4 rows, 13 columns, 46 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.125 3.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2]
```

```
[3, 2, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [3], [3], [3], [3]], [[2, 3],
[1, 4, 5], [1, 6, 7, 8], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5, 6,
7], [8, 3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3],
[4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6], [6]],
[[2], [1, 3, 4], [2], [5, 2, 6], [4], [7, 8, 4], [6], [6]], [[2, 3], [1], [1, 4,
5, 6], [7, 3], [8, 3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 41 columns and 254 nonzeros
Model fingerprint: 0x00c961ed
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 26 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 3.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 2]
[2, 3, 3, 2, 2, 2, 2, 3]
[3, 2, 2, 3, 3, 3, 3, 2]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [3], [3], [3], [3]], [[2, 3],
[1, 4, 5], [1, 6, 7, 8], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5, 6,
7], [8, 3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3],
[4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6], [6]],
[[2], [1, 3, 4], [2], [5, 2, 6], [4], [7, 8, 4], [6], [6]], [[2, 3], [1], [1, 4,
5, 6], [7, 3], [8, 3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
```

```
Optimize a model with 7 rows, 41 columns and 242 nonzeros
Model fingerprint: 0x71fdafd9
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 3.5 ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 2]
[3, 2, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [3], [3], [3], [3]], [[2, 3],
[1, 4, 5], [1, 6, 7, 8], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5, 6,
7], [8, 3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3],
[4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6], [6]],
[[2], [1, 3, 4], [2], [5, 2, 6], [4], [7, 8, 4], [6], [6]], [[2, 3], [1], [1, 4,
5, 6], [7, 3], [8, 3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 33 columns and 198 nonzeros
Model fingerprint: 0x5131111a
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
```

```
Matriz:  [[7, 4, 6, 3, 6, 3, 5, 2, 7, 6, 6, 5, 3, 2, 2, 1, 6, 5, 5, 4, 2, 1, 1,
0, 5, 2, 4, 1, 4, 1, 3, 0, -1], [0, 3, 1, 4, 1, 4, 2, 5, 0, 1, 1, 2, 4, 5, 5, 6,
1, 2, 2, 3, 5, 6, 6, 7, 2, 5, 3, 6, 3, 6, 4, 7, -1], [-3, -1, -3, -1, -3, -1,
-3, -1, -3, -3, -3, -3, 0, 0, 0, 0, -3, -3, -3, -3, 0, 0, 0, 0, -2, 0, -2, 0,
-2, 0, -2, 0, 0], [-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, 0], [0, -2,
0, -2, 0, -2, 0, -2, 0, 0, 0, 0, -3, -3, -3, -3, 0, 0, 0, 0, -3, -3, -3, -3, -1,
-3, -1, -3, -1, -3, -1, -3, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [3], [3], [3], [3]], [[2, 3],
[1, 4, 5], [1, 6, 7, 8], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5, 6,
7], [8, 3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3],
[4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6], [6]],
[[2], [1, 3, 4], [2], [5, 2, 6], [4], [7, 8, 4], [6], [6]], [[2, 3], [1], [1, 4,
5, 6], [7, 3], [8, 3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 41 columns and 242 nonzeros
Model fingerprint: 0xb431b556
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 26 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 3.5 ]
Homomorfismos utilizados:
[1, 2, 1, 1, 2, 2, 1, 1]
[2, 3, 2, 2, 3, 3, 2, 2]
[3, 2, 3, 3, 2, 2, 3, 3]
```

```
For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [3], [3], [3], [3]], [[2, 3],
[1, 4, 5], [1, 6, 7, 8], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5, 6,
7], [8, 3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3],
[4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6], [6]],
[[2], [1, 3, 4], [2], [5, 2, 6], [4], [7, 8, 4], [6], [6]], [[2, 3], [1], [1, 4,
5, 6], [7, 3], [8, 3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 33 columns and 202 nonzeros
Model fingerprint: 0x1bfdd7f9
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[7, 6, 5, 4, 5, 4, 3, 2, 7, 6, 6, 5, 3, 2, 2, 1, 6, 5, 5, 4, 2, 1, 1,
0, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 0, 1, 1, 2, 4, 5, 5, 6,
1, 2, 2, 3, 5, 6, 6, 7, 2, 3, 4, 5, 4, 5, 6, 7, -1], [-3, -3, -2, -2, -2, -2,
-1, -1, -3, -3, -3, -3, 0, 0, 0, 0, -3, -3, -3, -3, 0, 0, 0, 0, -2, -2, -1, -1,
-1, -1, 0, 0, 0], [-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, 0], [0, 0,
-1, -1, -1, -1, -2, -2, 0, 0, 0, 0, -3, -3, -3, -3, 0, 0, 0, 0, -3, -3, -3, -3,
-1, -1, -2, -2, -2, -2, -3, -3, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [3], [3], [3], [3]], [[2, 3],
[1, 4, 5], [1, 6, 7, 8], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5, 6,
7], [8, 3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3],
[4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6], [6]],
[[2], [1, 3, 4], [2], [5, 2, 6], [4], [7, 8, 4], [6], [6]], [[2, 3], [1], [1, 4,
5, 6], [7, 3], [8, 3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 41 columns and 244 nonzeros
Model fingerprint: 0x90de1dd6
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
```

```
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 26 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.25 0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.5  0.   0.   0.   0.   3.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 2, 2]
[2, 1, 1, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [5]], [[2, 3],
[1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8], [7]], [[2, 3], [1, 4], [1, 5, 6],
[7, 8, 2], [3], [3], [4], [4]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8],
[6], [6]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [4], [5, 8], [7]], [[2, 3,
4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [4], [6]], [[2, 3], [1], [1, 4, 5], [6,
3], [7, 3], [4], [5, 8], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 41 columns and 258 nonzeros
Model fingerprint: 0x257a7fd2
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.500000000e+00
```

```
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 3.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 1, 1]
[2, 3, 3, 2, 3, 2, 2, 2]
[3, 2, 2, 3, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [5]], [[2, 3],
[1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8], [7]], [[2, 3], [1, 4], [1, 5, 6],
[7, 8, 2], [3], [3], [4], [4]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8],
[6], [6]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [4], [5, 8], [7]], [[2, 3,
4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [4], [6]], [[2, 3], [1], [1, 4, 5], [6,
3], [7, 3], [4], [5, 8], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 41 columns and 258 nonzeros
Model fingerprint: 0xaad47419
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 3.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 1]
[2, 3, 3, 2, 2, 2, 3, 2]
[3, 2, 2, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [5]], [[2, 3],
[1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8], [7]], [[2, 3], [1, 4], [1, 5, 6],
[7, 8, 2], [3], [3], [4], [4]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8],
[6], [6]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [4], [5, 8], [7]], [[2, 3,
```

```
4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [4], [6]], [[2, 3], [1], [1, 4, 5], [6,
3], [7, 3], [4], [5, 8], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 33 columns and 206 nonzeros
Model fingerprint: 0x29964c0f
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[7, 6, 6, 5, 4, 3, 3, 2, 7, 6, 6, 5, 4, 3, 3, 2, 5, 4, 4, 3, 2, 1, 1,
0, 5, 4, 4, 3, 2, 1, 1, 0, -1], [0, 1, 1, 2, 3, 4, 4, 5, 0, 1, 1, 2, 3, 4, 4, 5,
2, 3, 3, 4, 5, 6, 6, 7, 2, 3, 3, 4, 5, 6, 6, 7, -1], [-3, -3, -3, -3, -1, -1,
-1, -1, -3, -3, -3, -3, -1, -1, -1, -1, -2, -2, -2, -2, 0, 0, 0, 0, -2, -2, -2,
-2, 0, 0, 0, 0, 0], [-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, 0], [0, 0,
0, 0, -2, -2, -2, -2, 0, 0, 0, 0, -2, -2, -2, -2, -1, -1, -1, -1, -3, -3, -3,
-3, -1, -1, -1, -1, -3, -3, -3, -3, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [5]], [[2, 3],
[1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8], [7]], [[2, 3], [1, 4], [1, 5, 6],
[7, 8, 2], [3], [3], [4], [4]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8],
[6], [6]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [4], [5, 8], [7]], [[2, 3,
4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [4], [6]], [[2, 3], [1], [1, 4, 5], [6,
3], [7, 3], [4], [5, 8], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 41 columns and 258 nonzeros
Model fingerprint: 0xeeb8cfa9
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 26 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros
```

```
Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 3.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 1]
[2, 3, 3, 2, 2, 3, 2, 2]
[3, 2, 2, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [5]], [[2, 3],
[1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8], [7]], [[2, 3], [1, 4], [1, 5, 6],
[7, 8, 2], [3], [3], [4], [4]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8],
[6], [6]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [4], [5, 8], [7]], [[2, 3,
4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [4], [6]], [[2, 3], [1], [1, 4, 5], [6,
3], [7, 3], [4], [5, 8], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 33 columns and 206 nonzeros
Model fingerprint: 0x5725e0a3
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[7, 5, 4, 2, 6, 4, 3, 1, 7, 6, 6, 5, 5, 4, 4, 3, 4, 3, 3, 2, 2, 1, 1,
0, 6, 4, 3, 1, 5, 3, 2, 0, -1], [0, 2, 3, 5, 1, 3, 4, 6, 0, 1, 1, 2, 2, 3, 3, 4,
3, 4, 4, 5, 5, 6, 6, 7, 1, 3, 4, 6, 2, 4, 5, 7, -1], [-3, -2, -1, 0, -3, -2, -1,
0, -3, -3, -3, -3, -2, -2, -2, -2, -1, -1, -1, -1, 0, 0, 0, 0, -3, -2, -1, 0,
-3, -2, -1, 0, 0], [-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, 0], [0, -1,
-2, -3, 0, -1, -2, -3, 0, 0, 0, 0, -1, -1, -1, -1, -2, -2, -2, -2, -3, -3, -3,
-3, 0, -1, -2, -3, 0, -1, -2, -3, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]
```

```
For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [5]], [[2, 3],
[1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8], [7]], [[2, 3], [1, 4], [1, 5, 6],
[7, 8, 2], [3], [3], [4], [4]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8],
[6], [6]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [4], [5, 8], [7]], [[2, 3,
4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [4], [6]], [[2, 3], [1], [1, 4, 5], [6,
3], [7, 3], [4], [5, 8], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 33 columns and 206 nonzeros
Model fingerprint: 0xba7f0fe6
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[7, 6, 5, 4, 6, 5, 4, 3, 7, 6, 4, 3, 5, 4, 2, 1, 6, 5, 3, 2, 4, 3, 1,
0, 4, 3, 2, 1, 3, 2, 1, 0, -1], [0, 1, 2, 3, 1, 2, 3, 4, 0, 1, 3, 4, 2, 3, 5, 6,
1, 2, 4, 5, 3, 4, 6, 7, 3, 4, 5, 6, 4, 5, 6, 7, -1], [-3, -3, -2, -2, -3, -3,
-2, -2, -3, -3, -1, -1, -2, -2, 0, 0, -3, -3, -1, -1, -2, -2, 0, 0, -1, -1, 0,
0, -1, -1, 0, 0, 0], [-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, 0], [0,
0, -1, -1, 0, 0, -1, -1, 0, 0, -2, -2, -1, -1, -3, -3, 0, 0, -2, -2, -1, -1, -3,
-3, -2, -2, -3, -3, -2, -2, -3, -3, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [5]], [[2, 3],
[1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8], [7]], [[2, 3], [1, 4], [1, 5, 6],
[7, 8, 2], [3], [3], [4], [4]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8],
[6], [6]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [4], [5, 8], [7]], [[2, 3,
4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [4], [6]], [[2, 3], [1], [1, 4, 5], [6,
3], [7, 3], [4], [5, 8], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 33 columns and 210 nonzeros
Model fingerprint: 0xeec98f25
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
```

```
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[7, 6, 5, 4, 5, 4, 3, 2, 7, 5, 6, 4, 4, 2, 3, 1, 6, 4, 5, 3, 3, 1, 2,
0, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 0, 2, 1, 3, 3, 5, 4, 6,
1, 3, 2, 4, 4, 6, 5, 7, 2, 3, 4, 5, 4, 5, 6, 7, -1], [-3, -3, -2, -2, -2, -2,
-1, -1, -3, -2, -3, -2, -1, 0, -1, 0, -3, -2, -3, -2, -1, 0, -1, 0, -2, -2, -1,
-1, -1, -1, 0, 0, 0], [-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, 0], [0,
0, -1, -1, -1, -1, -2, -2, 0, -1, 0, -1, -2, -3, -2, -3, 0, -1, 0, -1, -2, -3,
-2, -3, -1, -1, -2, -2, -2, -2, -3, -3, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [6]], [[2, 3],
[1, 4], [1, 5, 6], [2], [7, 3], [3], [5, 8], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 4, 7], [8, 5], [5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 41 columns and 260 nonzeros
Model fingerprint: 0xdc16c0d5
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 26 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 3.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 1]
```

```
[2, 3, 3, 2, 2, 3, 2, 2]
[3, 2, 2, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [6]], [[2, 3],
[1, 4], [1, 5, 6], [2], [7, 3], [3], [5, 8], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 4, 7], [8, 5], [5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 41 columns and 260 nonzeros
Model fingerprint: 0x144e03e4
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 26 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    3.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  3.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 3.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 1]
[2, 3, 3, 2, 2, 2, 3, 2]
[3, 2, 2, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [6]], [[2, 3],
[1, 4], [1, 5, 6], [2], [7, 3], [3], [5, 8], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 4, 7], [8, 5], [5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 33 columns and 210 nonzeros
Model fingerprint: 0x9a947d7c
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
```

```
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[7, 6, 5, 4, 5, 4, 3, 2, 7, 6, 4, 3, 5, 4, 2, 1, 6, 5, 3, 2, 4, 3, 1,
0, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 0, 1, 3, 4, 2, 3, 5, 6,
1, 2, 4, 5, 3, 4, 6, 7, 2, 3, 4, 5, 4, 5, 6, 7, -1], [-3, -3, -2, -2, -2, -2,
-1, -1, -3, -3, -1, -1, -2, -2, 0, 0, -3, -3, -1, -1, -2, -2, 0, 0, -2, -2, -1,
-1, -1, -1, 0, 0, 0], [-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, 0], [0,
0, -1, -1, -1, -1, -2, -2, 0, 0, -2, -2, -1, -1, -3, -3, 0, 0, -2, -2, -1, -1,
-3, -3, -1, -1, -2, -2, -2, -2, -3, -3, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [5, 3], [6, 4], [5, 7], [6, 8], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 33 columns and 214 nonzeros
Model fingerprint: 0x9f2b0b74
Coefficient statistics:
  Matrix range     [1e+00, 7e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 24 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[7, 6, 5, 4, 5, 4, 3, 2, 7, 5, 5, 3, 5, 3, 3, 1, 6, 4, 4, 2, 4, 2, 2,
0, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 0, 2, 2, 4, 2, 4, 4, 6,
1, 3, 3, 5, 3, 5, 5, 7, 2, 3, 4, 5, 4, 5, 6, 7, -1], [-3, -3, -2, -2, -2, -2,
-1, -1, -3, -2, -2, -1, -2, -1, -1, 0, -3, -2, -2, -1, -2, -1, -1, 0, -2, -2,
-1, -1, -1, -1, 0, 0, 0], [-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, -3, 0],
[0, 0, -1, -1, -1, -1, -2, -2, 0, -1, -1, -2, -1, -2, -2, -3, 0, -1, -1, -2, -1,
-2, -2, -3, -1, -1, -2, -2, -2, -2, -3, -3, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]
```

[35]: `[[[[2], [1, 3, 4, 5], [2], [2], [6, 7, 8, 2], [5], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6], [6]],`

```
  [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5]],
  [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [4], [4]],
  [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [4], [5, 8], [7]],
  [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [4], [6]],
  [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [5, 8], [7]],
  [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [5], [6]],
  [[2, 3], [1], [1, 4], [5, 3], [6, 4], [5, 7], [6, 8], [7]]],
 [[[2], [1, 3, 4, 5, 6, 7, 8], [2], [2], [2], [2], [2], [2]],
  [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [3]],
  [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [4], [4], [4], [4]],
  [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [3], [3], [3], [3]],
  [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [2], [3], [3], [3]],
  [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4]],
  [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [4]],
  [[2], [1, 3, 4], [2], [5, 2, 6], [4], [7, 8, 4], [6], [6]],
  [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5], [5]],
  [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [5]],
  [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8], [7]],
  [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [6]],
  [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [6]],
  [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [3], [5, 8], [7]]]]
```

[36]:
```
hold(9)
```

```
For F =  [[[2], [1, 3, 4, 5, 6, 7, 8, 9], [2], [2], [2], [2], [2], [2], [2]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 259 columns and 1288 nonzeros
Model fingerprint: 0x96e4d63a
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 247 columns
Presolve time: 0.00s
Presolved: 4 rows, 12 columns, 40 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.500000e+00   0.000000e+00      0s
       4    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 4 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
```

```
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.42857143  0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.
 0.          0.          0.          0.          0.          0.07142857
 4.        ]
Homomorfismos utilizados:
[1, 2, 1, 1, 1, 1, 1, 1, 1]
[2, 3, 2, 2, 2, 2, 2, 2, 2]
[3, 2, 3, 3, 3, 3, 3, 3, 3]
```

```
For F =  [[[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [3], [3], [3], [3], [3], [3]],
[[2], [1, 3, 4], [2], [5, 6, 7, 8, 9, 2], [4], [4], [4], [4], [4]], [[2], [1, 3,
4, 5], [2], [2], [6, 7, 8, 9, 2], [5], [5], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 133 columns and 790 nonzeros
Model fingerprint: 0xd23cbd34
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 119 columns
Presolve time: 0.00s
Presolved: 4 rows, 14 columns, 50 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.4 0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.1 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [3], [3], [3], [3], [3], [3]],
[[2], [1, 3, 4], [2], [5, 6, 7, 8, 9, 2], [4], [4], [4], [4], [4]], [[2], [1, 3,
4, 5], [2], [2], [6, 7, 8, 9, 2], [5], [5], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 430 nonzeros
Model fingerprint: 0x5bfc267a
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
```

```
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 57 columns
Presolve time: 0.00s
Presolved: 4 rows, 16 columns, 58 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.33333333 0.         0.         0.
0.16666667 0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.5        0.         0.         0.         0.
 4.        ]
Homomorfismos utilizados:
[1, 2, 1, 1, 2, 2, 2, 2, 2]
[2, 1, 2, 2, 1, 1, 1, 1, 1]
[2, 3, 2, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [3], [3], [3], [3], [3], [3]],
[[2], [1, 3, 4], [2], [5, 6, 7, 8, 9, 2], [4], [4], [4], [4], [4]], [[2], [1, 3,
4, 5], [2], [2], [6, 7, 8, 9, 2], [5], [5], [5], [5]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 286 nonzeros
Model fingerprint: 0xcf552c39
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 31 columns
Presolve time: 0.00s
Presolved: 4 rows, 18 columns, 66 nonzeros
```

```
Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 2, 2, 2, 1, 1, 1, 1]
[2, 3, 2, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 133 columns and 792 nonzeros
Model fingerprint: 0x9f074cf4
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 119 columns
Presolve time: 0.00s
Presolved: 4 rows, 14 columns, 50 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
```

```
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.4 0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.1 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 133 columns and 792 nonzeros
Model fingerprint: 0xa5962ea2
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 119 columns
Presolve time: 0.00s
Presolved: 4 rows, 14 columns, 50 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
```

```
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.4 0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.1 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 133 columns and 792 nonzeros
Model fingerprint: 0xcf2bcd25
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 120 columns
Presolve time: 0.00s
Presolved: 4 rows, 13 columns, 46 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
```

```
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.4 0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.1 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 462 nonzeros
Model fingerprint: 0x69a421ee
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 57 columns
Presolve time: 0.00s
Presolved: 4 rows, 16 columns, 58 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
```

```
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 2]
[2, 3, 3, 2, 2, 2, 2, 2, 3]
[3, 2, 2, 3, 3, 3, 3, 3, 2]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 434 nonzeros
Model fingerprint: 0x2cc15677
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 55 columns
Presolve time: 0.00s
Presolved: 4 rows, 18 columns, 66 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
```

```
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 2, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 302 nonzeros
Model fingerprint: 0xed93666f
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 31 columns
Presolve time: 0.00s
Presolved: 4 rows, 18 columns, 66 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
```

```
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 2, 2]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 434 nonzeros
Model fingerprint: 0x036c77d6
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 56 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
```

```
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 2, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 294 nonzeros
Model fingerprint: 0x0486fa63
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
```

```
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 436 nonzeros
Model fingerprint: 0x3dd12cb1
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 58 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
```

```
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 2, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 294 nonzeros
Model fingerprint: 0x417aebb8
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.  0.
```

```
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 1, 1, 2, 2, 2, 1, 1]
[3, 2, 3, 3, 2, 2, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 310 nonzeros
Model fingerprint: 0x5afb0ce2
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 31 columns
Presolve time: 0.00s
Presolved: 4 rows, 18 columns, 66 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 2, 2]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
```

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[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 298 nonzeros
Model fingerprint: 0xc40ebafe
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.01s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.02 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
```

```
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 436 nonzeros
Model fingerprint: 0xd292ca8b
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 57 columns
Presolve time: 0.00s
Presolved: 4 rows, 16 columns, 58 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.33333333 0.         0.         0.
0.16666667 0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.5        0.         0.         0.         0.
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 2, 2, 2]
[2, 1, 1, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
[[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]], [[2, 3], [1,
4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]], [[2, 3], [1], [1, 4, 5,
6, 7, 8], [9, 3], [3], [3], [3], [3], [4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7,
```

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8, 9], [3], [4], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3],
[8, 9, 3], [7], [7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4],
[4], [4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]], [[2], [1, 3,
4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5,
6, 7], [8, 3], [9, 3], [3], [3], [4], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3],
[3], [8, 9, 3], [4], [6], [6]], [[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3],
[4], [4], [5], [5]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4],
[5], [6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 300 nonzeros
Model fingerprint: 0x64a53dfc
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 34 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
```

```
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 466 nonzeros
Model fingerprint: 0x15bde5d1
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 55 columns
Presolve time: 0.00s
Presolved: 4 rows, 18 columns, 66 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 3, 2, 2, 2, 2]
[3, 2, 2, 3, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
```

```
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 466 nonzeros
Model fingerprint: 0xa637775c
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 55 columns
Presolve time: 0.00s
Presolved: 4 rows, 18 columns, 66 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 2, 1]
[2, 3, 3, 2, 2, 2, 2, 3, 2]
[3, 2, 2, 3, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
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5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 466 nonzeros
Model fingerprint: 0xe2630bca
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 56 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 3, 2, 2, 2]
[3, 2, 2, 3, 3, 2, 3, 3, 3]
```

```
For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 310 nonzeros
Model fingerprint: 0x64611107
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
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[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 466 nonzeros
Model fingerprint: 0xae3ee07e
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 56 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
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[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 310 nonzeros
Model fingerprint: 0xdcda54df
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
```

```
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 310 nonzeros
Model fingerprint: 0xbcd88875
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 2, 2, 1, 1, 1, 2, 1]
[2, 3, 2, 2, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
```

```
Optimize a model with 7 rows, 49 columns and 310 nonzeros
Model fingerprint: 0x1f8ba3e3
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 2, 2]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 310 nonzeros
Model fingerprint: 0x66b3fd05
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
```

```
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 2]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 318 nonzeros
Model fingerprint: 0x3412a3b9
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s
```

```
Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 1]
[3, 2, 2, 3, 3, 3, 2, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 318 nonzeros
Model fingerprint: 0x77201c18
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
```

```
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 2, 1, 1]
[3, 2, 2, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 310 nonzeros
Model fingerprint: 0x36c5f2af
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.01s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 1, 2, 2, 2, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
```

```
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 314 nonzeros
Model fingerprint: 0x468bba7b
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 2, 1, 1, 1, 2]
[2, 3, 3, 2, 2, 3, 3, 3, 2]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]], [[2, 3],
[1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]], [[2, 3], [1, 4], [1,
5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]], [[2, 3], [1], [1, 4, 5, 6], [7,
3], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9,
2], [3], [5], [5], [5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4],
[5, 9], [8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]], [[2,
3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]], [[2, 3, 4], [1], [1, 5], [1,
```

```
6, 7], [3], [4], [8, 9, 4], [7], [7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8,
3], [4, 9], [5], [5], [6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9,
4], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 314 nonzeros
Model fingerprint: 0x58f8183f
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 1, 2, 2, 2, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 468 nonzeros
Model fingerprint: 0x24d08c92
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
```

```
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 58 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 3, 2, 2, 2]
[3, 2, 2, 3, 3, 2, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 468 nonzeros
Model fingerprint: 0xad497084
Coefficient statistics:
```

```
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 58 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 2, 1]
[2, 3, 3, 2, 2, 2, 2, 3, 2]
[3, 2, 2, 3, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 468 nonzeros
Model fingerprint: 0x005bd5a2
```

```
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 57 columns
Presolve time: 0.00s
Presolved: 4 rows, 16 columns, 58 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 73 columns and 468 nonzeros
```

```
Model fingerprint: 0x9e54d72f
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 57 columns
Presolve time: 0.00s
Presolved: 4 rows, 16 columns, 58 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.33333333 0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.16666667
 4.        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
```

```
Optimize a model with 7 rows, 49 columns and 318 nonzeros
Model fingerprint: 0x406c20b2
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 1, 1, 2]
[3, 2, 2, 3, 2, 3, 3, 3, 2]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 318 nonzeros
Model fingerprint: 0xc391b2f8
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros
```

```
Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 1, 2]
[3, 2, 2, 3, 3, 2, 3, 3, 2]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 314 nonzeros
Model fingerprint: 0xd648a31e
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
```

```
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 1]
[3, 2, 2, 3, 3, 3, 2, 2, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 314 nonzeros
Model fingerprint: 0xe8239712
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
```

```
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 314 nonzeros
Model fingerprint: 0x547e94b9
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 2, 1, 1, 2, 1]
[2, 3, 3, 2, 2, 3, 3, 2, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 322 nonzeros
Model fingerprint: 0x3d824606
```

```
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 2, 1, 1]
[3, 2, 2, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]], [[2, 3], [1,
4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]], [[2, 3], [1, 4], [1, 5,
6], [2], [7, 3], [3], [5, 8, 9], [7], [7]], [[2, 3], [1], [1, 4], [3, 5], [6, 4,
7, 8], [9, 5], [5], [5], [6]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8],
[9, 6], [6], [7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]], [[2,
3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]], [[2, 3], [1], [1,
4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]], [[2, 3], [1], [1, 4], [3, 5],
[6, 7, 4], [8, 5], [9, 5], [6], [7]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 316 nonzeros
Model fingerprint: 0x39d748ef
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 34 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
```

```
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9], [7], [7]],
[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9], [8]], [[2, 3],
[1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9], [8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 322 nonzeros
Model fingerprint: 0xb5ff55c1
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 2, 1, 1]
[3, 2, 2, 3, 2, 3, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9], [7], [7]],
[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9], [8]], [[2, 3],
[1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9], [8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
```

```
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 322 nonzeros
Model fingerprint: 0xcaa55237
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 1, 2, 1]
[3, 2, 2, 3, 2, 3, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9], [7], [7]],
[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9], [8]], [[2, 3],
[1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9], [8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 322 nonzeros
Model fingerprint: 0x06323b6e
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 30 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.000000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s
```

```
Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.5 0.  0.  0.  0.  0.  0.  0.  0.  0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.5 4. ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 2, 1]
[3, 2, 2, 3, 3, 2, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [8, 6], [9, 7], [8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 49 columns and 324 nonzeros
Model fingerprint: 0x653f65c4
Coefficient statistics:
  Matrix range     [1e+00, 8e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 4e+00]
Presolve removed 3 rows and 34 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.250000e+00   0.000000e+00      0s
       3    4.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.000000000e+00
Pesos asociados a los homomorfismos:  [0.  0.  0.  0.  0.  0.  0.  0.  0.5 0.
0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
 0.  0.  0.  0.5 0.  0.  0.  0.  0.  0.  0.  4. ]
Homomorfismos utilizados:
[2, 1, 1, 2, 1, 2, 1, 2, 1]
[2, 3, 3, 2, 3, 2, 3, 2, 3]
```

[36]:
```
[[],
 [[[2], [1, 3, 4, 5, 6, 7, 8, 9], [2], [2], [2], [2], [2], [2], [2]],
  [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [3], [3], [3], [3], [3], [3]],
  [[2], [1, 3, 4], [2], [5, 6, 7, 8, 9, 2], [4], [4], [4], [4], [4]],
  [[2], [1, 3, 4, 5], [2], [2], [6, 7, 8, 9, 2], [5], [5], [5], [5]],
  [[2, 3], [1, 4], [1, 5, 6, 7, 8, 9], [2], [3], [3], [3], [3], [3]],
  [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9], [2], [2], [3], [3], [3], [3]],
  [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9], [2], [2], [2], [3], [3], [3]],
```

```
[[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4]],
[[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [4], [4], [4], [4]],
[[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 3], [7], [7]],
[[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [4], [4], [4]],
[[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [6], [6], [6]],
[[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9], [2], [3], [4], [4], [4]],
[[2], [1, 3, 4], [2], [5, 6, 2, 7], [4], [4], [8, 9, 4], [7], [7]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5]],
[[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4], [6], [6]],
[[2, 3], [1], [1, 4, 5], [6, 7, 3], [8, 9, 3], [4], [4], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6]],
[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9], [5], [5], [5], [5]],
[[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9], [8]],
[[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [4], [4], [4]],
[[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9], [7], [7]],
[[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 2], [3], [5], [5], [5]],
[[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9], [8]],
[[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 2], [3], [3], [5], [5]],
[[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6]],
[[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9], [8]],
[[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [5, 8, 9], [7], [7]],
[[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [4], [8, 9, 4], [7], [7]],
[[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9], [5], [5], [6]],
[[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7]],
[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9], [6], [6], [6]],
[[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9], [8]],
[[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9], [7], [7]],
[[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [3], [5, 8, 9], [7], [7]],
[[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8], [9, 5], [5], [5], [6]],
[[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8], [9, 6], [6], [7]],
[[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7]],
[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [5], [8, 9, 5], [7], [7]],
[[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9], [8]],
[[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9], [6], [7]],
[[2, 3], [1], [1, 4], [3, 5], [6, 7, 4], [8, 5], [9, 5], [6], [7]],
[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9], [7], [7]],
[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9], [8]],
[[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9], [8]],
[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [8, 6], [9, 7], [8]]]
```

[37]:
```
hold(10)
```

```
For F =  [[[2], [1, 3, 4, 5, 6, 7, 8, 9, 10], [2], [2], [2], [2], [2], [2], [2],
[2]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
```

```
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 515 columns and 2568 nonzeros
Model fingerprint: 0x6a57b88b
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 502 columns
Presolve time: 0.00s
Presolved: 4 rows, 13 columns, 44 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   1.125000e+00   0.000000e+00      0s
       4    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 4 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5    0.     0.     0.     0.     0.
0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.4375 0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
```

```
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 0.     0.     0.     0.0625 4.5   ]
Homomorfismos utilizados:
[1, 2, 1, 1, 1, 1, 1, 1, 1, 1]
[2, 3, 2, 2, 2, 2, 2, 2, 2, 2]
[3, 2, 3, 3, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7, 8, 9, 10], [3], [3], [3], [3], [3], [3],
[3]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 9, 10, 2], [4], [4], [4], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [2], [6, 7, 8, 9, 10, 2], [5], [5], [5], [5],
[5]], [[2], [1, 3, 4, 5, 6], [2], [2], [2], [7, 8, 9, 10, 2], [6], [6], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 261 columns and 1558 nonzeros
Model fingerprint: 0x3d06e689
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 246 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
```

```
         0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
         3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.41666667
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
```

```
 0.         0.         0.         0.         0.         0.
 0.         0.08333333 4.5        ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7, 8, 9, 10], [3], [3], [3], [3], [3], [3],
[3]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 9, 10, 2], [4], [4], [4], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [2], [6, 7, 8, 9, 10, 2], [5], [5], [5], [5],
[5]], [[2], [1, 3, 4, 5, 6], [2], [2], [2], [7, 8, 9, 10, 2], [6], [6], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 814 nonzeros
Model fingerprint: 0x816fe0d4
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 120 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   8.750000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.375 0.    0.    0.    0.125 0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.5
 0.    0.    0.    0.    4.5  ]
Homomorfismos utilizados:
[1, 2, 1, 1, 2, 2, 2, 2, 2, 2]
[2, 1, 2, 2, 1, 1, 1, 1, 1, 1]
```

```
[2, 3, 2, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7, 8, 9, 10], [3], [3], [3], [3], [3], [3],
[3]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 9, 10, 2], [4], [4], [4], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [2], [6, 7, 8, 9, 10, 2], [5], [5], [5], [5],
[5]], [[2], [1, 3, 4, 5, 6], [2], [2], [2], [7, 8, 9, 10, 2], [6], [6], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 478 nonzeros
Model fingerprint: 0x6224ceb0
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 62 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 1, 1, 1, 2, 2, 2, 2, 2]
[2, 1, 2, 2, 2, 1, 1, 1, 1, 1]
[2, 3, 2, 2, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4, 5, 6, 7, 8, 9, 10], [3], [3], [3], [3], [3], [3],
[3]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 9, 10, 2], [4], [4], [4], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [2], [6, 7, 8, 9, 10, 2], [5], [5], [5], [5],
[5]], [[2], [1, 3, 4, 5, 6], [2], [2], [2], [7, 8, 9, 10, 2], [6], [6], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 382 nonzeros
```

```
Model fingerprint: 0xb274c501
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 4, 8, 3, 8, 3, 7, 2, 8, 3, 7, 2, 7, 2, 6, 1, 9, 8, 8, 7, 8, 7, 7,
6, 8, 7, 7, 6, 7, 6, 6, 5, 4, 3, 3, 2, 3, 2, 2, 1, 3, 2, 2, 1, 2, 1, 1, 0, 8, 3,
7, 2, 7, 2, 6, 1, 7, 2, 6, 1, 6, 1, 5, 0, -1], [0, 5, 1, 6, 1, 6, 2, 7, 1, 6, 2,
7, 2, 7, 3, 8, 0, 1, 1, 2, 1, 2, 2, 3, 1, 2, 2, 3, 2, 3, 3, 4, 5, 6, 6, 7, 6, 7,
7, 8, 6, 7, 7, 8, 7, 8, 8, 9, 1, 6, 2, 7, 2, 7, 3, 8, 2, 7, 3, 8, 3, 8, 4, 9,
-1], [-4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, 0], [-4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, 0], [0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0, -4, 0,
-4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
```

```
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 261 columns and 1560 nonzeros
Model fingerprint: 0x82b34660
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 246 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
```

```
 0.         0.         0.         0.         0.         0.41666667
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.08333333 4.5       ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
```

```
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 261 columns and 1560 nonzeros
Model fingerprint: 0x78c28dd3
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 246 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.41666667
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
```

```
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.08333333 4.5       ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
```

```
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 261 columns and 1560 nonzeros
Model fingerprint: 0x37727d7d
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 246 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5        0.         0.         0.
0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.41666667
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
```

```
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.08333333 4.5       ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 878 nonzeros
Model fingerprint: 0x8fad113d
Coefficient statistics:
```

```
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 120 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 1, 2]
[2, 3, 3, 2, 2, 2, 2, 2, 2, 3]
[3, 2, 2, 3, 3, 3, 3, 3, 3, 2]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
```

```
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 818 nonzeros
Model fingerprint: 0x689e5af0
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 118 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
```

```
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 510 nonzeros
Model fingerprint: 0xf6ff2d90
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 62 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 2, 2]
[2, 3, 3, 2, 2, 2, 2, 2, 3, 3]
```

```
[3, 2, 2, 3, 3, 3, 3, 3, 2, 2]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 818 nonzeros
Model fingerprint: 0x73769c3f
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 118 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 486 nonzeros
Model fingerprint: 0xd34f01ed
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
```

```
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 2, 2]
[2, 1, 1, 2, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 398 nonzeros
Model fingerprint: 0xd15ba562
Coefficient statistics:
```

```
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 5, 8, 4, 8, 4, 7, 3, 8, 4, 7, 3, 7, 3, 6, 2, 9, 8, 8, 7, 8, 7, 7,
6, 4, 3, 3, 2, 3, 2, 2, 1, 8, 7, 7, 6, 7, 6, 6, 5, 3, 2, 2, 1, 2, 1, 1, 0, 7, 3,
6, 2, 6, 2, 5, 1, 6, 2, 5, 1, 5, 1, 4, 0, -1], [0, 4, 1, 5, 1, 5, 2, 6, 1, 5, 2,
6, 2, 6, 3, 7, 0, 1, 1, 2, 1, 2, 2, 3, 5, 6, 6, 7, 6, 7, 7, 8, 1, 2, 2, 3, 2, 3,
3, 4, 6, 7, 7, 8, 7, 8, 8, 9, 2, 6, 3, 7, 3, 7, 4, 8, 3, 7, 4, 8, 4, 8, 5, 9,
-1], [-4, -1, -4, -1, -4, -1, -4, -1, -4, -1, -4, -1, -4, -1, -4, -1, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, 0, 0, 0, 0, 0, 0, 0, 0, -4, -4, -4, -4, -4, -4, -4, -4,
0, 0, 0, 0, 0, 0, 0, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0,
0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, 0], [0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3,
0, 0, 0, 0, 0, 0, 0, 0, -4, -4, -4, -4, -4, -4, -4, -4, 0, 0, 0, 0, 0, 0, 0, 0,
-4, -4, -4, -4, -4, -4, -4, -4, -1, -4, -1, -4, -1, -4, -1, -4, -1, -4, -1, -4,
-1, -4, -1, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
```

```
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 818 nonzeros
Model fingerprint: 0xe3e33b10
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 120 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
```

```
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 820 nonzeros
Model fingerprint: 0x76770398
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 120 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 398 nonzeros
Model fingerprint: 0xff948b74
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 8, 7, 4, 3, 3, 2, 8, 7, 7, 6, 3, 2, 2, 1, 9, 6, 8, 5, 8, 5, 7,
4, 8, 5, 7, 4, 7, 4, 6, 3, 6, 3, 5, 2, 5, 2, 4, 1, 5, 2, 4, 1, 4, 1, 3, 0, 8, 7,
7, 6, 3, 2, 2, 1, 7, 6, 6, 5, 2, 1, 1, 0, -1], [0, 1, 1, 2, 5, 6, 6, 7, 1, 2, 2,
3, 6, 7, 7, 8, 0, 3, 1, 4, 1, 4, 2, 5, 1, 4, 2, 5, 2, 5, 3, 6, 3, 6, 4, 7, 4, 7,
5, 8, 4, 7, 5, 8, 5, 8, 6, 9, 1, 2, 2, 3, 6, 7, 7, 8, 2, 3, 3, 4, 7, 8, 8, 9,
```

```
-1], [-4, -4, -4, -4, 0, 0, 0, 0, -4, -4, -4, -4, 0, 0, 0, 0, -4, -2, -4, -2,
-4, -2, -4, -2, -4, -2, -4, -2, -4, -2, -4, -2, -2, 0, -2, 0, -2, 0, -2, 0, -2,
0, -2, 0, -2, 0, -2, 0, -4, -4, -4, -4, 0, 0, 0, 0, -4, -4, -4, -4, 0, 0, 0, 0,
0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, 0], [0, 0, 0, 0, -4, -4, -4, -4, 0, 0, 0, 0, -4, -4, -4, -4,
0, -2, 0, -2, 0, -2, 0, -2, 0, -2, 0, -2, 0, -2, 0, -2, -2, -4, -2, -4, -2, -4,
-2, -4, -2, -4, -2, -4, -2, -4, -2, -4, 0, 0, 0, 0, -4, -4, -4, -4, 0, 0, 0, 0,
-4, -4, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 820 nonzeros
Model fingerprint: 0xdc44658d
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
```

```
Presolve removed 3 rows and 118 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 2, 2, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
```

```
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 486 nonzeros
Model fingerprint: 0x1dde430e
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 1, 1, 1, 2, 2, 2, 2, 2]
[2, 1, 2, 2, 2, 1, 1, 1, 1, 1]
[2, 3, 2, 2, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
```

```
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 526 nonzeros
Model fingerprint: 0x9f9e35d0
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 62 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 2, 2]
[2, 3, 3, 2, 2, 2, 2, 2, 3, 3]
[3, 2, 2, 3, 3, 3, 3, 3, 2, 2]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
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[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 406 nonzeros
Model fingerprint: 0xc6333449
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 6, 8, 5, 8, 5, 7, 4, 7, 4, 6, 3, 6, 3, 5, 2, 9, 8, 8, 7, 8, 7, 7,
6, 4, 3, 3, 2, 3, 2, 2, 1, 8, 7, 7, 6, 7, 6, 6, 5, 3, 2, 2, 1, 2, 1, 1, 0, 7, 4,
6, 3, 6, 3, 5, 2, 5, 2, 4, 1, 4, 1, 3, 0, -1], [0, 3, 1, 4, 1, 4, 2, 5, 2, 5, 3,
6, 3, 6, 4, 7, 0, 1, 1, 2, 1, 2, 2, 3, 5, 6, 6, 7, 6, 7, 7, 8, 1, 2, 2, 3, 2, 3,
3, 4, 6, 7, 7, 8, 7, 8, 8, 9, 2, 5, 3, 6, 3, 6, 4, 7, 4, 7, 5, 8, 5, 8, 6, 9,
-1], [-4, -2, -4, -2, -4, -2, -4, -2, -3, -1, -3, -1, -3, -1, -3, -1, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, 0, 0, 0, 0, 0, 0, 0, 0, -4, -4, -4, -4, -4, -4, -4, -4,
0, 0, 0, 0, 0, 0, 0, 0, -3, -1, -3, -1, -3, -1, -3, -1, -2, 0, -2, 0, -2, 0, -2,
0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, 0], [0, -2, 0, -2, 0, -2, 0, -2, -1, -3, -1, -3, -1, -3,
-1, -3, 0, 0, 0, 0, 0, 0, 0, 0, -4, -4, -4, -4, -4, -4, -4, -4, 0, 0, 0, 0, 0,
0, 0, 0, -4, -4, -4, -4, -4, -4, -4, -4, -1, -3, -1, -3, -1, -3, -1, -3, -2, -4,
-2, -4, -2, -4, -2, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
```

```
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
0]]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 490 nonzeros
Model fingerprint: 0x0ddfc86d
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
```

```
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 2, 2]
[2, 1, 1, 2, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 490 nonzeros
Model fingerprint: 0x9f60e97a
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s
```

```
Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 2, 2]
[2, 1, 1, 2, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 820 nonzeros
Model fingerprint: 0x61e9d6e5
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 122 columns
```

```
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 1, 1, 2, 2, 1, 1, 1, 1]
[2, 3, 2, 2, 3, 3, 2, 2, 2, 2]
[3, 2, 3, 3, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
```

```
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 410 nonzeros
Model fingerprint: 0x255261b4
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 7, 6, 7, 6, 5, 4, 7, 6, 5, 4, 5, 4, 3, 2, 9, 8, 8, 7, 8, 7, 7,
6, 4, 3, 3, 2, 3, 2, 2, 1, 8, 7, 7, 6, 7, 6, 6, 5, 3, 2, 2, 1, 2, 1, 1, 0, 7, 6,
5, 4, 5, 4, 3, 2, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 2, 3, 4,
5, 4, 5, 6, 7, 0, 1, 1, 2, 1, 2, 2, 3, 5, 6, 6, 7, 6, 7, 7, 8, 1, 2, 2, 3, 2, 3,
3, 4, 6, 7, 7, 8, 7, 8, 8, 9, 2, 3, 4, 5, 4, 5, 6, 7, 4, 5, 6, 7, 6, 7, 8, 9,
-1], [-4, -4, -3, -3, -3, -3, -2, -2, -3, -3, -2, -2, -2, -2, -1, -1, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, 0, 0, 0, 0, 0, 0, 0, 0, -4, -4, -4, -4, -4, -4, -4, -4,
0, 0, 0, 0, 0, 0, 0, 0, -3, -3, -2, -2, -2, -2, -1, -1, -2, -2, -1, -1, -1, -1,
0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, -1, -1, -1, -1, -2, -2, -1, -1, -2, -2,
-2, -2, -3, -3, 0, 0, 0, 0, 0, 0, 0, 0, -4, -4, -4, -4, -4, -4, -4, -4, 0, 0, 0,
0, 0, 0, 0, 0, -4, -4, -4, -4, -4, -4, -4, -4, -1, -1, -2, -2, -2, -2, -3, -3,
-2, -2, -3, -3, -3, -3, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3],
[3]], [[2, 3], [1, 4, 5, 6], [1, 7, 8, 9, 10], [2], [2], [2], [3], [3], [3],
[3]], [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9], [10, 3], [3], [3], [3], [3], [3],
[4]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9, 10], [3], [4], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [3], [3], [3], [3], [9, 10, 3], [8],
[8]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9, 10], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 10, 3], [6], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6, 7], [1, 8, 9, 10], [3], [3], [3], [4], [4],
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[4]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8, 9, 10], [2], [3], [4], [4], [4],
[4]], [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3, 4], [1, 5], [1, 6, 7], [1, 8, 9, 10], [2], [3], [3], [4], [4],
[4]], [[2], [1, 3, 4, 5], [2], [6, 7, 2], [8, 9, 10, 2], [4], [4], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [10, 3], [3], [3], [3], [4],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 10, 3], [4], [6], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6], [3], [7, 8, 3], [9, 10, 3], [5], [5], [6],
[6]], [[2], [1, 3, 4], [2], [2, 5, 6], [7, 8, 4], [9, 10, 4], [5], [5], [6],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5],
[6]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 10, 3], [4], [5], [6],
[6]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 492 nonzeros
Model fingerprint: 0xfabc18ba
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 62 columns
Presolve time: 0.01s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 2, 2]
[2, 1, 1, 2, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
```

```
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 882 nonzeros
Model fingerprint: 0x01631822
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 118 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
```

```
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 1, 1, 1, 1]
[2, 3, 3, 2, 3, 2, 2, 2, 2, 2]
[3, 2, 2, 3, 2, 3, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
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[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 882 nonzeros
Model fingerprint: 0x11e8cc96
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 118 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 2, 1]
[2, 3, 3, 2, 2, 2, 2, 2, 3, 2]
[3, 2, 2, 3, 3, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
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[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 882 nonzeros
Model fingerprint: 0x4ce2fdc9
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 118 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
```

```
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 3, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
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[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 518 nonzeros
Model fingerprint: 0x84ce56bb
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 2, 2]
[2, 1, 1, 2, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
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[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 882 nonzeros
Model fingerprint: 0x73e7bfaa
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 118 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 414 nonzeros
Model fingerprint: 0x2f5c2e44
Coefficient statistics:
```

```
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 8, 7, 8, 7, 7, 6, 5, 4, 4, 3, 4, 3, 3, 2, 9, 8, 8, 7, 8, 7, 7,
6, 5, 4, 4, 3, 4, 3, 3, 2, 7, 6, 6, 5, 6, 5, 5, 4, 3, 2, 2, 1, 2, 1, 1, 0, 7, 6,
6, 5, 6, 5, 5, 4, 3, 2, 2, 1, 2, 1, 1, 0, -1], [0, 1, 1, 2, 1, 2, 2, 3, 4, 5, 5,
6, 5, 6, 6, 7, 0, 1, 1, 2, 1, 2, 2, 3, 4, 5, 5, 6, 5, 6, 6, 7, 2, 3, 3, 4, 3, 4,
4, 5, 6, 7, 7, 8, 7, 8, 8, 9, 2, 3, 3, 4, 3, 4, 4, 5, 6, 7, 7, 8, 7, 8, 8, 9,
-1], [-4, -4, -4, -4, -4, -4, -4, -4, -1, -1, -1, -1, -1, -1, -1, -1, -4, -4,
-4, -4, -4, -4, -4, -4, -1, -1, -1, -1, -1, -1, -1, -1, -3, -3, -3, -3, -3, -3,
-3, -3, 0, 0, 0, 0, 0, 0, 0, 0, -3, -3, -3, -3, -3, -3, -3, -3, 0, 0, 0, 0, 0,
0, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, 0, 0, 0, 0, 0, 0, -3, -3, -3, -3, -3,
-3, -3, -3, -3, 0, 0, 0, 0, 0, 0, 0, 0, -3, -3, -3, -3, -3, -3, -3, -3, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -4, -4, -4, -4, -4, -4, -4, -4, -4, -1, -1, -1, -1, -1, -1, -1,
-1, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
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[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 882 nonzeros
Model fingerprint: 0xfae7d8df
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 120 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 518 nonzeros
Model fingerprint: 0xdf734572
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
```

```
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 2, 2]
[2, 1, 1, 2, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
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[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 518 nonzeros
Model fingerprint: 0x7f7f4a84
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 1, 1, 2, 2, 2, 2, 1, 2]
[2, 1, 2, 2, 1, 1, 1, 1, 2, 1]
[2, 3, 2, 2, 3, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
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[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 414 nonzeros
Model fingerprint: 0x7f505007
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 8, 7, 5, 4, 4, 3, 8, 7, 7, 6, 4, 3, 3, 2, 9, 8, 8, 7, 8, 7, 7,
6, 6, 5, 5, 4, 5, 4, 4, 3, 6, 5, 5, 4, 5, 4, 4, 3, 3, 2, 2, 1, 2, 1, 1, 0, 7, 6,
6, 5, 3, 2, 2, 1, 6, 5, 5, 4, 2, 1, 1, 0, -1], [0, 1, 1, 2, 4, 5, 5, 6, 1, 2, 2,
3, 5, 6, 6, 7, 0, 1, 1, 2, 1, 2, 2, 3, 3, 4, 4, 5, 4, 5, 5, 6, 3, 4, 4, 5, 4, 5,
5, 6, 6, 7, 7, 8, 7, 8, 8, 9, 2, 3, 3, 4, 6, 7, 7, 8, 3, 4, 4, 5, 7, 8, 8, 9,
-1], [-4, -4, -4, -4, -1, -1, -1, -1, -4, -4, -4, -4, -1, -1, -1, -1, -4, -4,
-4, -4, -4, -4, -4, -4, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2,
-2, -2, 0, 0, 0, 0, 0, 0, 0, 0, -3, -3, -3, -3, 0, 0, 0, 0, -3, -3, -3, -3, 0,
```

```
0, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, 0, 0, -3, -3, -3, -3, 0, 0, 0, 0, -3,
-3, -3, -3, 0, 0, 0, 0, 0, 0, 0, 0, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2,
-2, -2, -2, -2, -2, -4, -4, -4, -4, -4, -4, -4, -4, -1, -1, -1, -1, -4, -4, -4,
-4, -1, -1, -1, -1, -4, -4, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
```

```
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 518 nonzeros
Model fingerprint: 0x18ba118e
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 1, 1, 2, 2, 2, 1, 2, 2]
[2, 1, 2, 2, 1, 1, 1, 2, 1, 1]
[2, 3, 2, 2, 3, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
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[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
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[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 414 nonzeros
Model fingerprint: 0x3faf9286
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 5, 8, 4, 8, 4, 7, 3, 8, 4, 7, 3, 7, 3, 6, 2, 9, 8, 8, 7, 8, 7, 7,
6, 5, 4, 4, 3, 4, 3, 3, 2, 7, 6, 6, 5, 6, 5, 5, 4, 3, 2, 2, 1, 2, 1, 1, 0, 7, 3,
6, 2, 6, 2, 5, 1, 6, 2, 5, 1, 5, 1, 4, 0, -1], [0, 4, 1, 5, 1, 5, 2, 6, 1, 5, 2,
6, 2, 6, 3, 7, 0, 1, 1, 2, 1, 2, 2, 3, 4, 5, 5, 6, 5, 6, 6, 7, 2, 3, 3, 4, 3, 4,
4, 5, 6, 7, 7, 8, 7, 8, 8, 9, 2, 6, 3, 7, 3, 7, 4, 8, 3, 7, 4, 8, 4, 8, 5, 9,
-1], [-4, -1, -4, -1, -4, -1, -4, -1, -4, -1, -4, -1, -4, -1, -4, -1, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -1, -1, -1, -1, -1, -1, -1, -1, -3, -3, -3, -3, -3, -3,
-3, -3, 0, 0, 0, 0, 0, 0, 0, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0,
-3, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, 0], [0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0, -3, 0,
-3, 0, -3, 0, 0, 0, 0, 0, 0, 0, 0, -3, -3, -3, -3, -3, -3, -3, -3, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -4, -4, -4, -4, -4, -4, -4, -4, -4, -1, -4, -1, -4, -1, -4, -1,
-4, -1, -4, -1, -4, -1, -4, -1, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1,
```

```
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 518 nonzeros
Model fingerprint: 0x6ade6b19
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
```

```
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 2, 2]
[2, 3, 3, 2, 2, 2, 2, 2, 3, 3]
[3, 2, 2, 3, 3, 3, 3, 3, 2, 2]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
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[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 518 nonzeros
Model fingerprint: 0xf3785bf4
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1, 2]
[2, 3, 3, 3, 2, 2, 2, 2, 2, 3]
[3, 2, 2, 2, 3, 3, 3, 3, 3, 2]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
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[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 534 nonzeros
Model fingerprint: 0xc2ebdc86
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
```

```
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 2, 2, 1]
[2, 3, 3, 2, 2, 2, 2, 3, 3, 2]
[3, 2, 2, 3, 3, 3, 3, 2, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 518 nonzeros
Model fingerprint: 0x684fd9ff
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
```

```
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1, 2]
[2, 3, 3, 3, 2, 2, 2, 2, 2, 3]
[3, 2, 2, 2, 3, 3, 3, 3, 3, 2]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
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[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 534 nonzeros
Model fingerprint: 0x4d8abf94
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 3, 3, 2, 2, 2]
[3, 2, 2, 3, 3, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
```

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[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 518 nonzeros
Model fingerprint: 0x13496093
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
```

```
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 1, 2]
[2, 3, 3, 3, 2, 2, 2, 2, 2, 3]
[3, 2, 2, 2, 3, 3, 3, 3, 3, 2]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 414 nonzeros
```

```
Model fingerprint: 0x402d09ba
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 5, 4, 8, 7, 4, 3, 8, 7, 4, 3, 7, 6, 3, 2, 9, 8, 8, 7, 7, 6, 6,
5, 5, 4, 4, 3, 3, 2, 2, 1, 8, 7, 7, 6, 6, 5, 5, 4, 4, 3, 3, 2, 2, 1, 1, 0, 7, 6,
3, 2, 6, 5, 2, 1, 6, 5, 2, 1, 5, 4, 1, 0, -1], [0, 1, 4, 5, 1, 2, 5, 6, 1, 2, 5,
6, 2, 3, 6, 7, 0, 1, 1, 2, 2, 3, 3, 4, 4, 5, 5, 6, 6, 7, 7, 8, 1, 2, 2, 3, 3, 4,
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-1], [-4, -4, -1, -1, -4, -4, -1, -1, -4, -4, -1, -1, -4, -4, -1, -1, -4, -4,
-4, -4, -3, -3, -3, -3, -1, -1, -1, -1, 0, 0, 0, 0, -4, -4, -4, -4, -3, -3, -3,
-3, -1, -1, -1, -1, 0, 0, 0, 0, -3, -3, 0, 0, -3, -3, 0, 0, -3, -3, 0, 0, -3,
-3, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
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0, 0, -3, -3, 0, 0, 0, 0, -1, -1, -1, -1, -3, -3, -3, -3, -4, -4, -4, -4, 0, 0,
0, 0, -1, -1, -1, -1, -3, -3, -3, -3, -4, -4, -4, -4, -1, -1, -4, -4, -1, -1,
-4, -4, -1, -1, -4, -4, -1, -1, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0],
[-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
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```
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 534 nonzeros
Model fingerprint: 0x730ba457
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 2, 2]
```

```
[3, 2, 2, 3, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 522 nonzeros
Model fingerprint: 0x776142c4
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros
```

```
Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 3, 3, 2, 2, 2, 2]
[3, 2, 2, 3, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
```

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[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 414 nonzeros
Model fingerprint: 0xa8441ab0
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 6, 8, 5, 8, 5, 7, 4, 8, 5, 7, 4, 7, 4, 6, 3, 9, 8, 8, 7, 5, 4, 4,
3, 7, 6, 6, 5, 3, 2, 2, 1, 8, 7, 7, 6, 4, 3, 3, 2, 6, 5, 5, 4, 2, 1, 1, 0, 6, 3,
5, 2, 5, 2, 4, 1, 5, 2, 4, 1, 4, 1, 3, 0, -1], [0, 3, 1, 4, 1, 4, 2, 5, 1, 4, 2,
5, 2, 5, 3, 6, 0, 1, 1, 2, 4, 5, 5, 6, 2, 3, 3, 4, 6, 7, 7, 8, 1, 2, 2, 3, 5, 6,
6, 7, 3, 4, 4, 5, 7, 8, 8, 9, 3, 6, 4, 7, 4, 7, 5, 8, 4, 7, 5, 8, 5, 8, 6, 9,
-1], [-4, -2, -4, -2, -4, -2, -4, -2, -4, -2, -4, -2, -4, -2, -4, -2, -4, -4,
-4, -4, -1, -1, -1, -1, -3, -3, -3, -3, 0, 0, 0, 0, -4, -4, -4, -4, -1, -1, -1,
-1, -3, -3, -3, -3, 0, 0, 0, 0, -2, 0, -2, 0, -2, 0, -2, 0, -2, 0, -2, 0, -2, 0,
-2, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, 0], [0, -2, 0, -2, 0, -2, 0, -2, 0, -2, 0, -2, 0,
-2, 0, -2, 0, 0, 0, 0, -3, -3, -3, -3, -1, -1, -1, -1, -4, -4, -4, -4, 0, 0, 0,
0, -3, -3, -3, -3, -1, -1, -1, -1, -4, -4, -4, -4, -2, -4, -2, -4, -2, -4, -2,
-4, -2, -4, -2, -4, -2, -4, -2, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
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1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0], [-1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
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-1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
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[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
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[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
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[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
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[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 522 nonzeros
Model fingerprint: 0x5e9d52eb
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
```

```
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 422 nonzeros
Model fingerprint: 0x84b389ba
```

```
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 6, 5, 8, 7, 5, 4, 7, 6, 4, 3, 6, 5, 3, 2, 9, 8, 8, 7, 7, 6, 6,
5, 5, 4, 4, 3, 3, 2, 2, 1, 8, 7, 7, 6, 6, 5, 5, 4, 4, 3, 3, 2, 2, 1, 1, 0, 7, 6,
4, 3, 6, 5, 3, 2, 5, 4, 2, 1, 4, 3, 1, 0, -1], [0, 1, 3, 4, 1, 2, 4, 5, 2, 3, 5,
6, 3, 4, 6, 7, 0, 1, 1, 2, 2, 3, 3, 4, 4, 5, 5, 6, 6, 7, 7, 8, 1, 2, 2, 3, 3, 4,
4, 5, 5, 6, 6, 7, 7, 8, 8, 9, 2, 3, 5, 6, 3, 4, 6, 7, 4, 5, 7, 8, 5, 6, 8, 9,
-1], [-4, -4, -2, -2, -4, -4, -2, -2, -3, -3, -1, -1, -3, -3, -1, -1, -4, -4,
-4, -4, -3, -3, -3, -3, -1, -1, -1, -1, 0, 0, 0, 0, -4, -4, -4, -4, -3, -3, -3,
-3, -1, -1, -1, -1, 0, 0, 0, 0, -3, -3, -1, -1, -3, -3, -1, -1, -2, -2, 0, 0,
-2, -2, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
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-4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, -2, -2, 0, 0, -2, -2, -1, -1, -3,
-3, -1, -1, -3, -3, 0, 0, 0, 0, -1, -1, -1, -1, -3, -3, -3, -3, -4, -4, -4, -4,
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0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
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-1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
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[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
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[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
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[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
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[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 414 nonzeros
Model fingerprint: 0xe003b442
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 6, 8, 5, 8, 5, 7, 4, 8, 5, 7, 4, 7, 4, 6, 3, 9, 8, 8, 7, 6, 5, 5,
4, 6, 5, 5, 4, 3, 2, 2, 1, 8, 7, 7, 6, 5, 4, 4, 3, 5, 4, 4, 3, 2, 1, 1, 0, 6, 3,
5, 2, 5, 2, 4, 1, 5, 2, 4, 1, 4, 1, 3, 0, -1], [0, 3, 1, 4, 1, 4, 2, 5, 1, 4, 2,
5, 2, 5, 3, 6, 0, 1, 1, 2, 3, 4, 4, 5, 3, 4, 4, 5, 6, 7, 7, 8, 1, 2, 2, 3, 4, 5,
5, 6, 4, 5, 5, 6, 7, 8, 8, 9, 3, 6, 4, 7, 4, 7, 5, 8, 4, 7, 5, 8, 5, 8, 6, 9,
-1], [-4, -2, -4, -2, -4, -2, -4, -2, -4, -2, -4, -2, -4, -2, -4, -2, -4, -4,
-4, -4, -2, -2, -2, -2, -2, -2, -2, -2, 0, 0, 0, 0, -4, -4, -4, -4, -2, -2, -2,
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-2, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
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-4, -4, -4, -4, -4, -4, -4, 0], [0, -2, 0, -2, 0, -2, 0, -2, 0, -2, 0, -2, 0,
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0, -2, -2, -2, -2, -2, -2, -2, -2, -4, -4, -4, -4, -2, -4, -2, -4, -2, -4, -2,
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-1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
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[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
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[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
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[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 422 nonzeros
Model fingerprint: 0x88e391aa
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
```

```
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 8, 7, 6, 5, 5, 4, 7, 6, 6, 5, 4, 3, 3, 2, 9, 8, 8, 7, 6, 5, 5,
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6, 5, 4, 3, 3, 2, 5, 4, 4, 3, 2, 1, 1, 0, -1], [0, 1, 1, 2, 3, 4, 4, 5, 2, 3, 3,
4, 5, 6, 6, 7, 0, 1, 1, 2, 3, 4, 4, 5, 3, 4, 4, 5, 6, 7, 7, 8, 1, 2, 2, 3, 4, 5,
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-1], [-4, -4, -4, -4, -2, -2, -2, -2, -3, -3, -3, -3, -1, -1, -1, -1, -4, -4,
-4, -4, -2, -2, -2, -2, -2, -2, -2, -2, 0, 0, 0, 0, -4, -4, -4, -4, -2, -2, -2,
-2, -2, -2, -2, -2, 0, 0, 0, 0, -3, -3, -3, -3, -1, -1, -1, -1, -2, -2, -2, -2,
0, 0, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
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-4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, 0, 0, -2, -2, -2, -2, -1, -1, -1, -1,
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-3, -3, -2, -2, -2, -2, -4, -4, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
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For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
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[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
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[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
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[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 422 nonzeros
Model fingerprint: 0xdf6948ea
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 6, 8, 5, 8, 5, 7, 4, 8, 5, 7, 4, 7, 4, 6, 3, 9, 8, 8, 7, 6, 5, 5,
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```

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For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
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[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
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[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 522 nonzeros
Model fingerprint: 0x32ca87ee
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros
```

```
Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 1, 1, 2, 2, 1, 1, 1, 2]
[2, 3, 2, 2, 3, 3, 2, 2, 2, 3]
[3, 2, 3, 3, 2, 2, 3, 3, 3, 2]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
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[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 422 nonzeros
Model fingerprint: 0xf85db7bd
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 7, 6, 7, 6, 5, 4, 8, 7, 6, 5, 6, 5, 4, 3, 9, 8, 8, 7, 5, 4, 4,
3, 7, 6, 6, 5, 3, 2, 2, 1, 8, 7, 7, 6, 4, 3, 3, 2, 6, 5, 5, 4, 2, 1, 1, 0, 6, 5,
4, 3, 4, 3, 2, 1, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 1, 2, 3,
4, 3, 4, 5, 6, 0, 1, 1, 2, 4, 5, 5, 6, 2, 3, 3, 4, 6, 7, 7, 8, 1, 2, 2, 3, 5, 6,
6, 7, 3, 4, 4, 5, 7, 8, 8, 9, 3, 4, 5, 6, 5, 6, 7, 8, 4, 5, 6, 7, 6, 7, 8, 9,
-1], [-4, -4, -3, -3, -3, -3, -2, -2, -4, -4, -3, -3, -3, -3, -2, -2, -4, -4,
-4, -4, -1, -1, -1, -1, -3, -3, -3, -3, 0, 0, 0, 0, -4, -4, -4, -4, -1, -1, -1,
-1, -3, -3, -3, -3, 0, 0, 0, 0, -2, -2, -1, -1, -1, -1, 0, 0, -2, -2, -1, -1,
-1, -1, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, -1, -1, -1, -1, -2, -2, 0, 0, -1,
-1, -1, -1, -2, -2, 0, 0, 0, 0, -3, -3, -3, -3, -1, -1, -1, -1, -4, -4, -4, -4,
0, 0, 0, 0, -3, -3, -3, -3, -1, -1, -1, -1, -4, -4, -4, -4, -2, -2, -3, -3, -3,
-3, -4, -4, -2, -2, -3, -3, -3, -3, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
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[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 426 nonzeros
Model fingerprint: 0xbcc478d6
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 7, 6, 7, 6, 5, 4, 7, 6, 5, 4, 5, 4, 3, 2, 9, 7, 8, 6, 8, 6, 7,
5, 5, 3, 4, 2, 4, 2, 3, 1, 8, 6, 7, 5, 7, 5, 6, 4, 4, 2, 3, 1, 3, 1, 2, 0, 7, 6,
5, 4, 5, 4, 3, 2, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 2, 3, 4,
5, 4, 5, 6, 7, 0, 2, 1, 3, 1, 3, 2, 4, 4, 6, 5, 7, 5, 7, 6, 8, 1, 3, 2, 4, 2, 4,
3, 5, 5, 7, 6, 8, 6, 8, 7, 9, 2, 3, 4, 5, 4, 5, 6, 7, 4, 5, 6, 7, 6, 7, 8, 9,
-1], [-4, -4, -3, -3, -3, -3, -2, -2, -3, -3, -2, -2, -2, -2, -1, -1, -4, -3,
-4, -3, -4, -3, -4, -3, -1, 0, -1, 0, -1, 0, -1, 0, -4, -3, -4, -3, -4, -3, -4,
```

```
-3, -1, 0, -1, 0, -1, 0, -1, 0, -3, -3, -2, -2, -2, -2, -1, -1, -2, -2, -1, -1,
-1, -1, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
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-2, -2, -2, -2, -3, -3, 0, -1, 0, -1, 0, -1, 0, -1, -3, -4, -3, -4, -3, -4, -3,
-4, 0, -1, 0, -1, 0, -1, 0, -1, -3, -4, -3, -4, -3, -4, -3, -4, -1, -1, -2, -2,
-2, -2, -3, -3, -2, -2, -3, -3, -3, -3, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
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1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
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-1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
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[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
```

```
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 522 nonzeros
Model fingerprint: 0xf2a2ba37
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 2, 2, 2]
[2, 1, 1, 1, 2, 2, 2, 1, 1, 1]
[2, 3, 3, 3, 2, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8, 9, 10], [5], [5], [5], [5],
[5]], [[2, 3], [1], [1, 4, 5, 6, 7, 8], [9, 3], [3], [3], [3], [3], [4, 10],
[9]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 10, 2], [3], [3], [4], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [3], [4, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4],
[4]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 9, 10, 2], [3], [5], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 8, 2], [9, 4], [4], [4], [4], [5, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5],
[5]], [[2], [1, 3, 4], [2], [5, 6, 7, 2], [8, 4], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6, 7, 8], [2], [9, 10, 2], [3], [3], [3], [5],
[5]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8, 9], [3], [10, 4], [4], [4], [4],
[6]], [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [3], [3], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [10, 3], [3], [4], [4], [4],
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[5]], [[2, 3], [1], [1, 4, 5], [6, 3], [3, 7], [4], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8, 9], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5, 6], [4, 7], [4, 8, 9, 10], [5], [6], [6],
[6]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 8, 3], [3], [3], [4, 9], [4, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6],
[6]], [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8],
[8]], [[2], [1, 3, 4], [2], [5, 2, 6], [7, 4], [8, 9, 4], [5, 10], [6], [6],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6],
[7]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 10, 4], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 430 nonzeros
Model fingerprint: 0x0b1dc3f4
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 8, 7, 6, 5, 5, 4, 7, 6, 6, 5, 4, 3, 3, 2, 9, 7, 7, 5, 8, 6, 6,
4, 6, 4, 4, 2, 5, 3, 3, 1, 8, 6, 6, 4, 7, 5, 5, 3, 5, 3, 3, 1, 4, 2, 2, 0, 7, 6,
6, 5, 4, 3, 3, 2, 5, 4, 4, 3, 2, 1, 1, 0, -1], [0, 1, 1, 2, 3, 4, 4, 5, 2, 3, 3,
4, 5, 6, 6, 7, 0, 2, 2, 4, 1, 3, 3, 5, 3, 5, 5, 7, 4, 6, 6, 8, 1, 3, 3, 5, 2, 4,
4, 6, 4, 6, 6, 8, 5, 7, 7, 9, 2, 3, 3, 4, 5, 6, 6, 7, 4, 5, 5, 6, 7, 8, 8, 9,
-1], [-4, -4, -4, -4, -2, -2, -2, -2, -3, -3, -3, -3, -1, -1, -1, -1, -4, -3,
-3, -2, -4, -3, -3, -2, -2, -1, -1, 0, -2, -1, -1, 0, -4, -3, -3, -2, -4, -3,
-3, -2, -2, -1, -1, 0, -2, -1, -1, 0, -3, -3, -3, -3, -1, -1, -1, -1, -2, -2,
-2, -2, 0, 0, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, 0, 0, -2, -2, -2, -2, -1, -1,
-1, -1, -3, -3, -3, -3, 0, -1, -1, -2, 0, -1, -1, -2, -2, -3, -3, -4, -2, -3,
-3, -4, 0, -1, -1, -2, 0, -1, -1, -2, -2, -3, -3, -4, -2, -3, -3, -4, -1, -1,
-1, -1, -3, -3, -3, -3, -2, -2, -2, -2, -4, -4, -4, -4, 0], [1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
```

```
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 884 nonzeros
Model fingerprint: 0x3d84e863
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 120 columns
Presolve time: 0.00s
```

```
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 3, 2, 2, 2, 2]
[3, 2, 2, 3, 3, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
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[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 884 nonzeros
Model fingerprint: 0x549ca98c
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 120 columns
Presolve time: 0.00s
Presolved: 4 rows, 17 columns, 62 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 1, 2, 1]
[2, 3, 3, 2, 2, 2, 2, 2, 3, 2]
[3, 2, 2, 3, 3, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
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```
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 884 nonzeros
Model fingerprint: 0x810c1be5
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 118 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
```

```
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
```

```
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 884 nonzeros
Model fingerprint: 0x0b3c542a
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 118 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 2, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
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[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 884 nonzeros
Model fingerprint: 0xbd28fc78
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 118 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
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[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 137 columns and 884 nonzeros
Model fingerprint: 0xb9d665cf
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
```

```
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 122 columns
Presolve time: 0.00s
Presolved: 4 rows, 15 columns, 54 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5   0.    0.    0.    0.    0.    0.
0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.375
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 0.    0.    0.    0.125 4.5  ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 1, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 2, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
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[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 534 nonzeros
Model fingerprint: 0xab3027dd
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 1, 1, 1, 2]
[2, 3, 3, 2, 3, 2, 2, 2, 2, 3]
[3, 2, 2, 3, 2, 3, 3, 3, 3, 2]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
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[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 522 nonzeros
Model fingerprint: 0x0ae1f5ef
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
```

```
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 2, 2]
[2, 1, 1, 2, 2, 2, 1, 1, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 534 nonzeros
Model fingerprint: 0xd22f9f32
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
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```
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 1, 1, 2]
[2, 3, 3, 2, 2, 3, 2, 2, 2, 3]
[3, 2, 2, 3, 3, 2, 3, 3, 3, 2]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
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[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 422 nonzeros
Model fingerprint: 0x73ac2186
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 8, 7, 8, 7, 7, 6, 5, 4, 4, 3, 4, 3, 3, 2, 9, 8, 8, 7, 7, 6, 6,
5, 6, 5, 5, 4, 4, 3, 3, 2, 7, 6, 6, 5, 5, 4, 4, 3, 4, 3, 3, 2, 2, 1, 1, 0, 7, 6,
6, 5, 6, 5, 5, 4, 3, 2, 2, 1, 2, 1, 1, 0, -1], [0, 1, 1, 2, 1, 2, 2, 3, 4, 5, 5,
6, 5, 6, 6, 7, 0, 1, 1, 2, 2, 3, 3, 4, 3, 4, 4, 5, 5, 6, 6, 7, 2, 3, 3, 4, 4, 5,
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-1], [-4, -4, -4, -4, -4, -4, -4, -4, -1, -1, -1, -1, -1, -1, -1, -1, -4, -4,
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-2, -2, -1, -1, -1, -1, 0, 0, 0, 0, -3, -3, -3, -3, -3, -3, -3, -3, 0, 0, 0, 0,
0, 0, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, 0, 0, 0, 0, 0, 0, -3, -3, -3, -3, -3,
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[-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
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-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
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[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 522 nonzeros
Model fingerprint: 0xaf4ae549
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
```

```
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 2, 1]
[2, 3, 3, 3, 2, 2, 2, 2, 3, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 522 nonzeros
Model fingerprint: 0xf91a2805
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
```

```
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 2, 1, 1, 1, 1, 2, 1]
[2, 3, 3, 3, 2, 2, 2, 2, 3, 2]
[3, 2, 2, 2, 3, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
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[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 422 nonzeros
Model fingerprint: 0xdc4ba708
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 6, 8, 5, 8, 5, 7, 4, 7, 4, 6, 3, 6, 3, 5, 2, 9, 8, 8, 7, 5, 4, 4,
3, 7, 6, 6, 5, 3, 2, 2, 1, 8, 7, 7, 6, 4, 3, 3, 2, 6, 5, 5, 4, 2, 1, 1, 0, 7, 4,
6, 3, 6, 3, 5, 2, 5, 2, 4, 1, 4, 1, 3, 0, -1], [0, 3, 1, 4, 1, 4, 2, 5, 2, 5, 3,
6, 3, 6, 4, 7, 0, 1, 1, 2, 4, 5, 5, 6, 2, 3, 3, 4, 6, 7, 7, 8, 1, 2, 2, 3, 5, 6,
6, 7, 3, 4, 4, 5, 7, 8, 8, 9, 2, 5, 3, 6, 3, 6, 4, 7, 4, 7, 5, 8, 5, 8, 6, 9,
-1], [-4, -2, -4, -2, -4, -2, -4, -2, -3, -1, -3, -1, -3, -1, -3, -1, -4, -4,
-4, -4, -1, -1, -1, -1, -3, -3, -3, -3, 0, 0, 0, 0, -4, -4, -4, -4, -1, -1, -1,
-1, -3, -3, -3, -3, 0, 0, 0, 0, -3, -1, -3, -1, -3, -1, -3, -1, -2, 0, -2, 0,
-2, 0, -2, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, -2, 0, -2, 0, -2, 0, -2, -1, -3, -1,
-3, -1, -3, -1, -3, 0, 0, 0, 0, -3, -3, -3, -3, -1, -1, -1, -1, -4, -4, -4, -4,
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-1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
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[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 422 nonzeros
Model fingerprint: 0x8f5926dd
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 7, 6, 4, 8, 6, 5, 3, 8, 6, 5, 3, 7, 5, 4, 2, 9, 8, 8, 7, 7, 6, 6,
5, 5, 4, 4, 3, 3, 2, 2, 1, 8, 7, 7, 6, 6, 5, 5, 4, 4, 3, 3, 2, 2, 1, 1, 0, 7, 5,
4, 2, 6, 4, 3, 1, 6, 4, 3, 1, 5, 3, 2, 0, -1], [0, 2, 3, 5, 1, 3, 4, 6, 1, 3, 4,
6, 2, 4, 5, 7, 0, 1, 1, 2, 2, 3, 3, 4, 4, 5, 5, 6, 6, 7, 7, 8, 1, 2, 2, 3, 3, 4,
4, 5, 5, 6, 6, 7, 7, 8, 8, 9, 2, 4, 5, 7, 3, 5, 6, 8, 3, 5, 6, 8, 4, 6, 7, 9,
-1], [-4, -3, -2, -1, -4, -3, -2, -1, -4, -3, -2, -1, -4, -3, -2, -1, -4, -4,
-4, -4, -3, -3, -3, -3, -1, -1, -1, -1, 0, 0, 0, 0, -4, -4, -4, -4, -3, -3, -3,
-3, -1, -1, -1, -1, 0, 0, 0, 0, -3, -2, -1, 0, -3, -2, -1, 0, -3, -2, -1, 0, -3,
-2, -1, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
```

```
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, 0], [0, -1, -2, -3, 0, -1, -2, -3, 0, -1, -2,
-3, 0, -1, -2, -3, 0, 0, 0, 0, -1, -1, -1, -1, -3, -3, -3, -3, -4, -4, -4, -4,
0, 0, 0, 0, -1, -1, -1, -1, -3, -3, -3, -3, -4, -4, -4, -4, -1, -2, -3, -4, -1,
-2, -3, -4, -1, -2, -3, -4, -1, -2, -3, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
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1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
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-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
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[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 538 nonzeros
Model fingerprint: 0x3fedc4b9
```

```
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
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[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 422 nonzeros
Model fingerprint: 0xdf3c3a28
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 6, 8, 5, 8, 5, 7, 4, 7, 4, 6, 3, 6, 3, 5, 2, 9, 8, 8, 7, 6, 5, 5,
4, 6, 5, 5, 4, 3, 2, 2, 1, 8, 7, 7, 6, 5, 4, 4, 3, 5, 4, 4, 3, 2, 1, 1, 0, 7, 4,
6, 3, 6, 3, 5, 2, 5, 2, 4, 1, 4, 1, 3, 0, -1], [0, 3, 1, 4, 1, 4, 2, 5, 2, 5, 3,
6, 3, 6, 4, 7, 0, 1, 1, 2, 3, 4, 4, 5, 3, 4, 4, 5, 6, 7, 7, 8, 1, 2, 2, 3, 4, 5,
5, 6, 4, 5, 5, 6, 7, 8, 8, 9, 2, 5, 3, 6, 3, 6, 4, 7, 4, 7, 5, 8, 5, 8, 6, 9,
-1], [-4, -2, -4, -2, -4, -2, -4, -2, -3, -1, -3, -1, -3, -1, -3, -1, -4, -4,
-4, -4, -2, -2, -2, -2, -2, -2, -2, -2, 0, 0, 0, 0, -4, -4, -4, -4, -2, -2, -2,
-2, -2, -2, -2, -2, -2, 0, 0, 0, 0, -3, -1, -3, -1, -3, -1, -3, -1, -2, 0, -2, 0,
-2, 0, -2, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
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-3, -1, -3, -1, -3, 0, 0, 0, 0, -2, -2, -2, -2, -2, -2, -2, -2, -4, -4, -4, -4,
0, 0, 0, 0, -2, -2, -2, -2, -2, -2, -2, -2, -4, -4, -4, -4, -1, -3, -1, -3, -1,
-3, -1, -3, -2, -4, -2, -4, -2, -4, -2, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
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[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 522 nonzeros
Model fingerprint: 0xc3cf2fe9
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
```

```
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 522 nonzeros
Model fingerprint: 0xeea27a2c
Coefficient statistics:
```

```
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 2, 1, 2, 2]
[2, 1, 1, 2, 2, 1, 1, 2, 1, 1]
[2, 3, 3, 2, 2, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
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[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 538 nonzeros
Model fingerprint: 0x0b8eed66
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 3, 3, 2, 2, 2]
[3, 2, 2, 3, 3, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
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[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 522 nonzeros
Model fingerprint: 0x249ec0cc
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
```

```
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 540 nonzeros
Model fingerprint: 0x96840778
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 62 columns
Presolve time: 0.00s
```

```
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
```

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[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 430 nonzeros
Model fingerprint: 0xaa882bf5
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 7, 7, 5, 6, 4, 4, 2, 8, 6, 6, 4, 5, 3, 3, 1, 9, 8, 8, 7, 7, 6, 6,
5, 7, 6, 6, 5, 5, 4, 4, 3, 6, 5, 5, 4, 4, 3, 3, 2, 4, 3, 3, 2, 2, 1, 1, 0, 8, 6,
6, 4, 5, 3, 3, 1, 7, 5, 5, 3, 4, 2, 2, 0, -1], [0, 2, 2, 4, 3, 5, 5, 7, 1, 3, 3,
5, 4, 6, 6, 8, 0, 1, 1, 2, 2, 3, 3, 4, 2, 3, 3, 4, 4, 5, 5, 6, 3, 4, 4, 5, 5, 6,
6, 7, 5, 6, 6, 7, 7, 8, 8, 9, 1, 3, 3, 5, 4, 6, 6, 8, 2, 4, 4, 6, 5, 7, 7, 9,
-1], [-4, -3, -3, -2, -2, -1, -1, 0, -4, -3, -3, -2, -2, -1, -1, 0, -4, -4, -4,
-4, -3, -3, -3, -3, -3, -3, -3, -3, -2, -2, -2, -2, -2, -2, -2, -2, -1, -1, -1,
-1, -1, -1, -1, -1, 0, 0, 0, 0, -4, -3, -3, -2, -2, -1, -1, 0, -4, -3, -3, -2,
-2, -1, -1, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, -1, -1, -2, -2, -3, -3, -4, 0, -1,
-1, -2, -2, -3, -3, -4, 0, 0, 0, 0, -1, -1, -1, -1, -1, -1, -1, -1, -2, -2, -2,
-2, -2, -2, -2, -2, -3, -3, -3, -3, -3, -3, -3, -3, -4, -4, -4, -4, 0, -1, -1,
-2, -2, -3, -3, -4, 0, -1, -1, -2, -2, -3, -3, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
```

```
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 426 nonzeros
Model fingerprint: 0x2697f763
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 7, 6, 7, 6, 5, 4, 7, 6, 5, 4, 5, 4, 3, 2, 9, 8, 8, 7, 5, 4, 4,
3, 7, 6, 6, 5, 3, 2, 2, 1, 8, 7, 7, 6, 4, 3, 3, 2, 6, 5, 5, 4, 2, 1, 1, 0, 7, 6,
5, 4, 5, 4, 3, 2, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 2, 3, 4,
5, 4, 5, 6, 7, 0, 1, 1, 2, 4, 5, 5, 6, 2, 3, 3, 4, 6, 7, 7, 8, 1, 2, 2, 3, 5, 6,
6, 7, 3, 4, 4, 5, 7, 8, 8, 9, 2, 3, 4, 5, 4, 5, 6, 7, 4, 5, 6, 7, 6, 7, 8, 9,
-1], [-4, -4, -3, -3, -3, -3, -2, -2, -3, -3, -2, -2, -2, -2, -1, -1, -4, -4,
-4, -4, -1, -1, -1, -1, -3, -3, -3, -3, 0, 0, 0, 0, -4, -4, -4, -4, -1, -1, -1,
-1, -3, -3, -3, -3, 0, 0, 0, 0, -3, -3, -2, -2, -2, -2, -1, -1, -2, -2, -1, -1,
-1, -1, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, -1, -1, -1, -1, -2, -2, -1, -1,
```

```
-2, -2, -2, -2, -3, -3, 0, 0, 0, 0, -3, -3, -3, -3, -1, -1, -1, -1, -4, -4, -4,
-4, 0, 0, 0, 0, -3, -3, -3, -3, -1, -1, -1, -1, -4, -4, -4, -4, -1, -1, -2, -2,
-2, -2, -3, -3, -2, -2, -3, -3, -3, -3, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 426 nonzeros
Model fingerprint: 0x0a577bc9
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
```

```
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 7, 7, 5, 8, 6, 6, 4, 7, 5, 5, 3, 6, 4, 4, 2, 9, 8, 8, 7, 6, 5, 5,
4, 6, 5, 5, 4, 3, 2, 2, 1, 8, 7, 7, 6, 5, 4, 4, 3, 5, 4, 4, 3, 2, 1, 1, 0, 7, 5,
5, 3, 6, 4, 4, 2, 5, 3, 3, 1, 4, 2, 2, 0, -1], [0, 2, 2, 4, 1, 3, 3, 5, 2, 4, 4,
6, 3, 5, 5, 7, 0, 1, 1, 2, 3, 4, 4, 5, 3, 4, 4, 5, 6, 7, 7, 8, 1, 2, 2, 3, 4, 5,
5, 6, 4, 5, 5, 6, 7, 8, 8, 9, 2, 4, 4, 6, 3, 5, 5, 7, 4, 6, 6, 8, 5, 7, 7, 9,
-1], [-4, -3, -3, -2, -4, -3, -3, -2, -3, -2, -2, -1, -3, -2, -2, -1, -4, -4,
-4, -4, -2, -2, -2, -2, -2, -2, -2, -2, 0, 0, 0, 0, -4, -4, -4, -4, -2, -2, -2,
-2, -2, -2, -2, -2, -2, 0, 0, 0, 0, -3, -2, -2, -1, -3, -2, -2, -1, -2, -1, -1, 0,
-2, -1, -1, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, -1, -1, -2, 0, -1, -1, -2, -1, -2,
-2, -3, -1, -2, -2, -3, 0, 0, 0, 0, -2, -2, -2, -2, -2, -2, -2, -2, -4, -4, -4,
-4, 0, 0, 0, 0, -2, -2, -2, -2, -2, -2, -2, -2, -4, -4, -4, -4, -1, -2, -2, -3,
-1, -2, -2, -3, -2, -3, -3, -4, -2, -3, -3, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
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[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 524 nonzeros
Model fingerprint: 0xeacbfce3
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 62 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 2, 1, 1]
[2, 3, 3, 2, 2, 2, 3, 3, 2, 2]
[3, 2, 2, 3, 3, 3, 2, 2, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
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[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 422 nonzeros
Model fingerprint: 0x4aeb1216
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 8, 7, 6, 5, 5, 4, 8, 7, 7, 6, 5, 4, 4, 3, 9, 7, 8, 6, 6, 4, 5,
3, 7, 5, 6, 4, 4, 2, 3, 1, 8, 6, 7, 5, 5, 3, 4, 2, 6, 4, 5, 3, 3, 1, 2, 0, 6, 5,
5, 4, 3, 2, 2, 1, 5, 4, 4, 3, 2, 1, 1, 0, -1], [0, 1, 1, 2, 3, 4, 4, 5, 1, 2, 2,
3, 4, 5, 5, 6, 0, 2, 1, 3, 3, 5, 4, 6, 2, 4, 3, 5, 5, 7, 6, 8, 1, 3, 2, 4, 4, 6,
5, 7, 3, 5, 4, 6, 6, 8, 7, 9, 3, 4, 4, 5, 6, 7, 7, 8, 4, 5, 5, 6, 7, 8, 8, 9,
-1], [-4, -4, -4, -4, -2, -2, -2, -2, -4, -4, -4, -4, -2, -2, -2, -2, -4, -3,
-4, -3, -2, -1, -2, -1, -3, -2, -3, -2, -1, 0, -1, 0, -4, -3, -4, -3, -2, -1,
-2, -1, -3, -2, -3, -2, -1, 0, -1, 0, -2, -2, -2, -2, 0, 0, 0, 0, -2, -2, -2,
```

```
-2, 0, 0, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, 0, 0, -2, -2, -2, -2, 0, 0, 0, 0,
-2, -2, -2, -2, 0, -1, 0, -1, -2, -3, -2, -3, -1, -2, -1, -2, -3, -4, -3, -4, 0,
-1, 0, -1, -2, -3, -2, -3, -1, -2, -1, -2, -3, -4, -3, -4, -2, -2, -2, -2, -4,
-4, -4, -4, -2, -2, -2, -2, -4, -4, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 430 nonzeros
```

```
Model fingerprint: 0x2c1375f0
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 7, 6, 7, 6, 5, 4, 8, 7, 6, 5, 6, 5, 4, 3, 9, 7, 8, 6, 6, 4, 5,
3, 7, 5, 6, 4, 4, 2, 3, 1, 8, 6, 7, 5, 5, 3, 4, 2, 6, 4, 5, 3, 3, 1, 2, 0, 6, 5,
4, 3, 4, 3, 2, 1, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 1, 2, 3,
4, 3, 4, 5, 6, 0, 2, 1, 3, 3, 5, 4, 6, 2, 4, 3, 5, 5, 7, 6, 8, 1, 3, 2, 4, 4, 6,
5, 7, 3, 5, 4, 6, 6, 8, 7, 9, 3, 4, 5, 6, 5, 6, 7, 8, 4, 5, 6, 7, 6, 7, 8, 9,
-1], [-4, -4, -3, -3, -3, -3, -2, -2, -4, -4, -3, -3, -3, -3, -2, -2, -4, -3,
-4, -3, -2, -1, -2, -1, -3, -2, -3, -2, -1, 0, -1, 0, -4, -3, -4, -3, -2, -1,
-2, -1, -3, -2, -3, -2, -1, 0, -1, 0, -2, -2, -1, -1, -1, -1, 0, 0, -2, -2, -1,
-1, -1, -1, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, -1, -1, -1, -1, -2, -2, 0, 0,
-1, -1, -1, -1, -2, -2, 0, -1, 0, -1, -2, -3, -2, -3, -1, -2, -1, -2, -3, -4,
-3, -4, 0, -1, 0, -1, -2, -3, -2, -3, -1, -2, -1, -2, -3, -4, -3, -4, -2, -2,
-3, -3, -3, -3, -4, -4, -2, -2, -3, -3, -3, -3, -4, -4, 0], [1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
```

```
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 524 nonzeros
Model fingerprint: 0x552b9da1
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 62 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 1, 2, 2, 2]
[2, 1, 1, 2, 1, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 3, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8, 9, 10], [6], [6], [6],
```

```
[6]], [[2, 3], [1, 4], [1, 5, 6, 7, 8], [2], [9, 3], [3], [3], [3], [5, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [2, 7], [3], [3], [4, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6], [2], [3, 7], [3], [5, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1, 4], [1, 5, 6, 7], [2], [8, 3], [3], [3], [5, 9, 10], [8],
[8]], [[2, 3], [1, 4, 5], [1, 6, 7], [2], [2], [8, 3], [3], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7, 8, 9], [10, 5], [5], [5], [5],
[6]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [10, 3], [3], [4], [4], [4],
[5]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 4, 8, 9], [10, 6], [6], [6],
[7]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3, 9], [4], [4], [4], [5, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [4], [4], [6, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [3], [4, 9], [5, 10], [7],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 2, 8], [3], [3], [4], [9, 10, 4], [8],
[8]], [[2, 3], [1], [1, 4, 5], [3], [6, 7, 3], [5, 8], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 2, 8], [3], [5], [9, 10, 5], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [2], [7, 3], [8, 3], [5, 9], [6, 10], [7],
[8]], [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6],
[7]], [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [10, 4], [7],
[8]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10],
[9]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 10, 5], [6], [7],
[7]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5], [7, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 524 nonzeros
Model fingerprint: 0x00d5ba28
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 62 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   7.500000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
```

```
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.25 0.   0.   0.   0.   0.   0.   0.
0.25 0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.5  0.   0.   0.   0.   0.   0.   0.   0.   4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 2, 2, 1, 2]
[2, 1, 1, 2, 2, 1, 1, 1, 2, 1]
[2, 3, 3, 2, 2, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 538 nonzeros
Model fingerprint: 0x7ac4b5e0
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
```

```
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 2, 1, 1, 1]
[2, 3, 3, 2, 3, 2, 3, 2, 2, 2]
[3, 2, 2, 3, 2, 3, 2, 3, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 538 nonzeros
Model fingerprint: 0x2ca4f244
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
```

```
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 1, 1, 2, 1]
[2, 3, 3, 2, 3, 2, 2, 2, 3, 2]
[3, 2, 2, 3, 2, 3, 3, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 430 nonzeros
Model fingerprint: 0x5e09ea88
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 8, 7, 7, 6, 6, 5, 6, 5, 5, 4, 4, 3, 3, 2, 9, 6, 8, 5, 8, 5, 7,
4, 7, 4, 6, 3, 6, 3, 5, 2, 7, 4, 6, 3, 6, 3, 5, 2, 5, 2, 4, 1, 4, 1, 3, 0, 7, 6,
6, 5, 5, 4, 4, 3, 4, 3, 3, 2, 2, 1, 1, 0, -1], [0, 1, 1, 2, 2, 3, 3, 4, 3, 4, 4,
5, 5, 6, 6, 7, 0, 3, 1, 4, 1, 4, 2, 5, 2, 5, 3, 6, 3, 6, 4, 7, 2, 5, 3, 6, 3, 6,
4, 7, 4, 7, 5, 8, 5, 8, 6, 9, 2, 3, 3, 4, 4, 5, 5, 6, 5, 6, 6, 7, 7, 8, 8, 9,
-1], [-4, -4, -4, -4, -3, -3, -3, -3, -2, -2, -2, -2, -1, -1, -1, -1, -4, -2,
-4, -2, -4, -2, -4, -2, -3, -1, -3, -1, -3, -1, -3, -1, -3, -1, -3, -1, -3, -1,
```

```
-3, -1, -2, 0, -2, 0, -2, 0, -2, 0, -3, -3, -3, -3, -2, -2, -2, -2, -1, -1, -1,
-1, 0, 0, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, 0, 0, -1, -1, -1, -1, -2, -2, -2,
-2, -3, -3, -3, -3, 0, -2, 0, -2, 0, -2, 0, -2, -1, -3, -1, -3, -1, -3, -1, -3,
-1, -3, -1, -3, -1, -3, -1, -3, -2, -4, -2, -4, -2, -4, -2, -4, -1, -1, -1, -1,
-2, -2, -2, -2, -3, -3, -3, -3, -4, -4, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 538 nonzeros
Model fingerprint: 0x3fdec948
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s
```

```
Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 2, 1, 1, 2, 1, 1]
[2, 3, 3, 2, 3, 2, 2, 3, 2, 2]
[3, 2, 2, 3, 2, 3, 3, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 538 nonzeros
Model fingerprint: 0x648c9e3f
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
```

```
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 1, 2, 1, 2, 1]
[2, 3, 3, 2, 2, 2, 3, 2, 3, 2]
[3, 2, 2, 3, 3, 3, 2, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 430 nonzeros
Model fingerprint: 0x8cb785d4
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.01s

Solved in 0 iterations and 0.01 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 7, 8, 6, 8, 6, 7, 5, 6, 4, 5, 3, 5, 3, 4, 2, 9, 8, 8, 7, 7, 6, 6,
5, 6, 5, 5, 4, 4, 3, 3, 2, 7, 6, 6, 5, 5, 4, 4, 3, 4, 3, 3, 2, 2, 1, 1, 0, 7, 5,
6, 4, 6, 4, 5, 3, 4, 2, 3, 1, 3, 1, 2, 0, -1], [0, 2, 1, 3, 1, 3, 2, 4, 3, 5, 4,
6, 4, 6, 5, 7, 0, 1, 1, 2, 2, 3, 3, 4, 3, 4, 4, 5, 5, 6, 6, 7, 2, 3, 3, 4, 4, 5,
5, 6, 5, 6, 6, 7, 7, 8, 8, 9, 2, 4, 3, 5, 3, 5, 4, 6, 5, 7, 6, 8, 6, 8, 7, 9,
```

```
-1], [-4, -3, -4, -3, -4, -3, -4, -3, -2, -1, -2, -1, -2, -1, -2, -1, -4, -4,
-4, -4, -3, -3, -3, -3, -2, -2, -2, -2, -1, -1, -1, -1, -3, -3, -3, -3, -2, -2,
-2, -2, -1, -1, -1, -1, 0, 0, 0, 0, -3, -2, -3, -2, -3, -2, -3, -2, -1, 0, -1,
0, -1, 0, -1, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, -1, 0, -1, 0, -1, 0, -1, -2, -3,
-2, -3, -2, -3, -2, -3, 0, 0, 0, 0, -1, -1, -1, -1, -2, -2, -2, -2, -3, -3, -3,
-3, -1, -1, -1, -1, -2, -2, -2, -2, -3, -3, -3, -3, -4, -4, -4, -4, -1, -2, -1,
-2, -1, -2, -1, -2, -3, -4, -3, -4, -3, -4, -3, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 538 nonzeros
Model fingerprint: 0x566e7eb0
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
```

```
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 2, 1, 1]
[2, 3, 3, 2, 2, 3, 2, 3, 2, 2]
[3, 2, 2, 3, 3, 2, 3, 2, 3, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 538 nonzeros
Model fingerprint: 0x43c43641
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 60 columns
Presolve time: 0.00s
Presolved: 4 rows, 21 columns, 78 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s
```

```
Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 1, 2, 1]
[2, 3, 3, 2, 2, 3, 2, 2, 3, 2]
[3, 2, 2, 3, 3, 2, 3, 3, 2, 3]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 430 nonzeros
Model fingerprint: 0x32bc6263
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 7, 8, 6, 6, 4, 5, 3, 8, 6, 7, 5, 5, 3, 4, 2, 9, 8, 8, 7, 7, 6, 6,
5, 7, 6, 6, 5, 5, 4, 4, 3, 6, 5, 5, 4, 4, 3, 3, 2, 4, 3, 3, 2, 2, 1, 1, 0, 7, 5,
6, 4, 4, 2, 3, 1, 6, 4, 5, 3, 3, 1, 2, 0, -1], [0, 2, 1, 3, 3, 5, 4, 6, 1, 3, 2,
```

```
4, 4, 6, 5, 7, 0, 1, 1, 2, 2, 3, 3, 4, 2, 3, 3, 4, 4, 5, 5, 6, 3, 4, 4, 5, 5, 6,
6, 7, 5, 6, 6, 7, 7, 8, 8, 9, 2, 4, 3, 5, 5, 7, 6, 8, 3, 5, 4, 6, 6, 8, 7, 9,
-1], [-4, -3, -4, -3, -2, -1, -2, -1, -4, -3, -4, -3, -2, -1, -2, -1, -4, -4,
-4, -4, -3, -3, -3, -3, -3, -3, -3, -3, -2, -2, -2, -2, -2, -2, -2, -2, -1, -1,
-1, -1, -1, -1, -1, -1, 0, 0, 0, 0, -3, -2, -3, -2, -1, 0, -1, 0, -3, -2, -3,
-2, -1, 0, -1, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, -1, 0, -1, -2, -3, -2, -3, 0,
-1, 0, -1, -2, -3, -2, -3, 0, 0, 0, 0, -1, -1, -1, -1, -1, -1, -1, -1, -2, -2,
-2, -2, -2, -2, -2, -2, -3, -3, -3, -3, -3, -3, -3, -3, -4, -4, -4, -4, -1, -2,
-1, -2, -3, -4, -3, -4, -1, -2, -1, -2, -3, -4, -3, -4, 0], [1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 430 nonzeros
Model fingerprint: 0xed223a4c
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
```

```
Infeasible model
Matriz:  [[9, 6, 8, 5, 8, 5, 7, 4, 7, 4, 6, 3, 6, 3, 5, 2, 9, 8, 8, 7, 6, 5, 5,
4, 7, 6, 6, 5, 4, 3, 3, 2, 7, 6, 6, 5, 4, 3, 3, 2, 5, 4, 4, 3, 2, 1, 1, 0, 7, 4,
6, 3, 6, 3, 5, 2, 5, 2, 4, 1, 4, 1, 3, 0, -1], [0, 3, 1, 4, 1, 4, 2, 5, 2, 5, 3,
6, 3, 6, 4, 7, 0, 1, 1, 2, 3, 4, 4, 5, 2, 3, 3, 4, 5, 6, 6, 7, 2, 3, 3, 4, 5, 6,
6, 7, 4, 5, 5, 6, 7, 8, 8, 9, 2, 5, 3, 6, 3, 6, 4, 7, 4, 7, 5, 8, 5, 8, 6, 9,
-1], [-4, -2, -4, -2, -4, -2, -4, -2, -3, -1, -3, -1, -3, -1, -3, -1, -4, -4,
-4, -4, -2, -2, -2, -2, -3, -3, -3, -3, -1, -1, -1, -1, -3, -3, -3, -3, -1, -1,
-1, -1, -2, -2, -2, -2, 0, 0, 0, 0, -3, -1, -3, -1, -3, -1, -3, -1, -2, 0, -2,
0, -2, 0, -2, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, -2, 0, -2, 0, -2, 0, -2, -1, -3,
-1, -3, -1, -3, -1, -3, 0, 0, 0, 0, -2, -2, -2, -2, -1, -1, -1, -1, -3, -3, -3,
-3, -1, -1, -1, -1, -3, -3, -3, -3, -2, -2, -2, -2, -4, -4, -4, -4, -1, -3, -1,
-3, -1, -3, -1, -3, -2, -4, -2, -4, -2, -4, -2, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 430 nonzeros
Model fingerprint: 0xef0b9e87
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
```

```
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 8, 7, 7, 6, 6, 5, 6, 5, 5, 4, 4, 3, 3, 2, 9, 8, 8, 7, 7, 6, 6,
5, 6, 5, 5, 4, 4, 3, 3, 2, 7, 6, 6, 5, 5, 4, 4, 3, 4, 3, 3, 2, 2, 1, 1, 0, 7, 6,
6, 5, 5, 4, 4, 3, 4, 3, 3, 2, 2, 1, 1, 0, -1], [0, 1, 1, 2, 2, 3, 3, 4, 3, 4, 4,
5, 5, 6, 6, 7, 0, 1, 1, 2, 2, 3, 3, 4, 3, 4, 4, 5, 5, 6, 6, 7, 2, 3, 3, 4, 4, 5,
5, 6, 5, 6, 6, 7, 7, 8, 8, 9, 2, 3, 3, 4, 4, 5, 5, 6, 5, 6, 6, 7, 7, 8, 8, 9,
-1], [-4, -4, -4, -4, -3, -3, -3, -3, -2, -2, -2, -2, -1, -1, -1, -1, -4, -4,
-4, -4, -3, -3, -3, -3, -2, -2, -2, -2, -1, -1, -1, -1, -3, -3, -3, -3, -2, -2,
-2, -2, -1, -1, -1, -1, 0, 0, 0, 0, -3, -3, -3, -3, -2, -2, -2, -2, -1, -1, -1,
-1, 0, 0, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, 0, 0, -1, -1, -1, -1, -2, -2, -2,
-2, -3, -3, -3, -3, 0, 0, 0, 0, -1, -1, -1, -1, -2, -2, -2, -2, -3, -3, -3, -3,
-1, -1, -1, -1, -2, -2, -2, -2, -3, -3, -3, -3, -4, -4, -4, -4, -1, -1, -1, -1,
-2, -2, -2, -2, -3, -3, -3, -3, -4, -4, -4, -4, 0], [1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 430 nonzeros
Model fingerprint: 0x5c2c523f
Coefficient statistics:
```

```
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 8, 7, 7, 6, 6, 5, 7, 6, 6, 5, 5, 4, 4, 3, 9, 8, 7, 6, 6, 5, 4,
3, 7, 6, 5, 4, 4, 3, 2, 1, 8, 7, 6, 5, 5, 4, 3, 2, 6, 5, 4, 3, 3, 2, 1, 0, 6, 5,
5, 4, 4, 3, 3, 2, 4, 3, 3, 2, 2, 1, 1, 0, -1], [0, 1, 1, 2, 2, 3, 3, 4, 2, 3, 3,
4, 4, 5, 5, 6, 0, 1, 2, 3, 3, 4, 5, 6, 2, 3, 4, 5, 5, 6, 7, 8, 1, 2, 3, 4, 4, 5,
6, 7, 3, 4, 5, 6, 6, 7, 8, 9, 3, 4, 4, 5, 5, 6, 6, 7, 5, 6, 6, 7, 7, 8, 8, 9,
-1], [-4, -4, -4, -4, -3, -3, -3, -3, -3, -3, -3, -3, -2, -2, -2, -2, -4, -4,
-3, -3, -2, -2, -1, -1, -3, -3, -2, -2, -1, -1, 0, 0, -4, -4, -3, -3, -2, -2,
-1, -1, -3, -3, -2, -2, -1, -1, 0, 0, -2, -2, -2, -2, -1, -1, -1, -1, -1, -1,
-1, -1, 0, 0, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, 0, 0, -1, -1, -1, -1, -1, -1,
-1, -1, -2, -2, -2, -2, 0, 0, -1, -1, -2, -2, -3, -3, -1, -1, -2, -2, -3, -3,
-4, -4, 0, 0, -1, -1, -2, -2, -3, -3, -1, -1, -2, -2, -3, -3, -4, -4, -2, -2,
-2, -2, -3, -3, -3, -3, -3, -3, -3, -3, -4, -4, -4, -4, 0], [1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
```

```
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 434 nonzeros
Model fingerprint: 0xfb8073c9
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 7, 6, 7, 6, 5, 4, 7, 6, 5, 4, 5, 4, 3, 2, 9, 7, 8, 6, 6, 4, 5,
3, 7, 5, 6, 4, 4, 2, 3, 1, 8, 6, 7, 5, 5, 3, 4, 2, 6, 4, 5, 3, 3, 1, 2, 0, 7, 6,
5, 4, 5, 4, 3, 2, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 2, 3, 4,
5, 4, 5, 6, 7, 0, 2, 1, 3, 3, 5, 4, 6, 2, 4, 3, 5, 5, 7, 6, 8, 1, 3, 2, 4, 4, 6,
5, 7, 3, 5, 4, 6, 6, 8, 7, 9, 2, 3, 4, 5, 4, 5, 6, 7, 4, 5, 6, 7, 6, 7, 8, 9,
-1], [-4, -4, -3, -3, -3, -3, -2, -2, -3, -3, -2, -2, -2, -2, -1, -1, -4, -3,
-4, -3, -2, -1, -2, -1, -3, -2, -3, -2, -1, 0, -1, 0, -4, -3, -4, -3, -2, -1,
-2, -1, -3, -2, -3, -2, -1, 0, -1, 0, -3, -3, -2, -2, -2, -2, -1, -1, -2, -2,
-1, -1, -1, -1, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, -1, -1, -1, -1, -2, -2,
-1, -1, -2, -2, -2, -2, -3, -3, 0, -1, 0, -1, -2, -3, -2, -3, -1, -2, -1, -2,
-3, -4, -3, -4, 0, -1, 0, -1, -2, -3, -2, -3, -1, -2, -1, -2, -3, -4, -3, -4,
-1, -1, -2, -2, -2, -2, -3, -3, -2, -2, -3, -3, -3, -3, -4, -4, 0], [1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [6, 8, 9, 10], [7], [7],
[7]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [9, 5], [5], [5], [6, 10],
[9]], [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [6, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [3], [8, 4], [7, 9], [8, 10],
[9]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10],
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4], [6, 8], [7, 9, 10], [8],
[8]], [[2, 3], [1], [1, 4, 5], [6, 3], [3], [7, 4, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10],
[9]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8],
[8]], [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5],
[7]], [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6],
[8]], [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10],
```

```
[9]], [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 434 nonzeros
Model fingerprint: 0xd8709a32
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.01s

Solved in 0 iterations and 0.01 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 7, 6, 7, 6, 5, 4, 7, 6, 5, 4, 5, 4, 3, 2, 9, 7, 7, 5, 8, 6, 6,
4, 6, 4, 4, 2, 5, 3, 3, 1, 8, 6, 6, 4, 7, 5, 5, 3, 5, 3, 3, 1, 4, 2, 2, 0, 7, 6,
5, 4, 5, 4, 3, 2, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 2, 3, 4,
5, 4, 5, 6, 7, 0, 2, 2, 4, 1, 3, 3, 5, 3, 5, 5, 7, 4, 6, 6, 8, 1, 3, 3, 5, 2, 4,
4, 6, 4, 6, 6, 8, 5, 7, 7, 9, 2, 3, 4, 5, 4, 5, 6, 7, 4, 5, 6, 7, 6, 7, 8, 9,
-1], [-4, -4, -3, -3, -3, -3, -2, -2, -3, -3, -2, -2, -2, -2, -1, -1, -4, -3,
-3, -2, -4, -3, -3, -2, -2, -1, -1, 0, -2, -1, -1, 0, -4, -3, -3, -2, -4, -3,
-3, -2, -2, -1, -1, 0, -2, -1, -1, 0, -3, -3, -2, -2, -2, -2, -1, -1, -2, -2,
-1, -1, -1, -1, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, -1, -1, -1, -1, -2, -2,
-1, -1, -2, -2, -2, -2, -3, -3, 0, -1, -1, -2, 0, -1, -1, -2, -2, -3, -3, -4,
-2, -3, -3, -4, 0, -1, -1, -2, 0, -1, -1, -2, -2, -3, -3, -4, -2, -3, -3, -4,
-1, -1, -2, -2, -2, -2, -3, -3, -2, -2, -3, -3, -3, -3, -4, -4, 0], [1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3, 7], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [9, 6], [10, 8],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [8, 6, 9], [10, 7], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 540 nonzeros
```

```
Model fingerprint: 0xe065ffeb
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 62 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 2, 1, 1, 1]
[2, 3, 3, 2, 2, 3, 3, 2, 2, 2]
[3, 2, 2, 3, 3, 2, 2, 3, 3, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3, 7], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [9, 6], [10, 8],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [8, 6, 9], [10, 7], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 81 columns and 540 nonzeros
Model fingerprint: 0x1149e8aa
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 62 columns
Presolve time: 0.00s
Presolved: 4 rows, 19 columns, 70 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
```

```
       0    0.0000000e+00   5.625000e-01   0.000000e+00      0s
       3    4.5000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.00 seconds (0.00 work units)
Optimal objective  4.500000000e+00
Pesos asociados a los homomorfismos:  [0.5  0.   0.   0.   0.   0.   0.   0.
0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.25 0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.25 4.5 ]
Homomorfismos utilizados:
[1, 2, 2, 1, 1, 2, 1, 1, 2, 1]
[2, 3, 3, 2, 2, 3, 2, 2, 3, 2]
[3, 2, 2, 3, 3, 2, 3, 3, 2, 3]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3, 7], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [9, 6], [10, 8],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [8, 6, 9], [10, 7], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 434 nonzeros
Model fingerprint: 0xc5543e21
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 7, 8, 6, 7, 5, 6, 4, 7, 5, 6, 4, 5, 3, 4, 2, 9, 8, 7, 6, 6, 5, 4,
3, 7, 6, 5, 4, 4, 3, 2, 1, 8, 7, 6, 5, 5, 4, 3, 2, 6, 5, 4, 3, 3, 2, 1, 0, 7, 5,
6, 4, 5, 3, 4, 2, 5, 3, 4, 2, 3, 1, 2, 0, -1], [0, 2, 1, 3, 2, 4, 3, 5, 2, 4, 3,
5, 4, 6, 5, 7, 0, 1, 2, 3, 3, 4, 5, 6, 2, 3, 4, 5, 5, 6, 7, 8, 1, 2, 3, 4, 4, 5,
6, 7, 3, 4, 5, 6, 6, 7, 8, 9, 2, 4, 3, 5, 4, 6, 5, 7, 4, 6, 5, 7, 6, 8, 7, 9,
-1], [-4, -3, -4, -3, -3, -2, -3, -2, -3, -2, -3, -2, -2, -1, -2, -1, -4, -4,
-3, -3, -2, -2, -1, -1, -3, -3, -2, -2, -1, -1, 0, 0, -4, -4, -3, -3, -2, -2,
-1, -1, -3, -3, -2, -2, -1, -1, 0, 0, -3, -2, -3, -2, -2, -1, -2, -1, -2, -1,
-2, -1, -1, 0, -1, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
```

```
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, -1, 0, -1, -1, -2, -1, -2,
-1, -2, -1, -2, -2, -3, -2, -3, 0, 0, -1, -1, -2, -2, -3, -3, -1, -1, -2, -2,
-3, -3, -4, -4, 0, 0, -1, -1, -2, -2, -3, -3, -1, -1, -2, -2, -3, -3, -4, -4,
-1, -2, -1, -2, -2, -3, -2, -3, -2, -3, -2, -3, -3, -4, -3, -4, 0], [1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1, 4], [1, 5], [2, 6], [3, 7], [4, 8], [5, 9, 10], [6], [7],
[7]], [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [9, 6], [6], [7, 10],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [9, 6], [10, 8],
[9]], [[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [8, 6, 9], [10, 7], [7],
[8]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 434 nonzeros
Model fingerprint: 0x5b50b879
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 7, 6, 7, 6, 5, 4, 7, 6, 5, 4, 5, 4, 3, 2, 9, 8, 6, 5, 7, 6, 4,
3, 7, 6, 4, 3, 5, 4, 2, 1, 8, 7, 5, 4, 6, 5, 3, 2, 6, 5, 3, 2, 4, 3, 1, 0, 7, 6,
5, 4, 5, 4, 3, 2, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 2, 3, 4,
5, 4, 5, 6, 7, 0, 1, 3, 4, 2, 3, 5, 6, 2, 3, 5, 6, 4, 5, 7, 8, 1, 2, 4, 5, 3, 4,
6, 7, 3, 4, 6, 7, 5, 6, 8, 9, 2, 3, 4, 5, 4, 5, 6, 7, 4, 5, 6, 7, 6, 7, 8, 9,
-1], [-4, -4, -3, -3, -3, -3, -2, -2, -3, -3, -2, -2, -2, -2, -1, -1, -4, -4,
-2, -2, -3, -3, -1, -1, -3, -3, -1, -1, -2, -2, 0, 0, -4, -4, -2, -2, -3, -3,
-1, -1, -3, -3, -1, -1, -2, -2, 0, 0, -3, -3, -2, -2, -2, -2, -1, -1, -2, -2,
-1, -1, -1, -1, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, -1, -1, -1, -1, -2, -2,
-1, -1, -2, -2, -2, -2, -3, -3, 0, 0, -2, -2, -1, -1, -3, -3, -1, -1, -3, -3,
-2, -2, -4, -4, 0, 0, -2, -2, -1, -1, -3, -3, -1, -1, -3, -3, -2, -2, -4, -4,
-1, -1, -2, -2, -2, -2, -3, -3, -2, -2, -3, -3, -3, -3, -4, -4, 0], [1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
```

```
1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]

For F =  [[[2, 3], [1], [1, 4], [5, 3], [6, 4], [7, 5], [6, 8], [7, 9], [8, 10],
[9]]]
Warning for adding constraints: zero or small (< 1e-13) coefficients, ignored
Gurobi Optimizer version 9.5.1 build v9.5.1rc2 (win64)
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
Optimize a model with 7 rows, 65 columns and 438 nonzeros
Model fingerprint: 0x38e83ae2
Coefficient statistics:
  Matrix range     [1e+00, 9e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 5e+00]
Presolve removed 3 rows and 54 columns
Presolve time: 0.00s

Solved in 0 iterations and 0.00 seconds (0.00 work units)
Infeasible model
Matriz:  [[9, 8, 7, 6, 7, 6, 5, 4, 7, 6, 5, 4, 5, 4, 3, 2, 9, 7, 7, 5, 7, 5, 5,
3, 7, 5, 5, 3, 5, 3, 3, 1, 8, 6, 6, 4, 6, 4, 4, 2, 6, 4, 4, 2, 4, 2, 2, 0, 7, 6,
5, 4, 5, 4, 3, 2, 5, 4, 3, 2, 3, 2, 1, 0, -1], [0, 1, 2, 3, 2, 3, 4, 5, 2, 3, 4,
5, 4, 5, 6, 7, 0, 2, 2, 4, 2, 4, 4, 6, 2, 4, 4, 6, 4, 6, 6, 8, 1, 3, 3, 5, 3, 5,
5, 7, 3, 5, 5, 7, 5, 7, 7, 9, 2, 3, 4, 5, 4, 5, 6, 7, 4, 5, 6, 7, 6, 7, 8, 9,
-1], [-4, -4, -3, -3, -3, -3, -2, -2, -3, -3, -2, -2, -2, -2, -1, -1, -4, -3,
-3, -2, -3, -2, -2, -1, -3, -2, -2, -1, -2, -1, -1, 0, -4, -3, -3, -2, -3, -2,
-2, -1, -3, -2, -2, -1, -2, -1, -1, 0, -3, -3, -2, -2, -2, -2, -1, -1, -2, -2,
-1, -1, -1, -1, 0, 0, 0], [-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4,
-4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, -4, 0], [0, 0, -1, -1, -1, -1, -2, -2,
-1, -1, -2, -2, -2, -2, -3, -3, 0, -1, -1, -2, -1, -2, -2, -3, -1, -2, -2, -3,
-2, -3, -3, -4, 0, -1, -1, -2, -1, -2, -2, -3, -1, -2, -2, -3, -2, -3, -3, -4,
-1, -1, -2, -2, -2, -2, -3, -3, -2, -2, -3, -3, -3, -3, -4, -4, 0], [1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 0], [-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
-1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 0]]
```

[37]:
```
[[[[2], [1, 3, 4, 5, 6], [2], [2], [2], [7, 8, 9, 10, 2], [6], [6], [6], [6]],
  [[2, 3], [1], [1, 4, 5, 6, 7], [3], [3], [3], [8, 9, 10, 3], [7], [7], [7]],
  [[2], [1, 3, 4], [2], [5, 6, 7, 2, 8], [4], [4], [4], [9, 10, 4], [8], [8]],
```

```
 [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [3], [3], [9, 10, 3], [4], [7], [7]],
 [[2, 3], [1], [1, 4, 5, 6, 7], [8, 3], [9, 3], [10, 3], [3], [4], [5], [6]],
 [[2, 3], [1, 4], [1, 5, 6, 7], [8, 9, 10, 2], [3], [3], [3], [4], [4], [4]],
 [[2, 3], [1, 4, 5], [1, 6, 7], [2], [8, 9, 10, 2], [3], [3], [5], [5], [5]],
 [[2, 3], [1, 4], [1, 5, 6, 7], [2], [3], [3], [8, 9, 10, 3], [7], [7], [7]],
 [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 9, 3], [10, 6], [6], [6], [7]],
 [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [4], [4], [9, 10, 4], [8], [8]],
 [[2, 3], [1], [1, 4, 5, 6], [7, 3], [3], [8, 9, 3], [4, 10], [6], [6], [7]],
 [[2, 3, 4], [1], [1, 5, 6], [1, 7, 8], [3], [3], [4], [9, 10, 4], [8], [8]],
 [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4, 9, 10], [5], [5], [6], [6]],
 [[2, 3, 4], [1, 5], [1, 6], [1, 7, 8], [2], [3], [4], [9, 10, 4], [8], [8]],
 [[2, 3, 4], [1], [1, 5], [1, 6, 7, 8], [3], [9, 4], [10, 4], [4], [6], [7]],
 [[2, 3], [1], [1, 4, 5, 6], [7, 3], [8, 3], [9, 3], [4], [5], [6, 10], [9]],
 [[2, 3], [1], [1, 4, 5], [6, 3], [7, 8, 3], [4], [5, 9], [5, 10], [7], [8]],
 [[2, 3], [1, 4], [1, 5, 6], [7, 8, 9, 2], [3], [3], [10, 4], [4], [4], [7]],
 [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7, 8], [5], [5], [9, 10, 5], [8], [8]],
 [[2, 3], [1], [1, 4, 5, 6], [3], [3], [7, 8, 3], [6, 9], [6], [7, 10], [9]],
 [[2, 3], [1], [1, 4, 5], [6, 3], [3], [4, 7, 8], [6], [9, 10, 6], [8], [8]],
 [[2], [1, 3, 4], [2], [5, 6, 2], [7, 4], [8, 4], [5, 9], [6, 10], [7], [8]],
 [[2, 3], [1], [1, 4], [3, 5], [6, 7, 4, 8], [9, 5], [10, 5], [5], [6], [7]],
 [[2, 3], [1], [1, 4, 5], [3, 6], [3], [7, 8, 4], [9, 6], [10, 6], [7], [8]],
 [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 9, 4], [4], [6], [6, 10], [9]],
 [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3], [8, 4], [9, 4], [6], [7, 10], [9]],
 [[2, 3], [1, 4], [1, 5], [6, 7, 2], [3, 8], [4], [4], [5, 9, 10], [8], [8]],
 [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [3], [3], [9, 4], [4], [7, 10], [9]],
 [[2, 3], [1, 4, 5], [1, 6], [2], [7, 8, 2], [3], [9, 5], [5], [7, 10], [9]],
 [[2, 3], [1, 4], [1, 5], [2, 6], [3], [4, 7, 8], [6], [9, 10, 6], [8], [8]],
 [[2, 3], [1, 4], [1, 5, 6], [7, 8, 2], [9, 3], [3], [10, 4], [4], [5], [7]],
 [[2, 3, 4], [1], [1, 5], [1, 6, 7], [3, 8], [9, 4], [4], [5, 10], [6], [8]],
 [[2, 3], [1], [1, 4], [3, 5], [6, 4, 7], [8, 5], [9, 5], [6], [7, 10], [9]],
 [[2, 3], [1], [1, 4, 5], [6, 3], [7, 3], [4], [8, 5], [7, 9], [8, 10], [9]],
 [[2, 3], [1], [1, 4], [3, 5], [4, 6, 7], [8, 5], [5], [9, 6], [10, 8], [9]],
 [[2, 3], [1], [1, 4], [3, 5], [4, 6], [5, 7], [8, 6, 9], [10, 7], [7], [8]],
 [[2, 3], [1], [1, 4], [5, 3], [6, 4], [7, 5], [6, 8], [7, 9], [8, 10], [9]]],
[[[2], [1, 3, 4, 5, 6, 7, 8, 9, 10], [2], [2], [2], [2], [2], [2], [2], [2]],
 [[2, 3], [1], [1, 4, 5, 6, 7, 8, 9, 10], [3], [3], [3], [3], [3], [3], [3]],
 [[2], [1, 3, 4], [2], [5, 6, 7, 8, 9, 10, 2], [4], [4], [4], [4], [4], [4]],
 [[2], [1, 3, 4, 5], [2], [2], [6, 7, 8, 9, 10, 2], [5], [5], [5], [5], [5]],
 [[2, 3], [1, 4], [1, 5, 6, 7, 8, 9, 10], [2], [3], [3], [3], [3], [3], [3]],
 [[2, 3], [1, 4, 5], [1, 6, 7, 8, 9, 10], [2], [2], [3], [3], [3], [3], [3]],
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