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Q1) list three wining move given are (10, 18, 24, 46, 53) as a Nim position.
* The binary Representation of the integers are

10 : 101000
18 : 100100
24 : 110000
46 : 101110
53 : 110101

111111

* Given to find position(p) Base 2 as fallows do XOR d nim Sum by Choosing 1, 2 and 4

10100 = [1+2+4+5+9]
10101

10101 => 21

This position has all bit Sets to zero (0). Except 2nd and ~~with~~ 4th
Choose 1, 2 and 3 XOR = 10110
11000 [1+8+2+5+9]

11001 = 25

This position has all bit Sets to Except 4th bit which are 1
Choose 2, 4, 8 XOR = 2+4+8+5+9 = 28
3 winning positions are 21, 25, 28
* Hence the winning positions are 21, 25, 28.

Q2) Open the gambit and enter the play offs of the two players in the fallowing order.

| | L | M | R |
|---|---|---|---|
| T | 1 | 0 | -1 |
| M | 0 | 1 | 0 |
| B | -1 | 0 | 1 |

The Nash Equilibrium for the game are :-
(T, M) with probability 1/2
(B, M) with probability 1/2

To Compute the set of Corelated Equillibria; the following command is run.
glpsol ---cpxlp <LP-file> -m coarsecorrEq.mod
So the Nash Equilibrium are
$(T, M) = p(T, M) = 1/2$
$(B, M) = p(B, M) = 1/2$

Q3) Palyer-1

| | C | D |
|---|---|---|
| A | (6, -10) | (0, 10) |
| B | (4, 1) | (1, 0) |

Player-1 Plays (A, B) = probability (P, 1-P)
Player-2 plays (C, D) = probability (q, 1-q)

$Exp = p(-10) + 1-p(1) = 1-11(p)$
$Exp = p(10) + 1-p(1) = 10p$

$EUC = EUd$
$1-11p = 10p = 1-21p = p = 1/2$
player II for $10p = 10/21$

$Ep_A = q(6) + (1-q)(0) = 6q$

$Ep_B = (4)q + (1-Q)(1) = 1+3q$

$Ep_A = Ep_B$
$6q = 1+3q = Q = 1/3.$

E(x) for player-I is $6q = 6\times 1/3 = 2$

Unique Strategy = $P(1/21)$ & $q = 1/2$

play offs 2 for player-I

10/21 for player-II

When we assume $p = 3/21 = 1/7 \times 1/21$

a) play off for player-1 : $1/3\times 6 = 2$ where she maintains play offs for player-1 would be

$1+3q-p+3pq$

$= [1+3\times 1/3 - 1/7 + 3\times 1/7 \times 1/3]$

$= 2$

b) Expected play off for player-II

$10p+q-21pq$

$= [10\times 1/7 + 1/3 - 21\times 1/3 \times 1/7]$

$= 16/21$ which is $> 10/21$

* player-II commit to playing Startagy "C" with probability "

By assuming $\boxed{q = 2/3}$

* Expected playoffs for player-II $= 10p+q-21p$

$= 10\times 1/21 + 2/3 - 21\times 1/21 \times 2/3$

$= 10/21$

Expected play off for player-I

$= 1+3(2/3) - 1/21 + 3\times 1/21 \times 2/3$

$= 3+21 - 1/21 = 341/20$

$= 3.05 \times 2$

player-II benefits by obtaining greater from she did nash equillibrium

Q4) To find a Nash equilibrium has glpsol, we first need to generate the Co-orresponding .dat file using the streets and statehouses

set S:- A B C D E F
set H:- G H I J K L

Param c

| | | | | | | |
|---|---|---|---|---|---|---|
| A | 1 | 2 | 3 | 4 | 5 | 6 |
| B | 2 | 4 | 6 | 8 | 10 | 12 |
| C | 3 | 6 | 9 | 12 | 15 | 18 |
| D | 4 | 8 | 12 | 16 | 20 | 24 |
| E | 5 | 10 | 15 | 20 | 25 | 30 |
| F | 6 | 12 | 18 | 24 | 30 | 36 |

Param d

| | | | | | | |
|---|---|---|---|---|---|---|
| G | 2 | 3 | 3 | 3 | 3 | 3 |
| H | 3 | 2 | 3 | 3 | 3 | 3 |
| I | 3 | 3 | 2 | 3 | 3 | 3 |
| J | 3 | 3 | 3 | 2 | 3 | 3 |
| K | 3 | 3 | 3 | 3 | 2 | 3 |
| L | 3 | 3 | 3 | 3 | 3 | 2 |

use the glpsol command to run, 2 per.0 sum and find a Nash equilibria

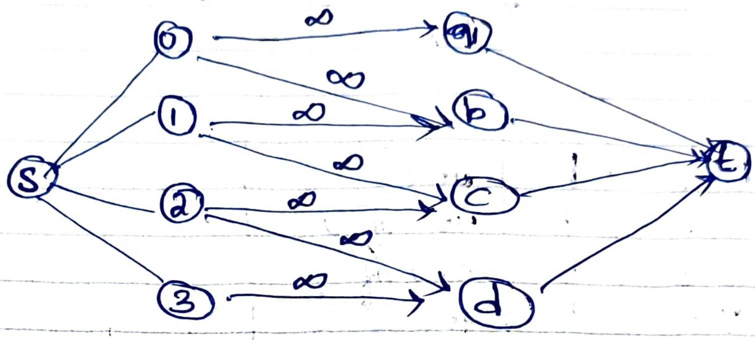
glpsol --mode 2per s0 sum.mod --dat hide and seek 2kp5q.dat

Running the Command yields the following Actual ranges of kept Variable

X: [1,6]
Y: [1,6]

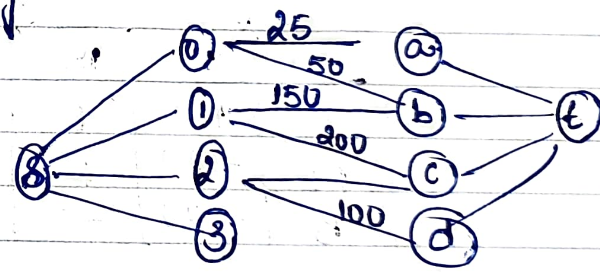
Objectives : optimal
Nash Equilibrium
$x : 4, \quad y : 4$

Q5)

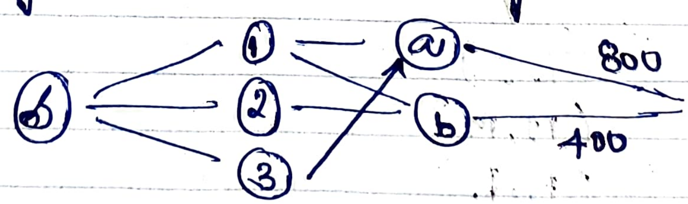



Binary Search between 0 and $\dfrac{(800+400+200+100)}{10+20+40+80} = 10$

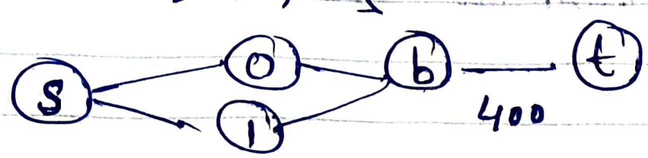
Assuming $A^{\alpha} = 5$ increasing 7.5
if $A^{\alpha} = 7.5$




Saturating all edges having $\delta$




$W = \{0, 1, b\}$



Binary Scratch $= 400/3 = 13.33$

$(s) - (0) - (b) \xrightarrow{400} t$

$x^0 = 40$

| A | Price | B | unity |
|---|---|---|---|
| 0 | 40 | b | 400 of 0 |
| 1 | 13.3 | b | 200 of 1 |
| 2 | 7.5 | b | 100 of 3 |
| 3 | 10 | d | 800 of 3 |
| | | b c | 300 of 2 |

Q6) open the gambit and Create new game as shown

| | L | M | R |
|---|---|---|---|
| T | 10 | 0 | -100 |
| M | -100 | 1 | -100 |
| B | -100 | -1 | 0 |

Compute all the gambit the show that outcome which are

(T, L)

(M, M)

(B, R)

we use in Lp file and the set of course Co-rrelated equalibria are u[illegible]

(T, L) probability = 1/3
(B, R) probability = 1/3
(m, m) probability = 1/3

Gambit - Untitled Strategic Game (unsaved changes)

File Edit View Format Tools Help

**Player 1**
Payoff: 2.0000

**Player 2**
Payoff: 0.4762

| | 1 | | 2 | |
|---|---|---|---|---|
| 1 | 6 | -10 | 0 | 10 |
| 2 | 4 | 1 | 1 | 0 |

Profiles

One equilibrium by logit tracing in strategic game

| # | 1: 1 | 1: 2 | 2: 1 | 2: 2 |
|---|---|---|---|---|
| 1 | 0.0476 | 0.9524 | 0.3333 | 0.6667 |

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Gambit - [C:\Users\balur\Downloads\hideAndSeek.2.kp59.gbt] Untitled Strategic Game (unsaved changes)

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**Cop**
Payoff: -1/3

**Robber**
Payoff: 1/3

| | 1st St / 2nd Ave | | 1st St / 4th Ave | | 2nd St / 4th Ave | | 2nd St / 5th Ave | | 3rd St / 2nd Ave | | 3rd St / 4th Ave | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1st St | 1 | -1 | 1 | -1 | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 |
| 2nd St | -1 | 1 | -1 | 1 | 1 | -1 | 1 | -1 | -1 | 1 | -1 | 1 |
| 3rd St | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 | 1 | -1 | 1 | -1 |
| 1st Ave | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 |
| 2nd Ave | 1 | -1 | -1 | 1 | -1 | 1 | -1 | 1 | 1 | -1 | -1 | 1 |
| 3rd Ave | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 |
| 4th Ave | -1 | 1 | 1 | -1 | 1 | -1 | -1 | 1 | -1 | 1 | 1 | -1 |
| 5th Ave | -1 | 1 | -1 | 1 | -1 | 1 | 1 | -1 | -1 | 1 | -1 | 1 |

Profiles

One equilibrium by solving a linear program in strategic game

| # | 1: 1st St | 1: 2nd St | 1: 3rd St | 1: 1st Ave | 1: 2nd Ave | 1: 3rd Ave | 1: 4th Ave | 1: 5th Ave | 2: 1st St / 2nd Ave | 2: 1st St / 4th Ave | 2: 2nd St / 4th Ave | 2: 2nd St / 5th Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | $\frac{1}{3}$ | $\frac{1}{3}$ | $\frac{1}{3}$ | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{1}{3}$ | 0 | $\frac{1}{3}$ |

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Gambit - [C:\Users\balur\Downloads\hideAndSeek.2.kp59.gbt] Untitled Strategic Game (unsaved changes)

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Cop
Payoff: -1/3

Robber
Payoff: 1/3

| | 1st St / 2nd Ave | | 1st St / 4th Ave | | 2nd St / 4th Ave | | 2nd St / 5th Ave | | 3rd St / 2nd Ave | | 3rd St / 4th Ave | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1st St | 1 | -1 | 1 | -1 | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 |
| 2nd St | -1 | 1 | -1 | 1 | 1 | -1 | 1 | -1 | -1 | 1 | -1 | 1 |
| 3rd St | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 | 1 | -1 | 1 | -1 |
| 1st Ave | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 |
| 2nd Ave | 1 | -1 | -1 | 1 | -1 | 1 | -1 | 1 | 1 | -1 | -1 | 1 |
| 3rd Ave | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 | -1 | 1 |
| 4th Ave | -1 | 1 | 1 | -1 | 1 | -1 | -1 | 1 | -1 | 1 | 1 | -1 |
| 5th Ave | -1 | 1 | -1 | 1 | -1 | 1 | 1 | -1 | -1 | 1 | -1 | 1 |

Profiles ▾ One equilibrium by solving a linear program in strategic game

| # | 1: 1st St | 1: 2nd St | 1: 3rd St | 1: 1st Ave | 1: 2nd Ave | 1: 3rd Ave | 1: 4th Ave | 1: 5th Ave | 2: 1st St / 2nd Ave | 2: 1st St / 4th Ave | 2: 2nd St / 4th Ave | 2: 2nd St / 5th Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | $\frac{1}{3}$ | $\frac{1}{3}$ | $\frac{1}{3}$ | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{1}{3}$ | 0 | $\frac{1}{3}$ |

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```
$ glpsol -m 2pers0sum.mod -d hideAndSeek.2.kp59.dat
...
Optimal Solution Found


Objective value: 4.0


Player 1's strategy:
s[1,'A'] = 1.0
s[1,'B'] = 0.0
s[1,'C'] = 0.0
s[1,'D'] = 0.0
s[1,'E'] = 0.0
s[1,'F'] = 0.0
s[1,'G'] = 0.0
s[1,'H'] = 0.0
s[1,'I'] = 0.0
s[1,'J'] = 0.0
s[1,'K'] = 0.0
s[1,'L'] = 0.0
```

```
Player 2's strategy:
s[2,'A'] = 0.0
s[2,'B'] = 0.0
s[2,'C'] = 0.0
s[2,'D'] = 0.0
s[2,'E'] = 1.0
s[2,'F'] = 0.0
s[2,'G'] = 0.0
s[2,'H'] = 0.0
s[2,'I'] = 0.0
s[2,'J'] = 0.0
s[2,'K'] = 0.0
s[2,'L'] = 0.0

Nash equilibrium:
Player 1: ['A']
Player 2: ['E']
```

```
Equilibrium 1:
Player 1: ['A', 'B', 'C', 'D']
Player 2: ['A', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L']
Payoffs: (3.0, 1.0)

Equilibrium 2:
Player 1: ['A']
Player 2: ['E']
Payoffs: (4.0, 0.0)

Equilibrium 3:
Player 1: ['B', 'C', 'D']
Player 2: ['E']
Payoffs: (1.0, 3.0)

Equilibrium 4:
Player 1: ['B']
Player 2: ['F', 'G', 'H', 'I', 'J', 'K', 'L']
Payoffs: (1.0, 3.0)

Equilibrium 5:
Player 1: ['C']
Player 2: ['F', 'G', 'H', 'I', 'J', 'K', 'L']
Payoffs: (1.0, 3.0)
```