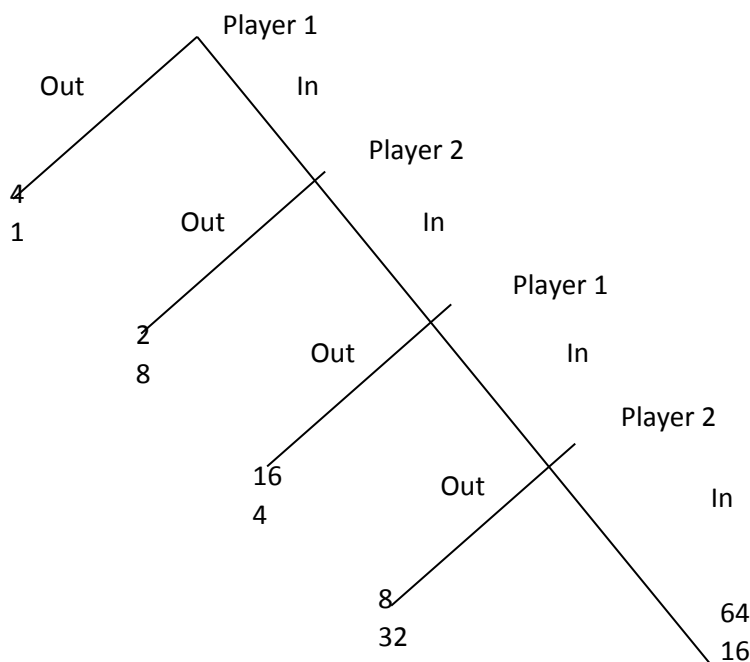**Problem set 6**

- Read the Example "two stage game of imperfect information" in slides 30 – 34 of lecture 6
- Read the economic application from slides 37 of lecture 6
  - o Stackelberg model of Duopoly
  - o Sequential bargaining
  - o Wage and employment
  - o Bank runs
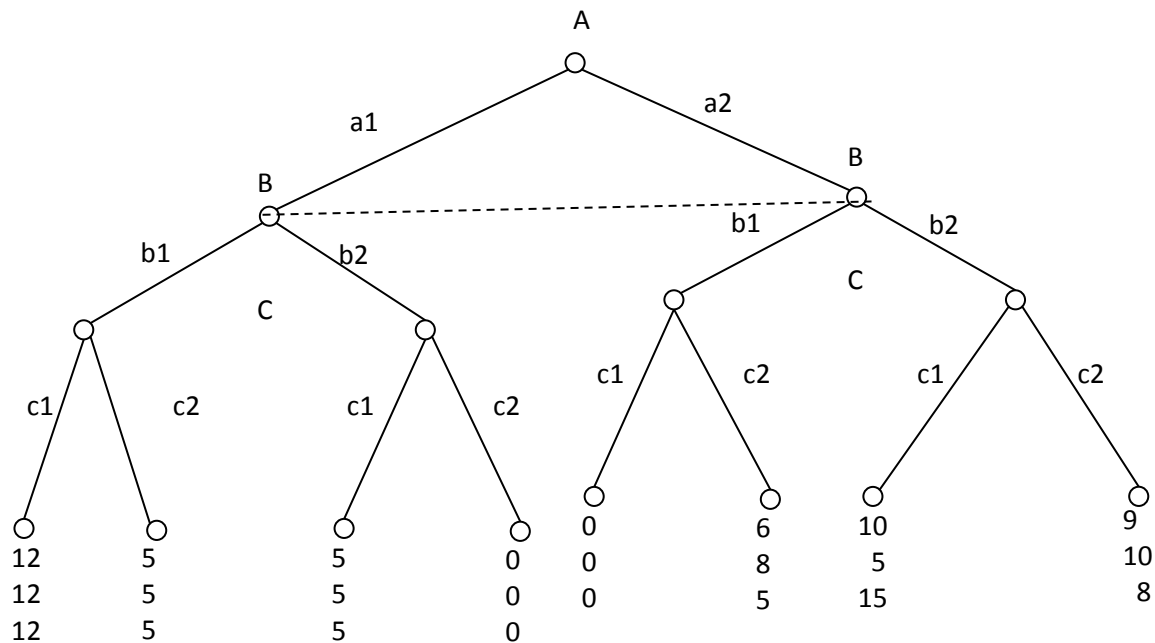 - o Tariffs and Imperfect international competition

Ex 1.

In each decision node players have two possible actions, *In* or *Out*

a) How many information sets for each player?
b) How many subgames?
c) Write all possible strategies for both players
d) Represent this game in normal form and find all Nash equilibria.
e) Find all Subgame Perfect Nash Equilibria

Ex 2. Two individuals, A and B, are working on a join project. They can devote it either high effort or low effort. If both players devote high effort, the outcome of the project is of high quality and each one receives 100$. If one or both devote low effort, the outcome of the project is of low quality and each one receives 50$. The opportunity cost to provide high effort is 30. The opportunity cost to provide low effort is 0. Individual A moves first, individual B observes the action of A and then moves.

a) Represent this situation using the extensive form representation
b) for both players write all possible strategies
c) Using the normal form, find all Nash equilibriums
d) Find all Subgame Perfect Nash Equilibria

Ex. 3

The tree has root A with branches a1 (left to node B) and a2 (right to node B). The two B nodes are connected by a dashed line (same information set). Each B node has branches b1 and b2 leading to C nodes, each C node has branches c1 and c2 leading to payoffs.

Payoffs (left to right):
- a1, b1, c1: 12, 12, 12
- a1, b1, c2: 5, 5, 5
- a1, b2, c1: 5, 5, 5
- a1, b2, c2: 0, 0, 0
- a2, b1, c1: 0, 0, 0
- a2, b1, c2: 6, 8, 5
- a2, b2, c1: 10, 5, 15
- a2, b2, c2: 9, 10, 8

a) How many information sets has player A?and player B? And player C? How many subgames?

b) For each player describe all possible strategies

c) Find all Subgame Perfect Nash Equilibria

Ex. 4 There are 2 players that must state one number from the set {0, 1, 2). The payoff of each player is given by the stated number minus the absolute difference between his stated number and the number stated by the other player. Players move in a sequence: Player 1 moves first then player 2. When player 2 has to move he is only partially informed about the choice of player 1: he can see if player 1 chosen 2 but he cannot discriminate if player 1 chosen 0 or 1

a) Represent this situation using the extensive form

b) How many information sets and subgames has this game

c) Describe all strategies of players 1 and 2

d) using the normal form find all NE

e) Find all Subgame Perfect Nash Equilibria