CSC242: Homework 1.3
AIMA Chapter 5.0–5.2.2

1. Define the following terms briefly:

   (a) Zero-sum game

   (b) Perfect information

   (c) Terminal state

   (d) Utility function

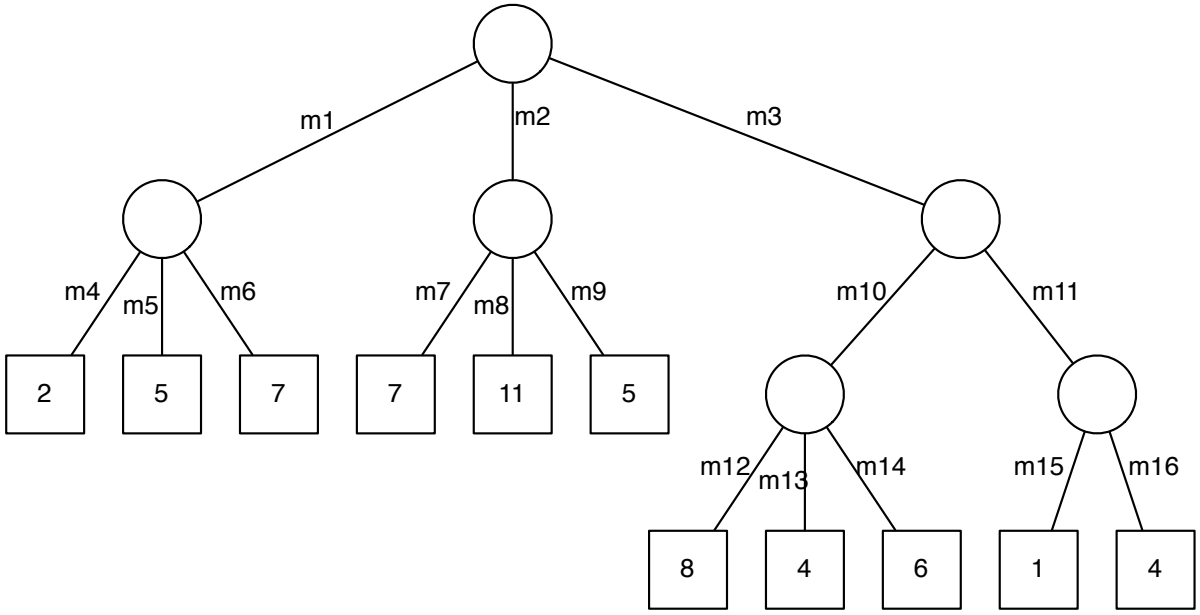
   (e) Game tree

2. Where does the name “MINIMAX” come from?

3. Here are the rules for a simple two-player math game. Two numbers are chosen; call them n and G. The goal of the game is to get from n to G by applying the following operations: adding 1, subtracting 1, multiplying by 2, and dividing by 2 (assume integer division). The players take turns performing one of the operations in each turn. The winner is the player who first gets to G.

   Which player wins for $n = 3$ and $G = 10$? Justify your answer.

4. Consider the following game tree:



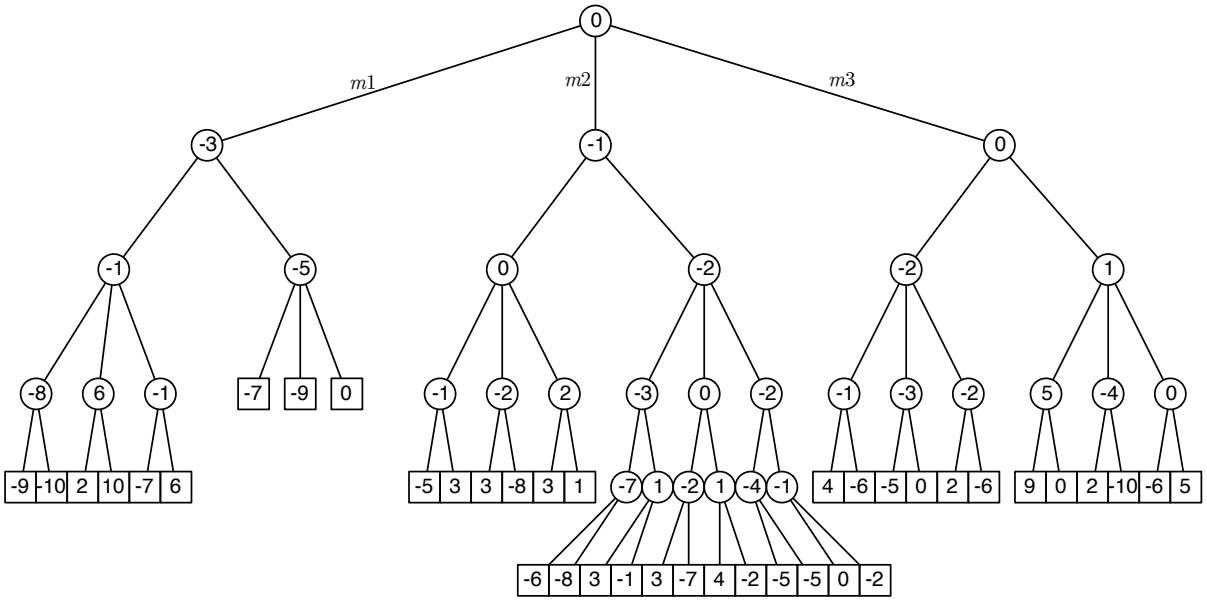
Terminal states are squares and are labelled with their utility for MAX. Non-terminals are circles. Edges are labeled with moves.

(a) Label the levels of the tree with MAX and MIN.

(b) Compute the minimax values of the non-terminal nodes.

(c) What is the optimal move for the first player? What is the second player's optimal response?

5. Consider the following game tree:



Terminal states are squares and are labelled with their utility for MAX. Non-terminals are circles and are labelled with a heuristic estimate of the value of the state. Some edges are labeled with moves.

(a) What is the MINIMAX value of the root and what move should MAX make?

(b) Suppose you can only search to depth 2 (two moves or *ply*). What is the H-MINIMAX value of the root and what move should MAX make?

(c) What if you can search to depth 3?

(d) What if you can search to depth 4?