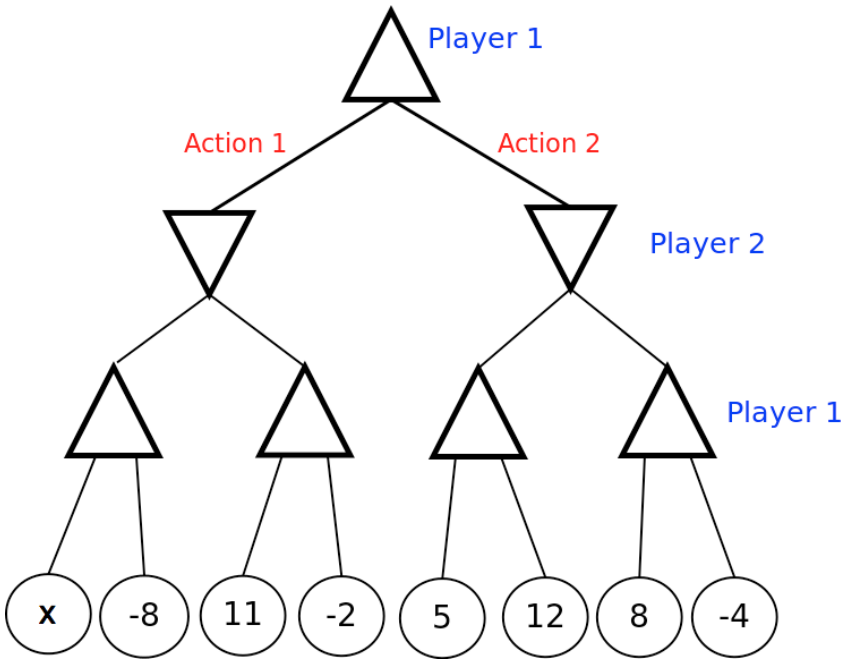
## QUESTION 3: UNKNOWN LEAF VALUE (8/8 points)

Consider the following game tree, where one of the leaves has an unknown payoff, x. Player 1 moves first, and attempts to maximize the value of the game.




Each of the next 3 questions asks you to write a constraint on x specifying the set of values it can take. In your constraints, you can use the letter x, integers, and the symbols > and <. If x has no possible values, write 'None'. If x can take on all values, write 'All'. As an example, if you think x can take on all values larger than 16, you should enter x > 16.

Assume Player 2 is a minimizing agent (and Player 1 knows this). For what values of x is Player 1 *guaranteed* to choose Action 1?

x>8

Assume Player 2 chooses actions at random with each action having equal probability (and Player 1 knows this). For what values of x is Player 1 *guaranteed* to choose Action 1?

x>9

Denote the minimax value of the tree as the value of the root when Player 1 is the maximizer and Player 2 is the minimizer. Denote the expectimax value of the tree as the value of the root when Player 1 is the maximizer and Player 2 chooses actions at random (with equal probability). For what values of x is the minimax value of the tree worth more than the expectimax value of the tree?

None

Is it possible to have a game, where the minimax value is strictly larger than the expectimax value?

- ( ) Yes
- (•) No ✔

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