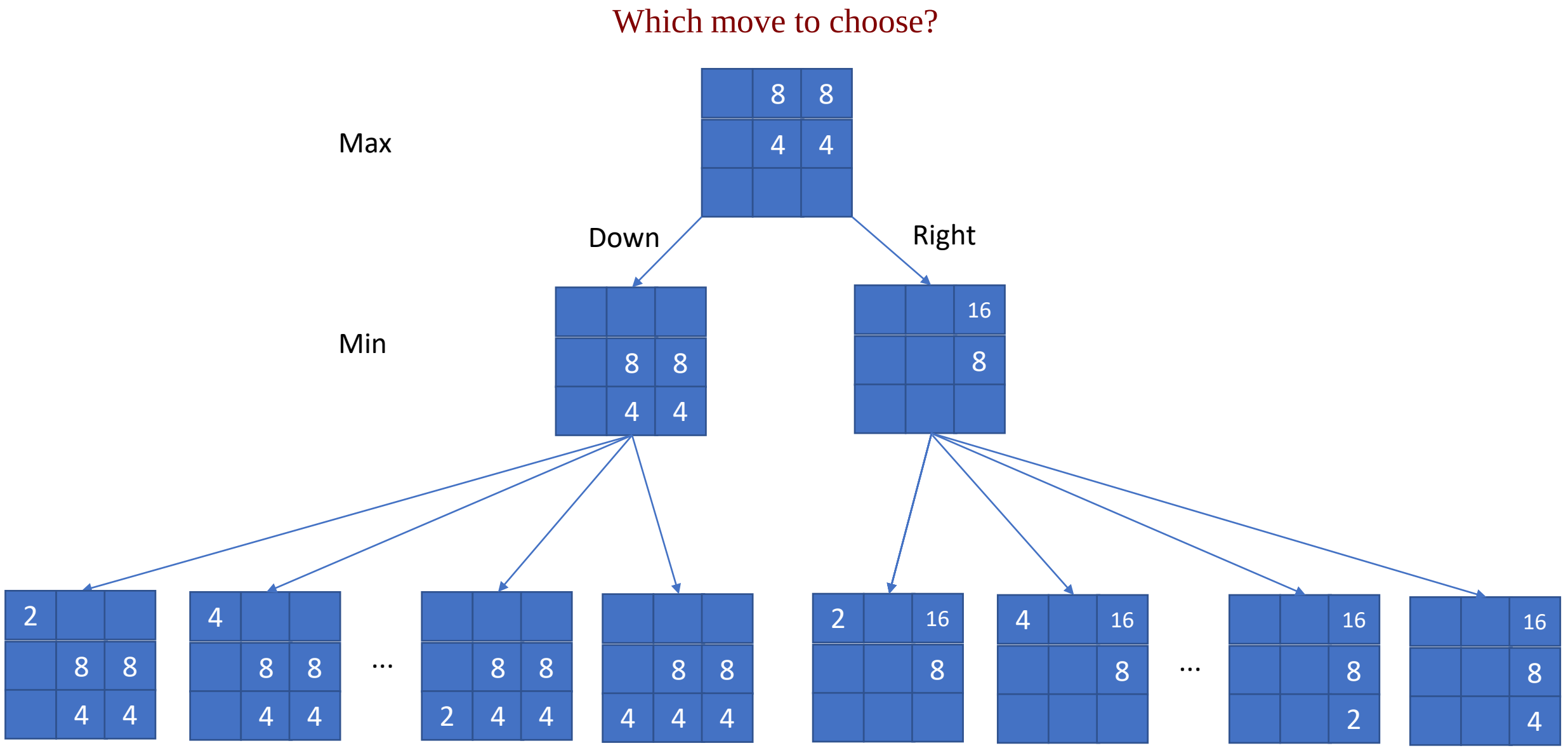
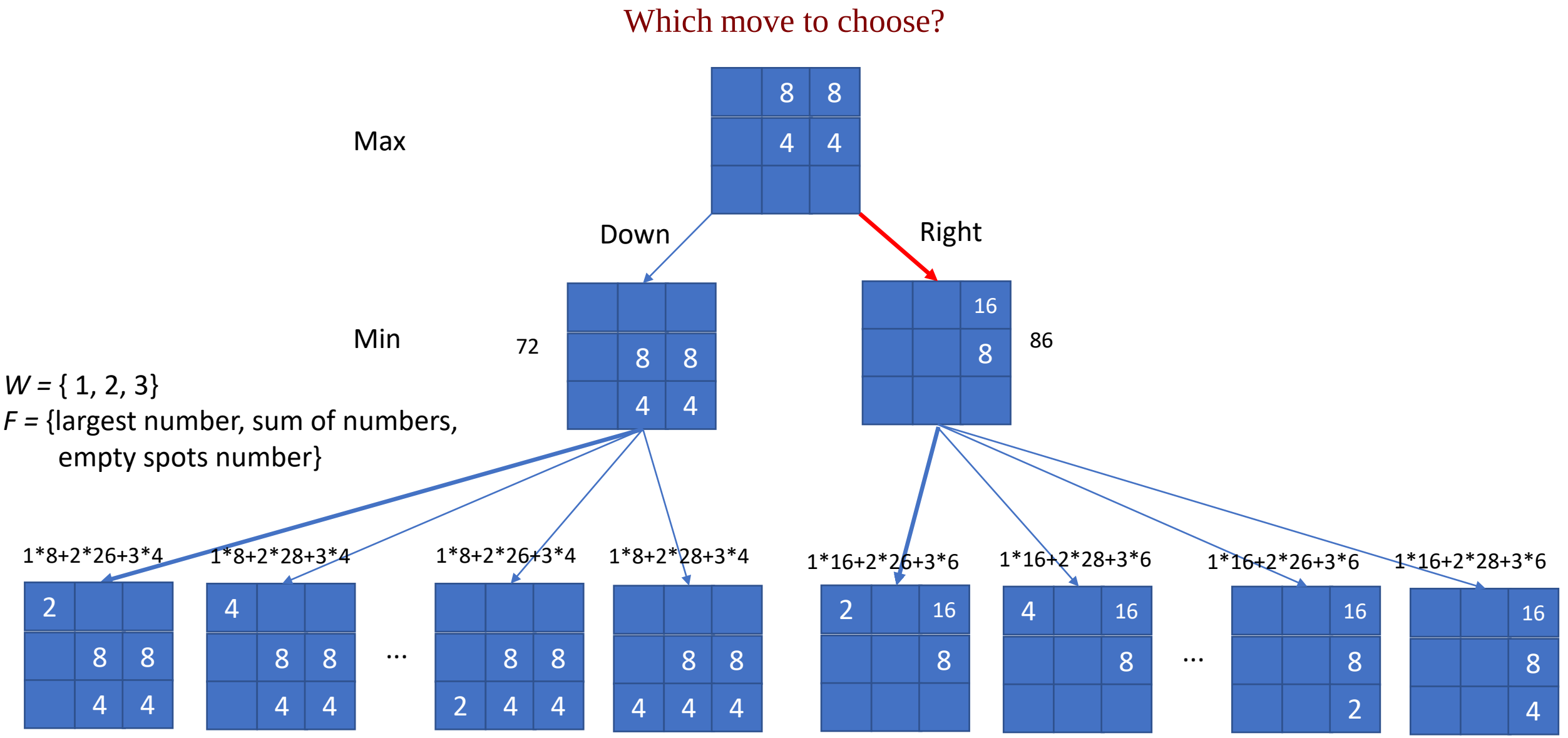
Minmax Search



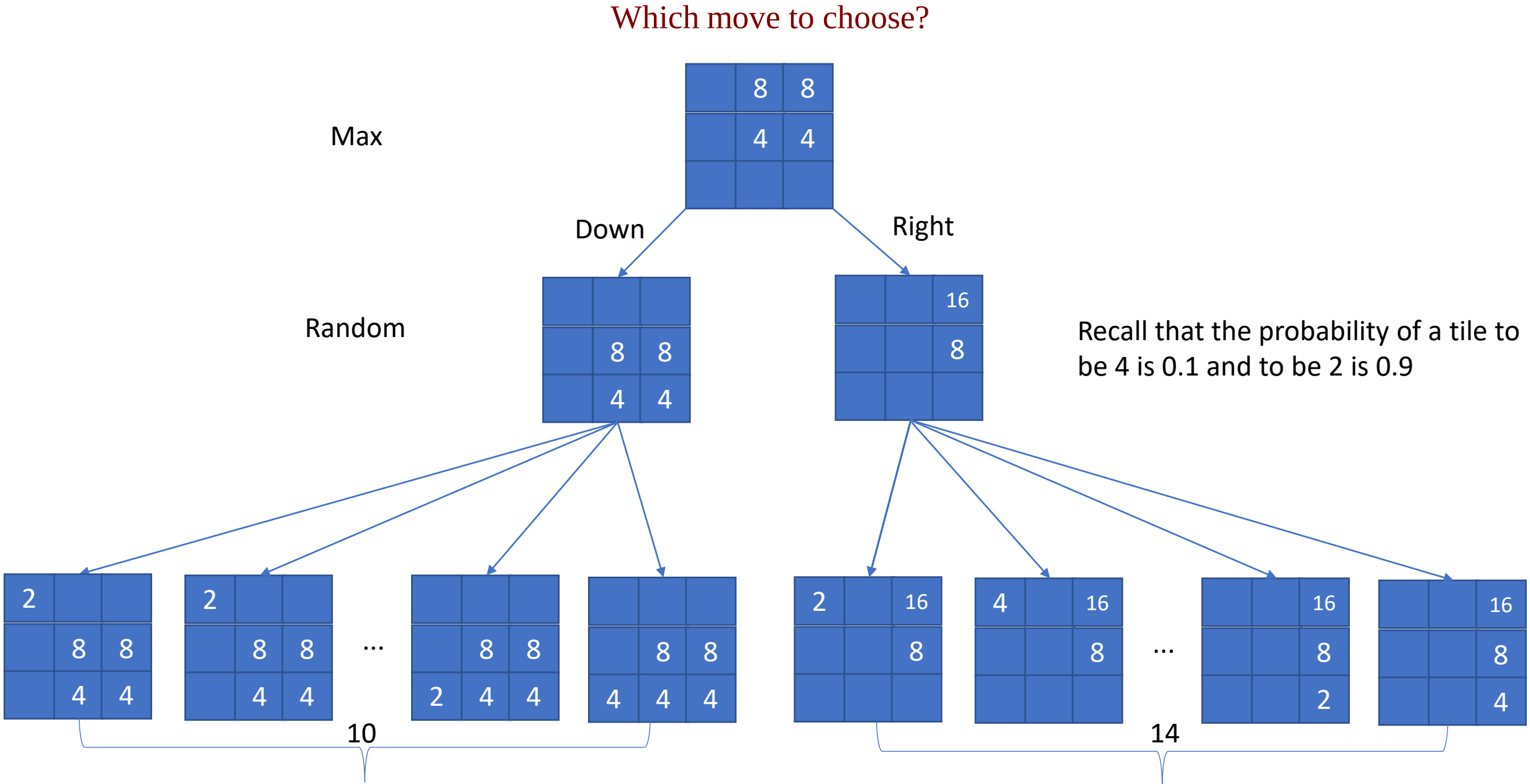
Heuristics (Evaluation function)

- Typical evaluation function for game: weighted linear function
  - $h(s) = w_1 f_1(s) + w_2 f_2(s) + \ldots + w_n f_n(s)$
  - *weights* · *features* [dot product]
- For example, $W = \{ 1, 2, 3\}$
  - $F =$ {largest number, sum of numbers, empty spots number, …}

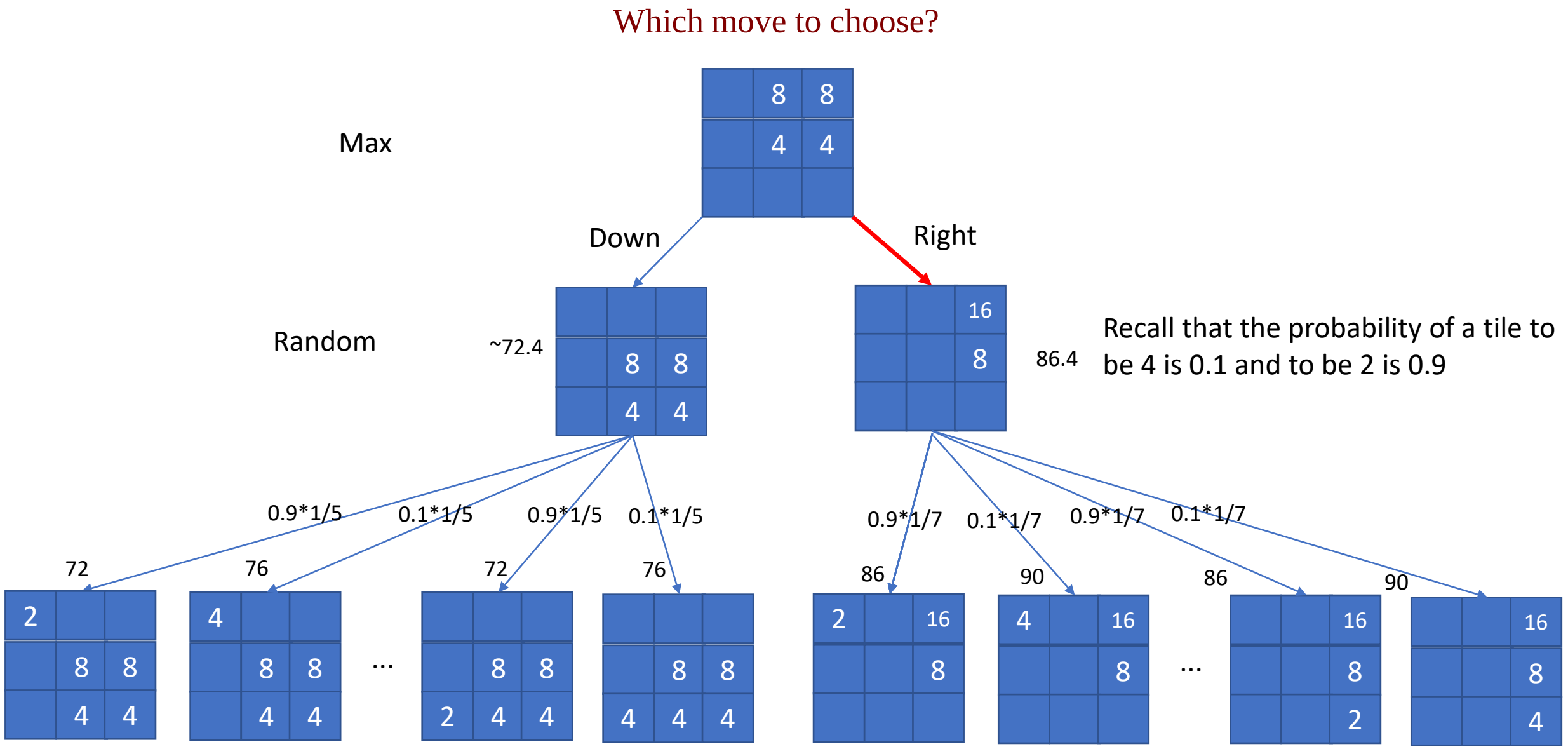
Minmax Search



Expectmax Search



Expectmax Search



Minmax and Expectmax Search

- Both *Minmax* and *Expectmax* can be used in 2048 game
  - In MP2, the system is random and **if your depth is the same**, Expectmax should perform better.
- Search Speed
  - Minmax can use *Alpha/Beta* pruning to accelerate your search speed, and therefore, under 40 mins, you may **search deeper with Minmax than Expectmax search** and eventually perform better.
  - You can mix your search process to fully utilize time budget, e.g. randomly choose which search algorithm to use to perform better under 40 mins limit.
- Heuristics
  - A good board may have many properties.
  - Design better heuristics functions to evaluate board.