

1. What is the size of the game tree for Noughts and Crosses? Sketch the game tree.

The **game tree size** is the total number of possible games that can be played.

In Noughts and Crosses there are many ways of winning the game

**Win in 5 moves:**  $8 \times 3! \times 6 \times 5 = 1440$  possibilities

**Win in 6 moves:**  $(8 \times 3! \times 6 \times 5 \times 4) - (6 \times 3! \times 2 \times 3!) = 5328$  possibilities

**Win in 7 moves:**  $(8 \times 3 \times 6 \times 3! \times 5 \times 4 \times 3) - (6 \times 3 \times 6 \times 3! \times 3!) = 47952$  possibilities

**Win in 8 moves:**  $(8 \times 3 \times 6 \times 3! \times 5 \times 4 \times 3 \times 2) - (6 \times 3 \times 6 \times 3! \times 2 \times 4!) = 72576$  possibilities

**Win in 9 moves:**  $(2 \times 3 \times 8 \times 4! \times 4!) + (6 \times 3 \times 4 \times 4! \times 4!) + (2 \times 1 \times 4! \times 4!) = 81792$  possibilities

**Match Draw :**  $16 \times 5! \times 4! = 46080$  possibilities

So total number of games for noughts and crosses are

$1440 + 5328 + 47952 + 72576 + 81792 + 46080 = 255168$  possible games in total.

Game Tree:

