Complexity of Breadth First Search

- b: branching factor; d: depth of the search tree
- Number of nodes: $1 + b + b^2 + b^3 + \ldots + b^{d-1}$
- Soon in your module "Mathematics in Computer Science" you'll learn to proof by induction

  $1 + b + b^2 + \ldots + b^{d-1} < b^d$ or $b^0 + b + b^2 + \ldots + b^{d-1} < b^d$

  You can proof it informally by letting the depth *d* = 1, 2, … in the equation and see if it's true (b = 2)

  d = 1, LHS = $2^0 = 1$; RHS = $2^1 = 2$

  d = 2, LHS = $2^0 + 2^1 = 3$; RHS = $2^2 = 4$

  d = 3, …
- Therefore the upper bound of space/time complexity for BFS is b^d
- You won't be asked to proof the time/space complexity in your exam. What you do need to know is the complexity of BFS is exponential b^d