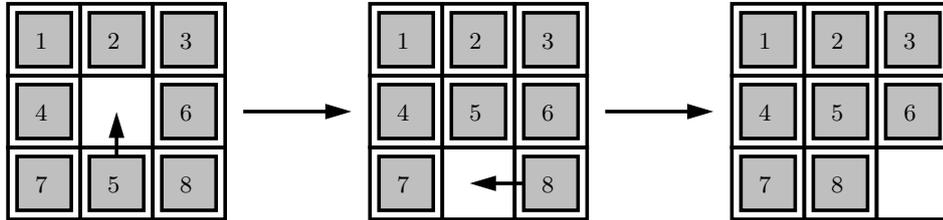


1 Artificial Intelligence (SBH)

Consider the standard 3×3 *sliding blocks puzzle*.



The aim is to find a sequence of moves that re-arranges the puzzle to the state shown on the right, where each move involves sliding a single square into the empty space.

- (a) Explain in detail how this problem can be treated as a *planning problem* by translating it into a *Boolean satisfiability (SAT)* problem. Your answer should address the following issues, and in each case should provide specific examples of the SAT representation:
- (i) The representation of the *start state* and *goal state*. [4 marks]
 - (ii) The representation of the relevant *actions* using *successor-state* axioms. [4 marks]
 - (iii) The need for *precondition axioms*. [2 marks]
 - (iv) The need for *action-exclusion* or *state-constraint* axioms, and why one might be preferred over the other. [3 marks]
 - (v) The algorithm that can be used to employ a SAT-solver to solve a given sliding blocks problem, and the method for extracting a solution. [3 marks]
- (b) You do not have a SAT-solver available. You do however have a solver for general *local search* problems. Explain how you might use the latter to solve the SAT problem obtained in Part (a). [4 marks]