204764 – Problem Sets for Search

1. **8-Puzzle**

Slide tiles into empty tile from Start to Goal

Diagram

Description automatically generated

* States:
* Actions:
* Transition Model:
* Goal Test:
* Step Cost:
* Path Cost:

1. **3 Jugs**

“You have three jugs, measuring 12 gallons, 8 gallons, and 3 gallons, and a water faucet. You can fill the jugs up or empty them out onto the ground, or pour from one jug (A) to another (B) until (1) the target jug (B) is full, or (2) the source jug is empty (A). You need to measure out exactly one gallon.”

* States:
* Actions:
* Transition Model:
* Goal Test:
* Step Cost:
* Path Cost:

1. n-Queen

Place n queens onto n n board without any piece being able to attack another

A picture containing crossword puzzle, checker

Description automatically generated

* **Incremental Formulation** – Place 1 queen at a time, 1 per column.
  + **Action**: placing a queen on the leftmost column not yet occupied
* **Complete-state Formulation** – Rearrange *n* queens already on the board, also one per columns
  + **Action**: changing row of a queen

1. Sudoku

Fill each square with 1..9 such that no two squares that share (1) column, (2) row, or (3) 3x3 group have the same number.

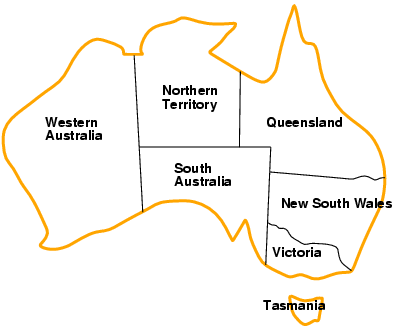
Shape

Description automatically generated with medium confidence

* *X* =
* *D* =
* C =

1. **Map-coloring**

Color each state of Australia in the map using {red, green, blue} such that no states that share border have the same color.



* *X* =
* *D* =
* C =

1. **Conference Scheduling**

You are scheduling events for a small conference in a day. There are 4 events, P1 - P4. Each event takes either morning session (AM) or afternoon session (PM). There are 2 rooms available that can host any one event at a time. There are some constraint between events, however:

* Event P1 must take place before event P2
* Event P1 and P3 share the same speaker, and cannot take place at the same time

What will be the schedule?

|  |  |  |
| --- | --- | --- |
|  | AM | PM |
| Room 1 |  |  |
| Room 2 |  |  |

* *X* =
* *D* =
* C =

1. **Cryptarithmetic**

A picture containing pool ball

Description automatically generated

Problem is shown on (a). Each letter is a digit. No two letters can have the same digit. Hypergraph (b) shows constraints between variables, where *C*1, *C*2 and *C*3 are carries, and can have value between 0 and 1. Find the correct digit for each letter.

* Variables: *F T U W R O C1 C2 C3*
* Domains:
  + {0,1,2,3,4,5,6,7,8,9} for *F, T, U, W, R,* and *O*
  + {*0, 1*} *for* carry variables *C1, C2,* and *C3*
* Constraints: *Alldiff* (*F,T,U,W,R,O*)
  + O + O = R + 10 · *C1*
  + *C1* + W + W = U + 10 · *C2*
  + *C2* + T + T = O + 10 · *C3*
  + *C3* = F, T ≠ 0, F ≠ 0