CMPUT 355 Quiz 2 Marking Rubric

Grading Rubric

```
Question 1
    1 mark off for each wrong indentation
    1 mark off for each wrong order

Question 2
    a) Incorrect w/ no work = 0
       Rough word that demonstates understanding = 0.5
       Correct = 1
    b) Incorrect w/ no work = 0
       Rough word that demonstates understanding = 0.5
       Correct = 1
    c) Incorrect w/ no work = 0
       Rough word that demonstates understanding = 0.5
       Correct = 1
    d) 0.5 points per level correct. -0.25 points for repeating nodes.

Question 3
    0.5 points given for each correct answer

Question 4
    a) 1 point given for a position 21 moves way from goal
    b) 1 point given for explanation that makes sense
    c) 1 point given for how many moves the position given in a) takes
    d) 1 point given for explanation that makes sense

Question 5
    2 points given for correct sequence (if shorted path is given, 1 point is awarded)
    6 points given for correct nodes with its respective cost
        (if shortest path with correct nodes and costs are given award 3 marks)
```

Quiz 2a

1.
```
                    (6)
              (5)
                 (4)
                 (1)
                    (3)
                 (2)
```

2. a) The number of inversions is 3 (7 and 6, 7 and 5, 6 and 5)

   b) The goal position is

   ```
   1 2 3 4
   5 6 7 _
   ```

   So the sum of distances from the goal location is $1 + 1 + 1 + 4 + 1 + 1 + 3 = 12$

   c) There are (rows*columns)! states in a sliding tile puzzle. There are 2 components in the graph: solvable states and unsolvable states, with $1/2$ of all states in each, so the number of nodes in the component that includes this position is $(2 * 4)!/2 = 8!/2 = 20160$

   d)
   ```
                    123_
                    4765
              D/        \R
           4123      1_23
           _765      4765
            R|    D/    \R
           4123  1723  12_3
           7_65  4_65  4765
   ```

3. a) Moves: 82, Searched: 1,765,263

   b) Moves: 120, Searched: 6,865

   c) Moves: 90, Searched: 145,722

4. a) Any position that takes 21 moves is a valid answer. For example,

   ```
   4 5 _
   1 2 3
   ```

   b) To make the initial state solvable (and the goal), we need to permute squares 4 and 5. Thus, if we permute 4 and 5 in the last position encountered, it will be both solvable, and as many moves away from the goal as possible.

   c) 21

   d) From the output, level 22 is the first level to have no nodes, meaning level 21 (corresponding to 21 moves) is the furthest away from the goal.

5.
   ```
   A 0, B 36, D 37, C 44, E 45, F 48, Z 49
   ```

Quiz 2b

1.
```
                    (6)
              (1)
                  (5)
                  (2)
                      (4)
                  (3)
```

2. a) The number of inversions is 2 (7 and 5, 7 and 6)

   b) The goal position is

   ```
   1 2 3 4
   5 6 7 _
   ```

   So the sum of distances from the goal location is $1 + 1 + 1 + 4 + 1 + 2 + 2 = 12$

   c) There are (rows*columns)! states in a sliding tile puzzle. There are 2 components in the graph: solvable states and unsolvable states, with $1/2$ of all states in each, so the number of nodes in the component that includes this position is $(2 * 4)!/2 = 8!/2 = 20160$

   d)
   ```
                   123_
                    4756
             D/        \R
           4123       1_23
           _756        4756
            R|    D/    \R
           4123  1723  12_3
           7_56  4_56  4756
   ```

3. a) Moves: 120, Searched: 6,865

   b) Moves: 90, Searched: 145,722

   c) Moves: 82, Searched: 1,765,263

4. a) Any position that takes 21 moves is a valid answer. For example,

   ```
   4 5 _
   1 2 3
   ```

   b) To make the initial state solvable (and the goal), we need to permute squares 1 and 2. Thus, if we permute 1 and 2 in the last position encountered, it will be both solvable, and as many moves away from the goal as possible.

   c) 21

   d) From the output, level 22 is the first level to have no nodes, meaning level 21 (corresponding to 21 moves) is the furthest away from the goal.

5.
   ```
   A 0, D 35, B 36, E 44, C 45, F 48, Z 49
   ```

Quiz 2c

1.
```
                    (6)
              (2)
                  (1)
                  (3)
                      (5)
                  (4)
```

2. a) The number of inversions is 2 (6 and 5, 7 and 5)

    b) The goal position is

    ```
    1 2 3 4
    5 6 7 _
    ```

    So the sum of distances from the goal location is $1 + 1 + 1 + 4 + 3 + 0 + 0 = 10$

    c) There are (rows*columns)! states in a sliding tile puzzle. There are 2 components in the graph: solvable states and unsolvable states, with $1/2$ of all states in each, so the number of nodes in the component that includes this position is $(2 * 4)!/2 = 8!/2 = 20160$

    d)
    ```
                      123_
                       4675
                 D/        \R
                4123       1_23
                _675       4675
                 R|    D/    \R
                4123  1623  12_3
                6_75  4_75  4675
    ```

3. a) Moves: 90, Searched: 145,722

    b) Moves: 82, Searched: 1,765,263

    c) Moves: 120, Searched: 6,865

4. a) Any position that takes 21 moves is a valid answer. For example,

    ```
    4 5 _
    1 2 3
    ```

    b) To make the initial state solvable (and the goal), we need to permute squares 3 and 2. Thus, if we permute 3 and 2 in the last position encountered, it will be both solvable, and as many moves away from the goal as possible.

    c) 21

    d) From the output, level 22 is the first level to have no nodes, meaning level 21 (corresponding to 21 moves) is the furthest away from the goal.

5.   A 0, B 36, D 37, C 44, E45, G 44, F 48, Z 49