**Exercise 3: Tiles Game**

**Mark Scheme:**

<table>
<thead>
<tr>
<th>Unit of Work</th>
<th>Claimed Done</th>
<th>Mark Awarded</th>
<th>Max. Mark</th>
</tr>
</thead>
</table>

### [1] Design and Coding

**Preliminaries**
- 5 points if the viva is conducted on Tuesday, 2 points for Thursday and 0 points for Friday.
- The student was ready for the viva when it began (program ran immediately, correct files were loaded, electronic submission had been done).

### Design
- A clear, neat diagram showing all the classes used, with accurate relationships between them.
- A clear, concise narrative, which explains the design and includes an explanation of the data representation used.
- Choice of classes: Do they correspond to natural concepts or actors. Are they named using nouns?
- Choice of classes: Low coupling between classes and high cohesion of each class.

### Coding
- The code implements the design effectively.
- Methods do one task. Variable names are sensible. Classes begin with Uppercase letters, variables / methods with lowercase.

### Javadoc
- The code displays clear Javadoc.
- The Javadoc has been compiled into a meaningful set of API web pages.

### [2] Reading and displaying an image

- A `JFrame` window appears.
- The `JFrame` window is an appropriate size.
- The specified image is displayed in the window.
- The program terminates when the window is closed.

### [3] Tiling the image

- The image gets cropped correctly.
- The student can effectively explain the data structure chosen for `Tile` objects.
- It is possible to change the size of the grid, through alteration of a constant in the code.
- The tiles get drawn on the screen in the correct places.


- The tiles are shuffled well.
- The starting arrangement is always solvable. The student can explain how this is guaranteed.
- The tiles move correctly when they are clicked. Clicking on grid-locked tiles or the blank tile does nothing.
- The program knows when the game is over and prevents any further moves.

### [5] User interface

- Clicking 'New Game' starts a new game, which works properly. Test this by playing the game.
- It is possible to specify the number of tiles in the interface. Accept a series of preset sizes, as well as programs that allow you to type a desired size.
- There is an appropriate notice informing the user that they have won the game.
- Award marks for the sensible use of GUI components. Only deduct marks here if the interface is difficult to use.

### [6] Computer player

- The student can explain his/her strategy for solving the game.
- The computer can make moves by itself. These moves do not have to be sensible, but must be seen on the screen.
- The computer gets close to a solution.
- The computer can solve any (solvable) arrangement of the tiles.

**Total mark awarded:** 105