Testing

An in-depth outlining and evidencing of the tests carried out to check the completeness of code and ensure quality control.

For the testing of the software,

# Requirements Testing

## Game Setup

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| **Test No.** | **Description** | **Input(s)** | **Expected Outcome** | **Actual Outcome** | **Success/Action** |
| 1 | User enters a number of human players into form. | Number of players [integer] where input is between 1-6. | Progress to game screen. | the countdown timer screen is shown | Success |
| 2 | User enters a number of human players into form. | Number of players [integer] where input is outside of range 1-6. | Error message, return to entry form. | A message box appears, and the user is unable to go to game screen | Success |
| 3 | Does the game engine correctly fill in vacant players with AI player? | Number of human players [integer] playing. | The game engine fills up to five vacant spots with AI. |  | Fail. No AI players currently implemented |
| 4 | Does the system assign all players with a unique game token each? | Number of players [integer] playing. | Each player has a unique token. | Every player is assigned a unique piece | success |
| 5 | User uploads own data to the game. | Property data [csv file], card data [csv file]. | Board and cards are generated using user’s uploaded data. | The game loads with the space names and pictures in correspondence to the CSV file | success |
| 6 | User uploads own data to the game; files go over the limit of tiles/cards that can be added. | Property data [csv file], card data [csv file]. | Error message is displayed; the game overwrites the tiles/cards that it can, within said limit. |  | No implementation yet. the game throws stops at 40 pieces. Any thing under with throw an error |
| 7 | User uploads own data to the game; files are under the limit of tiles/cards that can be added. | Property data [csv file], card data [csv file]. | Error message is shown displayed; as many tiles/cards are overwritten; remaining tiles/cards remain default. |  |  |

## Dice Rolling

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| **Test No.** | **Description** | **Input(s)** | **Expected Outcome** | **Actual Outcome** | **Success/Action** |
| 1 | Current user clicks dice roll button. | Dice roll [button click]. | User’s token moves between 1-12 tiles along the board. | The players position changes. | Success |
| 2 | Double dice roll. | User throws a ‘double’ [button click]. | Current user is able to throw another dice roll. | A message box showing that a double has been obtained | Success |
| 3 | Triple dice roll. | User throws a third ‘double’ in the same turn [button click]. | Game token of user is moved to ‘jail’ tile, doesn’t pass go. | A message box appears that tells the user that they are now in jail | Success |

## Game Engine

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| **Test No.** | **Description** | **Input(s)** | **Expected Outcome** | **Actual Outcome** | **Success/Action** |
| 1 | Game view switches to next player after current user ends turn. | End turn [button click]. | Player information switches to next user. | The next players information is shown | Success |
| 2 | All players begin going around the board in a clockwise direction from GO. | All players click dice roll button [button click] in their respective first move. | All player tokens move to tiles in clockwise direction. | All players do move in the clockwise direction. | Success |
| 3 | All players assigned £1500 cash prior to first roll. | Successful game setup. | Each player’s cash variable set to £1500. | Each player has a starting money of £1500 | Success |
| 4 | Game time limit expires. | Timer value reaches 0 [time]. | Game is halted. Winner is determined and player name is presented. | A message box with each players details are shown. | success |

## Banking/Properties

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| **Test No.** | **Description** | **Input(s)** | **Expected Outcome** | **Actual Outcome** | **Success/Action** |
| 1 | Bank is supplied the correct amount of cash. | Successful game setup. | Value of cash owned by the bank is £50,000. | The bank has infinite money. | Changed from |
| 2 | Only the Banker has access to the bank – no players. | Successful game setup. | No player can make ‘direct contact’ with the bank. | The players cannot access the bank and there is no trading. | Partial. The bank I not a player |
| 3 | Player tries to purchase a property before completing their first circuit of the board. | Player clicks ‘buy property’ button [button click]. | Error message displayed; property is not added to player’s inventory. | Error message asking the user to complete one turn of the board | Success |
| 4 | Player tries to purchase a property having initially completed first circuit of board; also has enough cash to afford the property. | Player clicks ‘buy property’ button [button click]. | Property is added to the player’s inventory. | There is a property list that holds all the values of the properties | success |
| 5 | Player tries to purchase a property having initially completed first circuit of board; does not have enough cash to afford the property. | Player clicks ‘buy property’ button [button click].  Insufficient cash amount [integer]. | Error message displayed; property is not added to player’s inventory. | A message shows telling the user that they don’t have the funds to complete the purchase | success |
| 6 | Bank awards £200 to player for passing ‘Go’ tile. | Player game piece passes ‘Go’ tile after completing a full circuit. | Player’s cash amount is increased by £200. | The players cash amount increases by 200 | success |
| 7 | Bank receives correct amount of cash when property is successfully purchased. | Player clicks ‘buy property’ button [button click]. | Player has the property value deducted from account; bank gains this value. | The players money decreases. And the property is added to the owned properties | Partial. As banker is the computer its money is infinite |
| 8 | Property is placed on auction if not bought by current player. | Player lands on unclaimed property and ends turn [button click] without purchasing said property. | Property is floated on auction to rest of the players. | N/A | No implementation as yet. |
| 9 | Player bids on auctioned property; can afford said bid. | Player places the winning bid on the auctioned property [button click]. | The player gains the property and its card; value of winning bid is deducted from their account and added to the bank. | N/A | No implementation as yet |
| 10 | Player bids on auctioned property; is unable to afford said bid. | Player places the winning bid on the auctioned property [button click].  Insufficient cash amount [integer]. | Error message is displayed; property is not sold and auction ends. Game proceeds to next turn. | N/A | No implementation as yet |
| 11 | Property is floated for auction; a player has not completed a full circuit of the board yet. | Banker floats a property for auction. | Player and all other players yet to complete initial full board cycle are excluded from auction. | N/A | No implementation |
| 12 | User makes a trade offer to another player. | Player selects assets to offer as trade. | Player on receiving end of trade is presented with a message alert, asking whether they wish to confirm trade; if so, necessary transactions take place between the two players. | N/A | No implementation |
| 13 | A player attempts to make a second trade offer in the same turn. | Player clicks ‘make trade offer’ button [button click]. | Error message is displayed; trade is not presented to the receiving player. | N/A | No implementation |

## Rent/Property Sets

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| **Test No.** | **Description** | **Input(s)** | **Expected Outcome** | **Actual Outcome** | **Success/Action** |
| 1 | Player lands on a property already owned by another player. | Player lands on a property owned by another player [board tile]. | The rent value of the property is deducted from the player’s account and added to the property owner’s account. | The rent is automatically deducted from the player and sent to the owners account | Success |
| 2 | Player makes ‘improvements’ to their property; doesn’t have enough cash to do so. | Player clicks ‘buy house/hotel’ button [button click].  Insufficient cash amount [integer]. | Error message is displayed; house/hotel is not added to the property. | An error message is shown saying that the player doesn’t have the cash | Failure |
| 3 | Player makes ‘improvements’ to their property; has enough cash to afford to. | Player clicks ‘buy house/hotel’ button [button click]. | Purchased house/hotel is added to the property; rent value of property is increased as specified.  Cost of transaction is deducted from player’s account and added to banker’s account. | A window is shown and which says the number of houses and the new rent. The money for the house is also subtracted | Success |
| 4 | Player lands on a property where the completed property set is owned by another player. | Player lands on a property owned by another player [board tile]. | The player pays the property owner double the value of the rent. | The player has rent taken and sent to the owner | Partial. Need to implement a method to check if the owner has the set |
| 5 | Player lands on a property where the completed property set is owned by another player; said property owner has made ‘improvements’ to this set. | Player lands on a property owned by another player [board tile]. | The player pays the property owner the calculated ‘improved’ rent. | The player pays the owner the rent with the new improvement cost | Success |
| 6 | Player does not have enough cash to pay a property owner upon landing on their property. | Player lands on a property owned by another player [board tile].  Insufficient cash amount [integer]. | The player’s properties in their inventory are sold to the rent receiver. | N/A no implementation | Failure |
| 7 | Player does not have enough cash to pay a property owner upon landing on their property; doesn’t have enough asset value to cover the rent. | Player lands on a property owned by another player [board tile].  Insufficient cash amount [integer].  Insufficient asset value in inventory [integer]. | As much cash is added to the rent receiver’s account; paying player is declared bankrupt and ejected from the game; bankrupt player’s game token is removed from board. | N/A implementation | failure |
| 8 | Player sells a property back to the bank. | Player clicks ‘sell property’ button [button click]. | Property card is transferred from player’s account to the bank; value of the property is added to the player’s account and deducted from the bank. | N/A no implementation | Failure |
| 9 | Player mortgages a property. | Player clicks ‘mortgage property’ button [button click]. | Bank pays the player half the value of the property; rent value for said property is reduced to £0. | The player does receive half the property value. And all houses/hotels are removed and rent is set to 0; | Success |
| 10 | Player attempts to sell or mortgage a property; currently has ‘improvements’ assigned to said property. | Player clicks ‘mortgage property’ or ‘sell property’ button [button click].  ‘improvements’ on property in question [Boolean]. | Error message displayed; the property is not sold or mortgaged. | N/A no implementation | Failures |
| 11 | Player buys a house/hotel for a property in their owned set; difference between houses on said property is no greater than the houses on other properties in the same set. | Player clicks ‘buy house/hotel’ button [button click].  Difference between houses in the set is -1 or 0 [integer]. | House/hotel is successfully bought and added to the property; value of house is transferred from player’s account to the bank. | N/A no implementation | Failure |
| 12 | Player buys a house/hotel for a property in their owned set; difference between houses on said property is 1 greater than the houses on other properties in the same set. | Player clicks ‘buy house/hotel’ button [button click].  Difference between houses in the set is 1 [integer]. | Error message is displayed; transaction is not completed. | N/A no implementation | Failure |
| 13 | A player’s mortgaged property is sold back to the bank. | Player clicks ‘sell property’ button [button click]. | Half of the property value is transferred from the bank to the selling player’s account. | A message shows saying that there is now a mortgage on the property. | Success |

## Card Stack/Special Tiles

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| **Test No.** | **Description** | **Input(s)** | **Expected Outcome** | **Actual Outcome** | **Success/Action** |
| 1 | User withdraws a card from stack. | User lands on a card stack tile [board tile]. | Card at top of stack is withdrawn and displayed to all players. | The card is displayed to the user | Success |
| 2 | User withdraws a card from stack. | User lands on a card stack tile [board tile]. | A duplicate of withdrawn card is placed at bottom of stack. | The card returns to the pile | Partial. Random identifier used to select what card is picked |
| 3 | A player picks up a fine. | Player lands on a tile applying a fine [board tile] or picks up a card applying a fine [card draw]. | Value of the fine is deducted from the player’s account and added to the ‘free parking’ total. | The value is taken from the player and added to the free parking | Success |
| 4 | A player lands on the ‘free parking’ tile. | Player lands on ‘free parking’ tile [board tile]. | Current total value of ‘free parking’ is transferred to the player in question’s account. | The value of free parking is given to the player | Success |
| 5 | Player is sent to jail; pays £50 fine. | Player picks up a ‘go to jail’ card [card draw].  Pays £50 fine [integer] to ‘free parking’. | Player’s game token is moved to the ‘jail’ tile, but placed on ‘just visiting’; player cannot make any other actions that turn. | The player is moved to the just visiting position. | Partial. The player can manage properties |
| 6 | Player is sent to jail; doesn’t pay £50 fine. | Player picks up a ‘go to jail’ card [card draw]. | Player’s game token is moved to the ‘jail’ tile and can make no action (including receiving rent) for the next 2 rounds. | The players in jail Boolean is set to true. And the player can only roll to get out of jail | Partial. The user can roll a double to get out of jail on the next turn. |
| 7 | Player uses ‘get out of jail free’ card. | Player uses ‘get out of jail free card’ [card draw]. | The card is taken from the player’s inventory and placed at the bottom of the appropriate card pile; game token is moved to ‘just visiting’. | The card is taken from the user and the user is moved to just visiting | Success |

## User Interface

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| **Test No.** | **Description** | **Input(s)** | **Expected Outcome** | **Actual Outcome** | **Success/Action** |
| 1 | Main menu options are all visible and selectable. | Successful game start-up. | All menu options are displayed to the user clearly – selecting each option will take the user to the corresponding setup screen for that option. | All buttons work as required and the entry screens for the abridged and normal versions are accounted for | Success |
| 2 | Game board displayed after selecting “Start full game”. | “Start full game” button clicked [button click]. | Menu screen is replaced with a view of the 10x10 board. | Game board shown after selecting the normal button | Success |
| 3 | Game board displayed after selecting “Start abridged game”. | “Start abridged game” button clicked [button click]. | Menu screen is replaced with a view of the 10x10 board. | Menu is replaced with a screen for the countdown timer input | Success |
| 4 | Player game tokens visible. | Game set up with six players. | With all game tokens starting on the “Go” tile, all tokens are clearly visible to the players. | No tokens visible on the board | Failure |
| 5 | Player cash amounts are visible. | Game set up with six players. | All players can see each other’s current cash amount. | N/A no implementation | Failure |
| 6 | Cash deduction is temporarily shown next to associated cash amount. | Player 1 makes a transaction. | Making a transaction deducts money from the player’s account; this deduction is displayed next to the cash amount for said player. | N/A  No implementation | Failure |
| 7 | Withdrawn cards are displayed and fully visible to the players. | Player withdraws a card from one of the card piles [card draw]. | Card is flipped and is displayed to the players. Card instructions can be clearly read. Card display can be exited via a “close button”. | A message box pops up with the details of the card shown. | Success |
| 8 | Dice roll results are visible. | Player rolls dice on their turn [dice roll]. | Animation plays, and dice roll result is clearly visible to the players. | A message box pops up with the value of the dice roll | Success |