# **Towers of Hanoi Test Cases**

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| **Requirement to test** | **Test Data Input/User Action** | **Expected Outcomes** | **Actual Outcomes** |
| 1. Interface is displayed correctly when the program runs | Run "towers of hanoi" program |  | As expected |
| 2 Uses four Disks and three Pegs and lets the user drag and drop Disks from one Peg to another. | Run "towers of hanoi" program |  | As expected |
| 2.1 Try to move Disk to Peg | Try to move Disk 1 from Peg 1 to Peg 2 using drag’n’drop |  | As expected |
| 2.2 Try to move another Disk to another Peg | Try to move Disk 2 from Peg 1 to Peg 3 using drag’n’drop |  | As expected |
| 3. Try moving a Disk second from top of a pile | Run "towers of hanoi" program. Try to move Disk 2 from Peg 1 using drag’n’drop | Error occurs, Disk 2 remains at the previous position | As expected |
| 4. Try moving a Disk at the bottom of a pile | Run "towers of hanoi" program. Make pile of 3 Disks on Peg 3. Try to move Disk 3 from Peg 3 using drag’n’drop | Error occurs, Disk 3 remains at the previous position | As expected |
| 5. Try putting a larger Disk on top of a smaller Disk. | Run "towers of hanoi" program. Move Disk 1 to Peg 2 using drag’n’drop. Trying to move Disk 2 to Peg 2 using drag’n’drop. | Error occurs, Disk 2 remains at the previous position | As expected |
| 6. Try moving more than one Disk at a time | It is impossible to carry out this test because of the features of the program | - | - |
| 7. Keeps count of the number of moves. | Make several allowed moves using drag’n’drop | After each move the value in the field “Your total Moves”  is added to 1 | As expected |
| 8. Begin a new game after a game has been started | Run "towers of hanoi" program. Make several random allowed moves. Choose with mouse  [Game]->[Reset] from the Main Menu | New game starts. Disks moved back to starting positions. Number of moves set to zero. Stored moves set to zero. | As expected |
| 9. Number of moves set to zero | Run "towers of hanoi" program. Make several random allowed moves. Choose with mouse  [Game]->[Reset] from the Main Menu | Number of moves set to zero. | As expected |
| 10. Disks moved back to starting positions | Run "towers of hanoi" program. Make several random allowed moves. Choose with mouse  [Game]->[Reset] from the Main Menu | Disks moved back to starting positions. | As expected |
| 11. Enforces the rules | Run "towers of hanoi" program. Make some random allowed moves moves. Mouse click on [Help] in Main menu in random moment | Game Rules are displayed in pop-up window. | As expected |
| 12. Valid moves are stored | Run "towers of hanoi" program. Make several random allowed moves. | All moves are stored in the ListBox in right corner. | As expected |
| 12.1 Try putting a larger Disk on top of a smaller Disk. | From current position try to move Disk 3 from Peg 1 to Peg 2. | Error occurs. Moves stored in the ListBox remain unchanged.  Number of moves remains unchanged | As expected |
| 12.2 Try moving a Disk not from the top | From current position try to move Disk 2 from Peg 2. | Error occurs. Moves stored in the ListBox remain unchanged.  Number of moves remains unchanged | As expected |
| 13. The program displays the message “You have successfully completed the game with the minimum number of moves” when all of the Disks have been transferred to the third Peg with the minimum number of moves. | Run "towers of hanoi" program |  | As expected |
| 13.2. Move 1 | Move Disk 1 from Peg 1 to Peg 2 | Move allowed  Moves: 1  Move stored | As expected |
| 13.3. Move 2 | Move Disk 2 from Peg 1 to Peg 3 | Move allowed  Moves: 2  Move stored | As expected |
| 13.4. Move 3 | Move Disk 1 from Peg 2 to Peg 3 | Move allowed  Moves: 3  Move stored | As expected |
| 13.5. Move 4 | Move Disk 3 from Peg 1 to Peg 2 | Move allowed  Moves: 4  Move stored | As expected |
| 13.6. Move 5 | Move Disk 1 from Peg 3 to Peg 1 | Move allowed  Moves: 5  Move stored | As expected |
| 13.7. Move 6 | Move Disk 2 from Peg 3 to Peg 2 | Move allowed  Moves: 6  Move stored | As expected |
| 13.8. Move 7 | Move Disk 1 from Peg 1 to Peg 2 | Move allowed  Moves: 7  Move stored | As expected |
| 13.9. Move 8 | Move Disk 4 from Peg 1 to Peg 3 | Move allowed  Moves: 8  Move stored | As expected |
| 13.10. Move 9 | Move Disk 1 from Peg 2 to Peg 3 | Move allowed  Moves: 9  Move stored | As expected |
| 13.11 Move 10 | Move Disk 2 from Peg 2 to Peg 1 | Move allowed  Moves: 10  Move stored | As expected |
| 13.12 Move 11 | Move Disk 1 from Peg 3 to Peg 1 | Move allowed  Moves: 11  Move stored | As expected |
| 13.13 Move 12 | Move Disk 3 from Peg 2 to Peg 3 | Move allowed  Moves: 12  Move stored | As expected |
| 13.14 Move 13 | Move Disk 1 from Peg 1 to Peg 2 | Move allowed  Moves: 13  Move stored | As expected |
| 13.15 Move 14 | Move Disk 2 from Peg 1 to Peg 3 | Move allowed  Moves: 14  Move stored | As expected |
| 13.16 Move 15 | Move Disk 1 from Peg 2 to Peg 3 | Move allowed  Moves: 15  Move stored  Message “You have successfully completed the game with the minimum number of moves” appears. | As expected |
| 14. The program displays the message “You have successfully completed the game but not with the minimum number of moves” when all of the disks have been transferred to the third peg with more than the minimum number of moves. | Run "towers of hanoi" program |  | As expected |
| 14.2. Move 1 | Move Disk 1 from Peg 1 to Peg 2 | Move allowed  Moves: 1  Move stored | As expected |
| 14.3. Move 2 | Move Disk 1 from Peg 1 to Peg 2 | Move allowed  Moves: 2  Move stored | As expected |
| 14.2. Move 3 | Move Disk 1 from Peg 1 to Peg 2 | Move allowed  Moves: 3  Move stored | As expected |
| 14.3. Move 4 | Move Disk 2 from Peg 1 to Peg 3 | Move allowed  Moves: 4  Move stored | As expected |
| 14.4. Move 5 | Move Disk 1 from Peg 2 to Peg 3 | Move allowed  Moves: 5  Move stored | As expected |
| 14.5. Move 6 | Move Disk 3 from Peg 1 to Peg 2 | Move allowed  Moves: 6  Move stored | As expected |
| 14.6. Move 7 | Move Disk 1 from Peg 3 to Peg 1 | Move allowed  Moves: 7  Move stored | As expected |
| 14.7. Move 8 | Move Disk 2 from Peg 3 to Peg 2 | Move allowed  Moves: 8  Move stored | As expected |
| 14.8. Move 9 | Move Disk 1 from Peg 1 to Peg 2 | Move allowed  Moves: 9  Move stored | As expected |
| 14.9. Move 10 | Move Disk 4 from Peg 1 to Peg 3 | Move allowed  Moves: 10  Move stored | As expected |
| 14.10. Move 11 | Move Disk 1 from Peg 2 to Peg 3 | Move allowed  Moves: 11  Move stored | As expected |
| 14.11 Move 12 | Move Disk 2 from Peg 2 to Peg 1 | Move allowed  Moves: 12  Move stored | As expected |
| 14.12 Move 13 | Move Disk 1 from Peg 3 to Peg 1 | Move allowed  Moves: 13  Move stored | As expected |
| 14.13 Move 14 | Move Disk 3 from Peg 2 to Peg 3 | Move allowed  Moves: 14  Move stored | As expected |
| 14.14 Move 15 | Move Disk 1 from Peg 1 to Peg 2 | Move allowed  Moves: 15  Move stored | As expected |
| 14.15 Move 16 | Move Disk 2 from Peg 1 to Peg 3 | Move allowed  Moves: 16  Move stored | As expected |
| 14.16 Move 17 | Move Disk 1 from Peg 2 to Peg 3 | Move allowed  Moves: 17  Move stored  Message “You have successfully completed the game but not with the minimum number of moves” appears. | As expected |
| 15. Load an incomplete stored game and finish it. | Run "towers of hanoi" program |  | As expected |
| 15.2. Move 1 | Move Disk 1 from Peg 1 to Peg 3 | Move allowed  Moves: 1  Move stored | As expected |
| 15.3. Move 2 | Move Disk 2 from Peg 1 to Peg 2 | Move allowed  Moves: 2  Move stored | As expected |
| 15.4. Move 3 | Move Disk 1 from Peg 3 to Peg 2 | Move allowed  Moves: 3  Move stored | As expected |
| 15.5. Move 4 | Move Disk 3 from Peg 1 to Peg 3 | Move allowed  Moves: 4  Move stored | As expected |
| 15.6. Move 5 | Move Disk 1 from Peg 2 to Peg 1 | Move allowed  Moves: 5  Move stored | As expected |
| 15.7. Move 6 | Move Disk 2 from Peg 2 to Peg 3 | Move allowed  Moves: 6  Move stored | As expected |
| 15.8. Move 7 | Move Disk 1 from Peg 1 to Peg 3 | Move allowed  Moves: 7  Move stored | As expected |
| 15.9. Move 8 | Move Disk 4 from Peg 1 to Peg 2 | Move allowed  Moves: 8  Move stored | As expected |
| 15.10. Move 9 | Move Disk 1 from Peg 3 to Peg 2 | Move allowed  Moves: 9  Move stored | As expected |
| 15.11 Move 10 | Move Disk 2 from Peg 3 to Peg 1 | Move allowed  Moves: 10  Move stored | As expected |
| 15.12 Move 11 | Move Disk 1 from Peg 2 to Peg 1 | Move allowed  Moves: 11  Move stored | As expected |
| 15.13 Move 12 | Move Disk 3 from Peg 3 to Peg 2 | Move allowed  Moves: 12  Move stored | As expected |
| 15.14 Move 13 | Move Disk 1 from Peg 1 to Peg 3 | Move allowed  Moves: 13  Move stored | As expected |
| 15.15 Move 14 | Move Disk 2 from Peg 1 to Peg 2 | Move allowed  Moves: 14  Move stored | As expected |
| 15.16 Save current game | Choose with mouse  [Game]->[Save] from the Main Menu | Message “Your game was saved successfully” appears | As expected |
| 15.16 Run new game | Close "towers of hanoi" program. Run "towers of hanoi" program |  | As expected |
| 15.16 Load saved game | Choose with mouse  [Game]->[Load] from the Main Menu | Message “Last saved game was loaded successfully” appears. | As expected |
| 15.18 Move 15 | Move Disk 1 from Peg 3 to Peg 2 | Move allowed  Moves: 15  Move stored  Message “You have successfully completed the game with the minimum number of moves” appears. | As expected |
| 16.1 Play a completed game from a list of stored moves using animation controlled by a timer. | Completing a game in a random number of moves |  | As expected |
| 16.2 Start animation | Click Animate button | Program animate all made moves. 1 move in 1 second.    Message “Animation has ended” appears after all moves were animated. | As expected |