

GROUP 7 TEST PLAN & ICD

Sudoku

Group 7 Project Test Plan & ICD, Rev 14

CMSC 495 (6380) Current Trends and Projects in Computer Science (2205)

University of Maryland Global Campus

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Group 7

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Revision	Date	Description	Contributor
1	6/16/2020	Cover page and revision table created.	Chris Breen
2	6/16/2020	Initial draft of Test Cases and ICD Table	Chris Breen
3	6/16/2020	Updated Test Cases with additional tests	Ben Brandhorst
4	6/16/2020	Updated ICD Tables with additional information	Ben Brandhorst
5	6/17/2020	Updated remaining entries in ICD Table	Chris Smith
6	6/17/2020	Preliminary editing	Chris Smith
7	6/21/2020	Final formatting for publication	Chris Breen
8	6/28/2020	Sprint 1 Test Case Updates: Test Cases #1, 5, 6, 9, 10, 11. Added Test Case #14, 15.	Chris Breen
9	6/27/2020	Sprint 1 Test Case Updates: Test Cases #4, 8, and 12	Chris Smith
10	7/2/2020	Sprint 2: Added Test Case #16	Chris Breen
11	7/2/2020	Sprint 2 Test Case Update: Test Case #3	Chris Smith
12	7/5/2020	Sprint 2 Test Case Update: Test Case #7	Ben Brandhorst
13	7/7/2020	Sprint 3 Test Case Update: Test Case #6, #13	Chris Breen
14	7/10/2020	Final formatting and updated screenshots	Chris Breen

TEST CASES

Test Case #	Req #	Test Description	Expected Result	Actual Result	Pass/Fail
1	N/A	Startup: Login to the AWS Console, upload the package, and initialize the environment and application.	AWS Elastic Beanstalk confirms Health status of environment and application as “Ok”.	AWS Elastic Beanstalk confirms Health status of environment and application as “Ok”.	Pass. Figure 1.
2	N/A	Shutdown: Login to the AWS Console and terminate the Sudoku application and environment.	AWS Elastic Beanstalk confirms environment terminated.	N/A. Environment will not be terminated until after the course has finished.	Pass
3	N/A	Error Handling: Visit ‘Start a New Game’ web page, enter valid name but invalid difficulty. Click ‘Create Game’.	Appropriate error message displayed to user, affording opportunity to try again.	Appropriate error message is displayed to the user, affording them the opportunity to try again.	Pass. Figure 2.
4	N/A	Error Handling: Visit ‘Start a New Game’, attempt to perform XSS injection attacks into the username field, select a valid difficulty level, click ‘Create Game’.	Invalid username is discarded; username set to ‘Anonymous’; game play continues as normal.	Play.html displays ‘Anonymous’ as the username after attempting an XSS injection attack.	Pass. Figures 3-4.
5	N/A	Error Handling: Perform all necessary steps to begin a game. During gameplay, stop the database server, and attempt to continue playing.	User should be unaware of any database issues. Game continues to behave as expected all the way through successfully solving the puzzle, but updates not saved to the Played DB table.	N/A. Retaining SQLite DB which consists of a simple file, no external AWS RDS resources to start/stop.	Pass

Test Case #	Req #	Test Description	Expected Result	Actual Result	Pass/Fail
6	SUD-64	Error Handling: During game play, client closes the browser, then re-opens and visits play.html to resume their game.	Game state is restored to exactly where it was before closing the web browser.	Game state is restored to exactly where it was before closing the web browser.	Pass. Figure 5
7	SUD-5, 6, 7, 8, 19, 28, 29, 30, 31	View Static Pages: From home page, click ‘How to Play’, ‘Play Game’, ‘Leaderboards’. Wait for each to load.	All webpages displayed as expected on desktop, tablet, and phone displays.	All webpages displayed as expected on desktop and phone displays.	Pass. Figure 6, 7, 8, 9, 10, 11, 12, 13.
8	SUD-9, 17, 18, 24, 25, 26, 34, 45, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58	Start New Game: From the home page, click “Start a New Game”, enter valid username and difficulty level, click Create Game.	Play.html is displayed with a new puzzle, pencil marks is checked by default, numbers 1-9 in grey are displayed in cells that do not contain a given number in the solution.	Play.html displays as expected, with a new puzzle, checked option for pencil marks, and grey numbers 1-9 in cells that do not contain a given number.	Pass. Figure 14.
9	SUD-9, 22, 34, 35, 36, 37, 38, 39, 40, 41, 42, 58, 60, 61	Play Game: Picking up from test 8, interact with the game as required to remove a number from the scratchpad.	Deselected number no longer appears in possible solutions in the highlighted cell	Deselected number no longer appears in possible solutions in the highlighted cell	Pass. Figure 15.
10	SUD-9, 22, 34, 35, 36, 37, 38, 39, 40, 41, 42, 58, 60, 61	Play Game: Solve a cell and confirm user puzzle input matches saved puzzle solution by clicking ‘Verify Solution’ button	‘Verify Solution’ button returns message notifying user that input matches stored solution	‘Verify Solution’ button returns message notifying user that input matches stored solution	Pass. Figure 16.

Test Case #	Req #	Test Description	Expected Result	Actual Result	Pass/Fail
11	SUD-9, 22, 34, 35, 36, 37, 38, 39, 40, 41, 42, 58, 60, 61	Play Game: Solve puzzle and confirm all inputs are correct by clicking ‘Verify Solution’ button	‘Verify Solution’ button returns message to user that puzzle is solved correctly. Username, puzzle data, and time elapsed solving puzzle are saved to database.	‘Verify Solution’ button returns message to user that puzzle is solved correctly. Username, puzzle data, and time elapsed solving puzzle are saved to database.	Pass. Figure 17, 18.
12	SUD-32, 33, 34	Leaderboard: From the homepage, click ‘Leaderboards’ menu item.	The quickest 5 games from each difficulty level are displayed along with the player's name.	The five quickest games from current difficulty settings are displayed.	Pass. Figure 19.
13	SUD-46, 47, 48	Custom Puzzle: From homepage click ‘Start a New Game’->‘Custom’. Enter 81 character string of givens and unknowns using ‘?’. Click ‘Create Game’	Play.html is rendered with the custom board entered by the user.	Play.html is rendered with the custom board entered by the user.	Pass. Figure 20, 21.
14	SUD-10, 11, 13, 14, 15, 16, 53, 54	Create Games: Run the create_game.py module within the IDE.	Application begins generating games of varying difficulty levels, outputting progress information to the console and saving the puzzles to a textfile based on today's date.	Application generate games of varying difficulty levels, outputting progress information to the console and saving the puzzles to a textfile based on today's date.	Pass. Figure 22.
15	SUD-63	Upload: Navigate to /sudoku/upload, login with admin credentials, choose a puzzle file to upload, submit.	Confirmation screen rendered. Manual DB query reveals new puzzles successfully imported.	Confirmation screen rendered. Manual DB query reveals new puzzles successfully imported.	Pass Figure 23, 24.

Test Case #	Req #	Test Description	Expected Result	Actual Result	Pass/Fail
16	SUD-65	Hints: Start a game, play for a few minutes, click “Get Hint”	Message displayed with technique name and general location of where it can be used (which row, column, or block).	“There is a Hidden Pair in Row 9”	Pass Figure 25

Test Case #1. Pass. AWS Elastic Beanstalk confirms Health status of environment and application as “Ok”.

The screenshot shows the AWS Elastic Beanstalk console interface. On the left, there's a sidebar with navigation links like 'Environments', 'Applications', 'sudoku' (with 'Application versions' and 'Saved configurations'), 'Sudoku-env' (with 'Go to environment', 'Configuration', 'Logs', 'Health', 'Monitoring', 'Alarms', 'Managed updates', 'Events', 'Tags'), and 'Recent environments' (listing 'Sudoku-env'). The main content area shows the 'Sudoku-env' environment details. It includes an 'Info' message about a managed update, a 'Health' section with a green checkmark and 'Ok' status, a 'Running version' of 'sudoku-0.1.9', and a 'Platform' section for Python 3.7 on Amazon Linux 2/3.0.3. Below these are sections for 'Recent events' and 'Logs'. The bottom of the screen shows the Mac OS X dock with various application icons.

Time	Type	Details
2020-06-24 14:19:08 UTC-0700	INFO	Environment health has transitioned from Info to Ok.
2020-06-24 14:18:08 UTC-0700	INFO	Removed instance [i-04871cf42b6687e7] from your environment.
2020-06-24 14:18:08 UTC-0700	INFO	Added instance [i-076ef082259b72158] to your environment.
2020-06-24 14:17:33 UTC-0700	INFO	Environment update completed successfully.
2020-06-24 14:17:09 UTC-0700	INFO	Environment health has transitioned from Ok to Info. Configuration update in progress (running for 57 seconds).

Figure 1 - Test Case #1

Test Case #3. Pass. Using OWASP ZAP, the request was tampered to post a valid player name (Test_Case_3), but an invalid difficulty level (10). As a result, the application prompts the user to select a valid difficulty level, as shown in Figure 2.

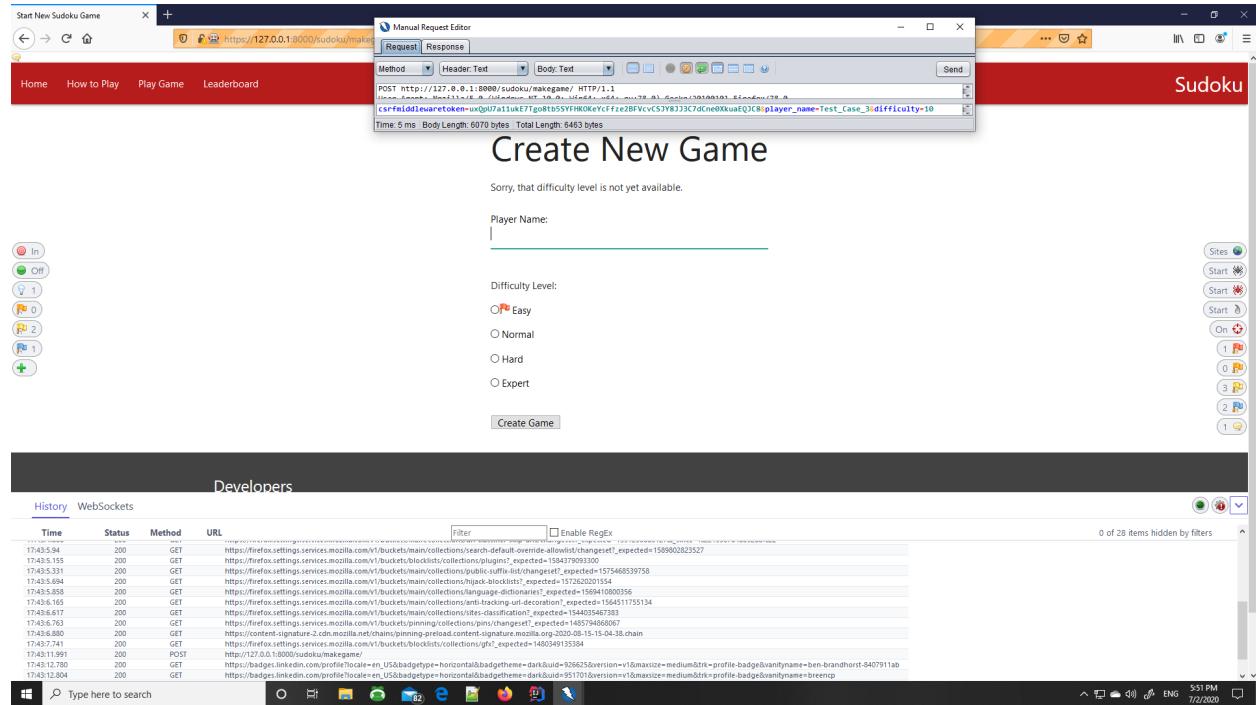


Figure 2 - Test Case #3

Test Case #4. Pass. Play.html displays ‘Anonymous’ as the username after attempting an XSS injection attack.



The screenshot shows the 'Create New Game' interface. At the top, there's a red header bar with links for Home, How to Play, Play Game, and Leaderboard, and the word 'Sudoku' on the right. Below the header is a light blue form area with the title 'Create New Game'. It has a 'Player Name:' field containing '<body onload=alert('test')>' and a 'Difficulty Level' section with radio buttons for Easy (selected), Normal, Hard, and Expert. A 'Create Game' button is at the bottom.



The screenshot shows the 'Developers' section of the website. It features three developer profiles with their names, roles, and brief descriptions:

- Ben Brandhorst**: Logistic Chef at United States Marine Corps
- Christopher Breen**: Master Sergeant of Marines, Software Developer, Scuba...
- Christopher Smith**: Student at University of Maryland Global Campus

Figure 3 - Test Case #4 (attempted XSS)



The screenshot shows the 'Welcome Anonymous!' page. At the top, there's a red header bar with links for Home, How to Play, Play Game, and Leaderboard, and the word 'Sudoku' on the right. Below the header is a light blue main area with the title 'Welcome Anonymous!'. On the left, there's a 'Verify Solutions' checkbox. The central part of the page is a 9x9 Sudoku grid containing the following values:

1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	5	1 2 3 4	1 2 3 4	2	3	1
5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	2		
1 2 3 4	1 2 3 4	6	1 2 3 4	1 2 3 4	7	1 2 3 4	1 2 3 4	2	
5 6 7 8 9	5 6 7 8 9		5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9			
1 2 3 4	1 2 3 4	9	1 2 3 4	2	1 2 3 4	8	1	1 2 3 4	3
5 6 7 8 9	5 6 7 8 9		5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9			
5	7	1 2 3 4	1 2 3 4	6	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	4
5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1	1 2 3 4	1 2 3 4	5	5
5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	
8	1 2 3 4	1 2 3 4	5	3	1 2 3 4	6	4	7	6
5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	
3	1 2 3 4	5	1 2 3 4	8	4	1 2 3 4	1 2 3 4	1 2 3 4	7
5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	
1 2 3 4	1 2 3 4	1	1 2 3 4	1 2 3 4	1 2 3 4	3	8	8	
5 6 7 8 9	5 6 7 8 9		5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9			
1 2 3 4	8	1 2 3 4	1 2 3 4	1	1 2 3 4	1 2 3 4	6	1 2 3 4	9
5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	5 6 7 8 9	

Figure 4 - Test Case #4

Test Case #6. Pass. During the Final Sprint, a “Resume Previous” button was added to newgame.html if Django Session information is found in the sessions database table. A user that navigates away from play.html can resume their game by clicking this button to be redirected back to play.html and pick up where they left off.

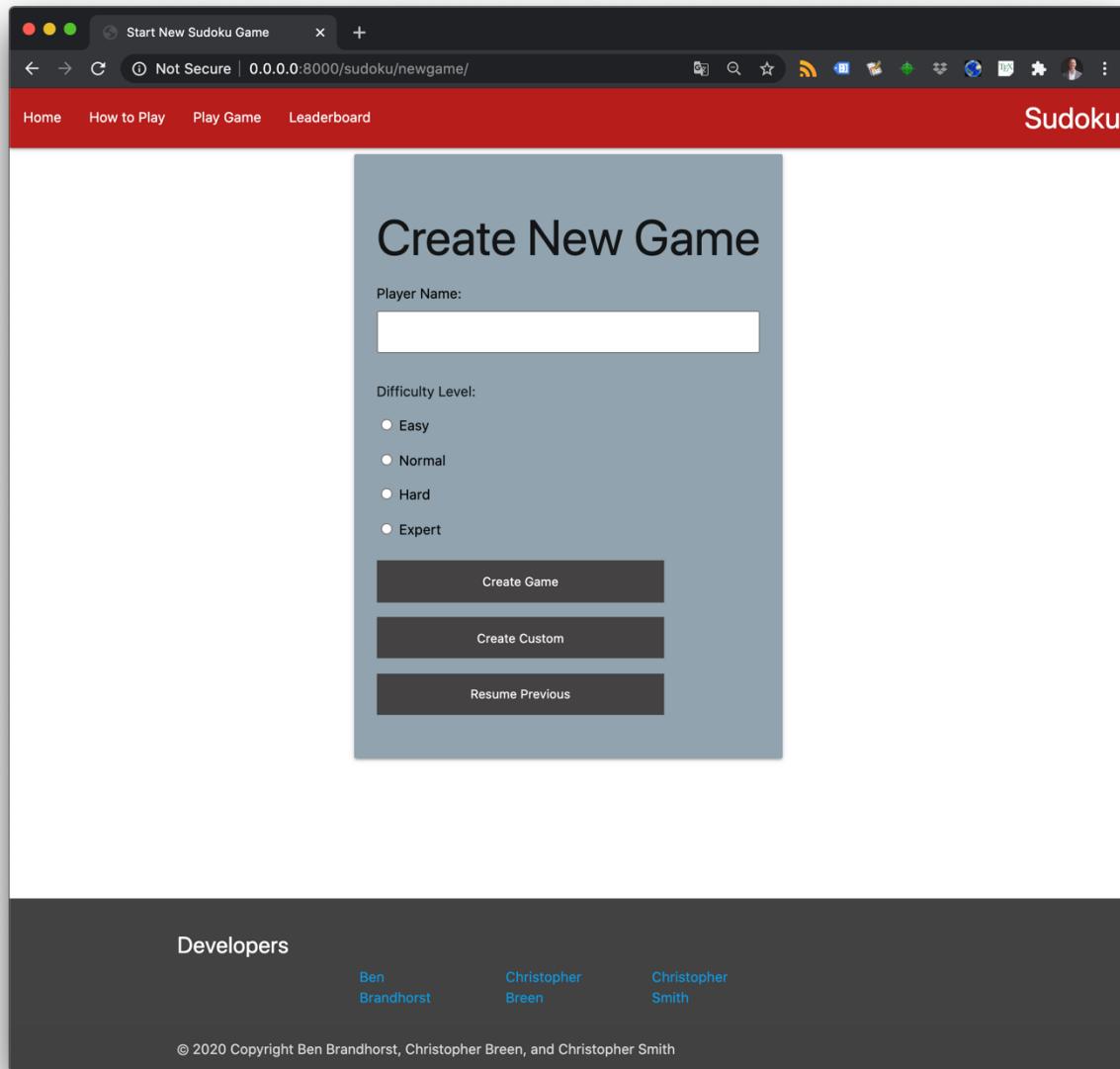


Figure 5 - Resume Previous Game Option

Test Case #7. Pass. All webpages displayed as expected on desktop and phone displays.

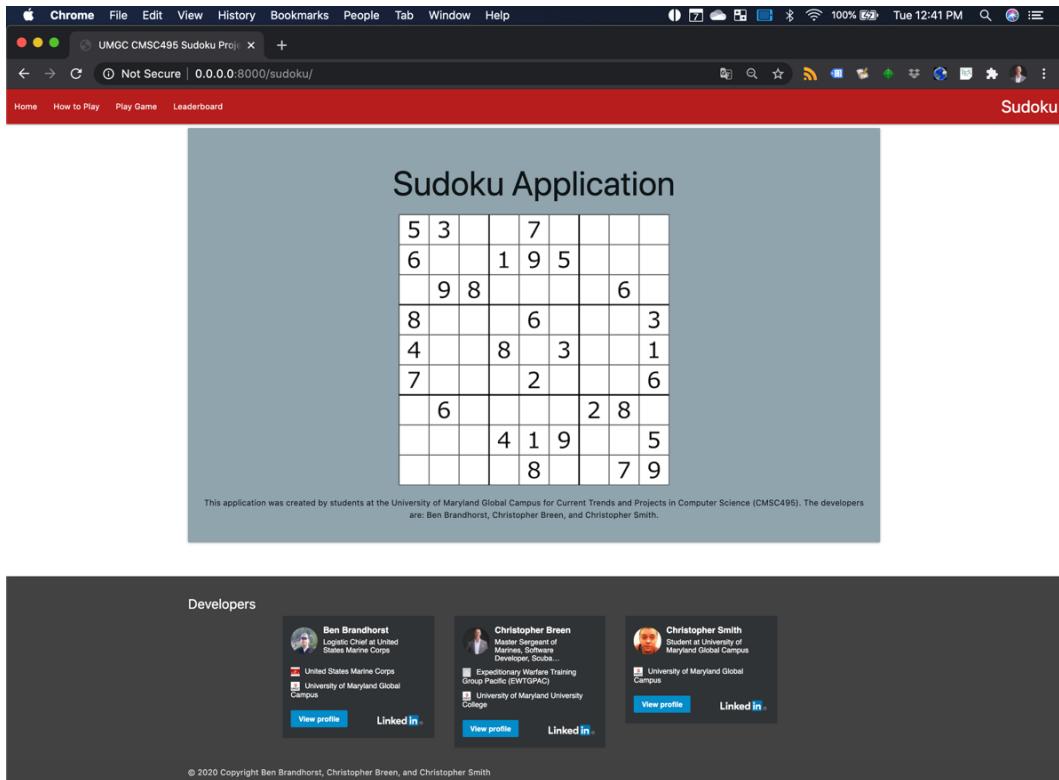


Figure 6 - Test Case #7 – Index.html Desktop View

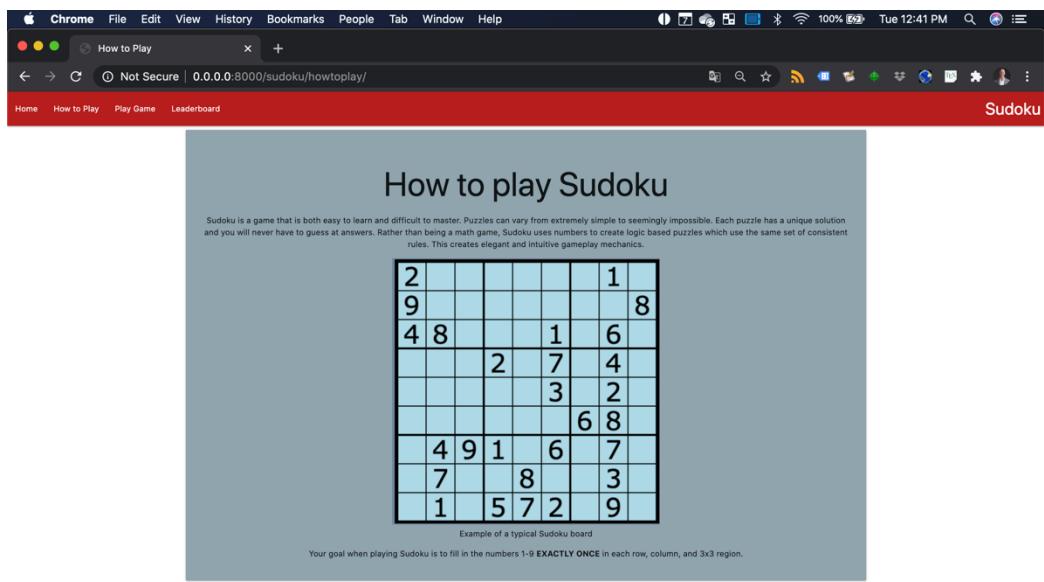
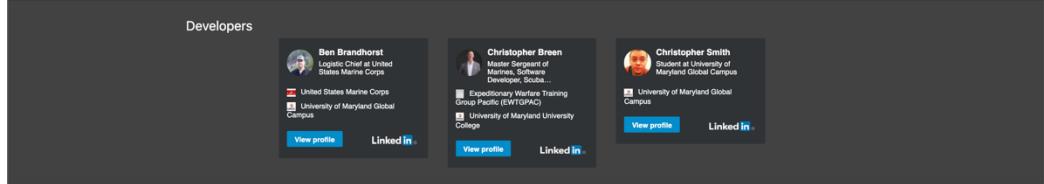


Figure 7 - Test Case #7 – Howtoplay.html Desktop View



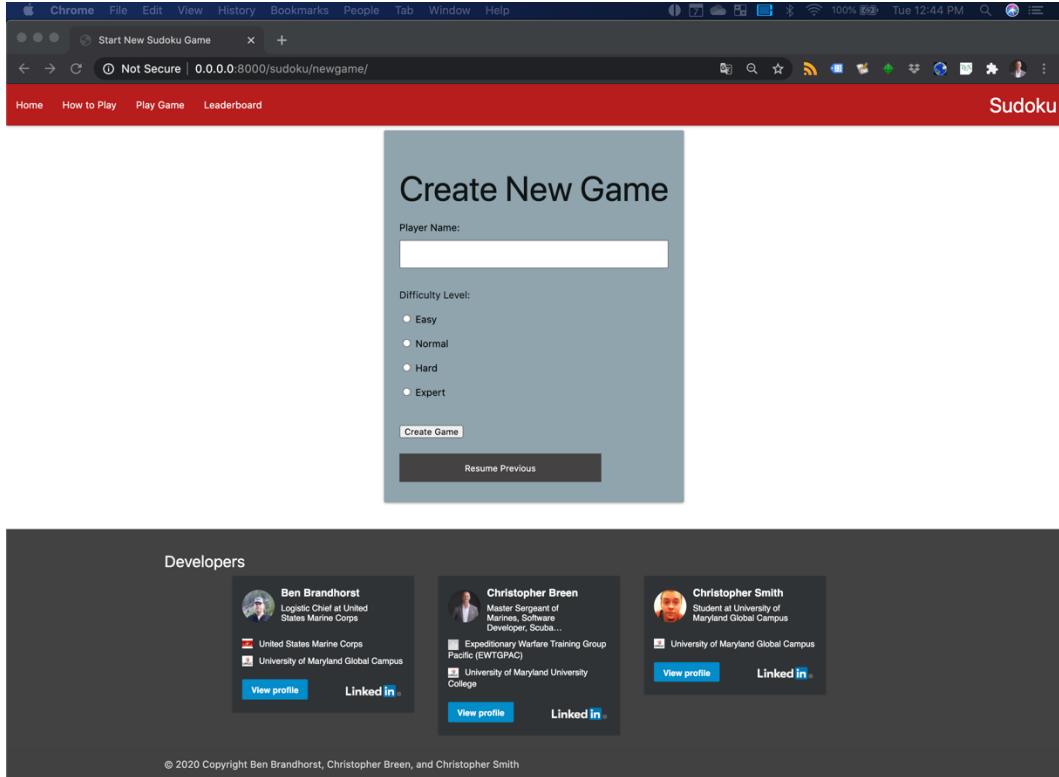


Figure 8 - Test Case #7 – Newgame.html Desktop View

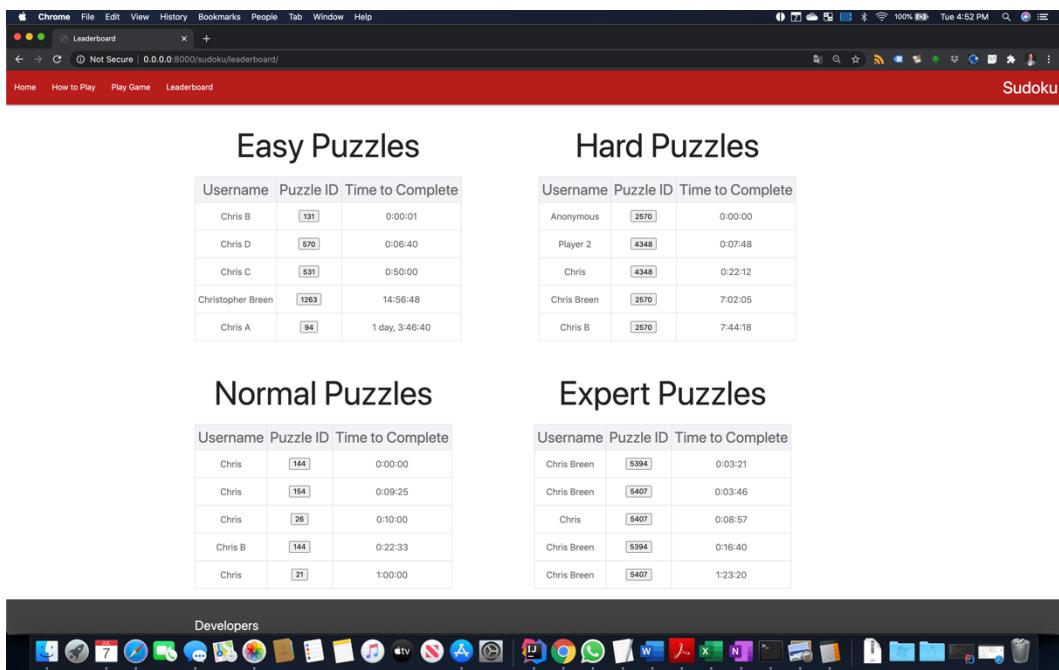


Figure 9 - Test Case #7 – Leaderboard.html Desktop View

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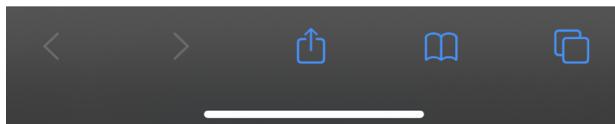
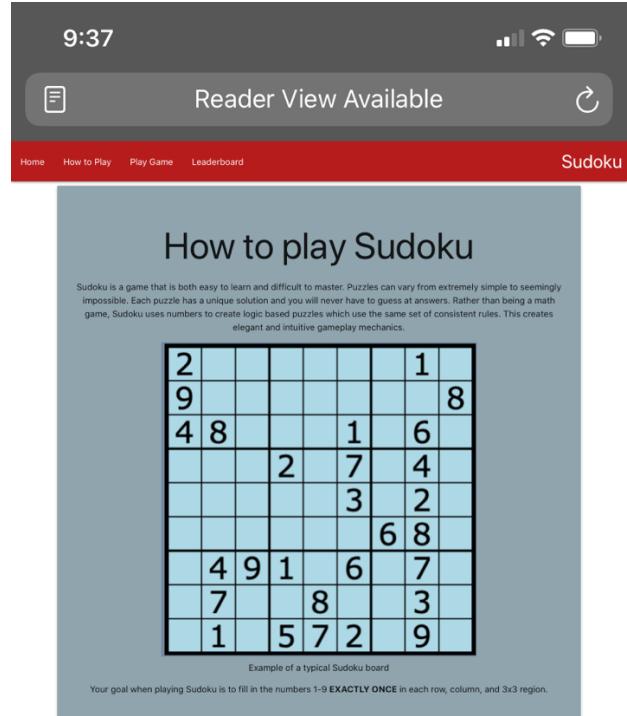
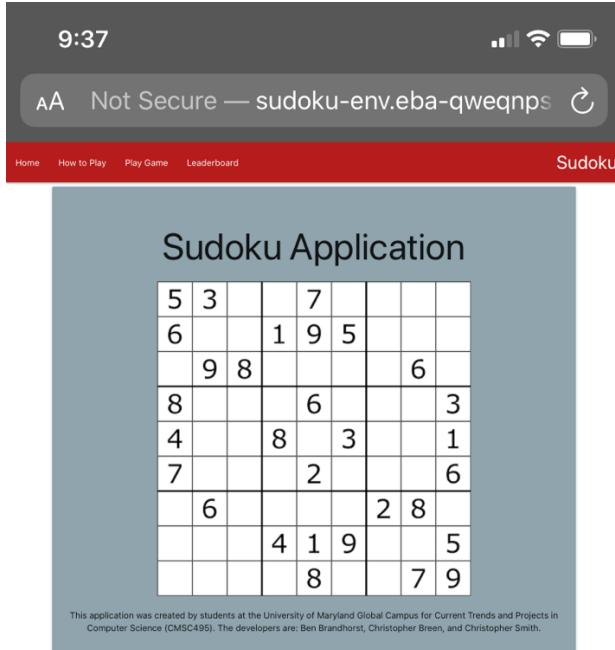


Figure 10 - Test Case #7 – Index.html Mobile View

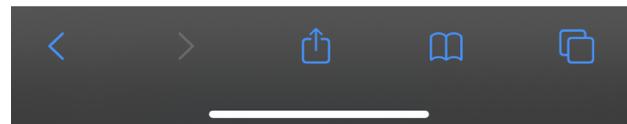
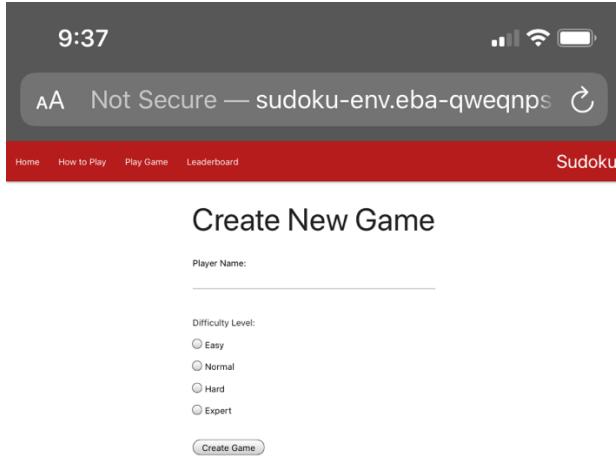


Figure 11 - Test Case #7 – Howtoplay.html Mobile View



Easy Difficulty		
Username	Puzzle ID	Time to Complete
Chris B	131	0:00:01
Chris D	570	0:06:40
Chris C	531	0:50:00
Christopher Breen	1263	14:56:48
Chris A	94	1 day, 3:46:40

Normal Difficulty

Username	Puzzle ID	Time to Complete
Chris	26	0:10:00
Chris	21	1:00:00
Chris	408	1:10:00
Chris	152	1:20:00
Chris	24	1:50:00

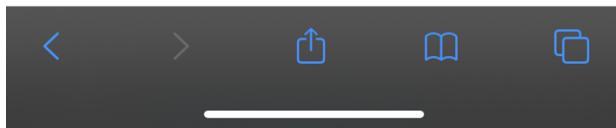


Figure 12 - Test Case #7 – Newgame.html Mobile View

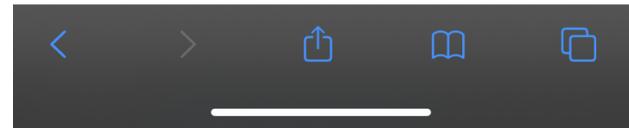


Figure 13 - Test Case #7 – Leaderboard.html Mobile View

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Test Case #8. Pass. Play.html displays as expected, with a new puzzle, checked option for pencil marks, and grey numbers 1-9 in cells that do not contain a given number.



Figure 14 - Test Case #8

Test Case #9. Pass. Deselected number no longer appears in possible solutions in the highlighted cell.

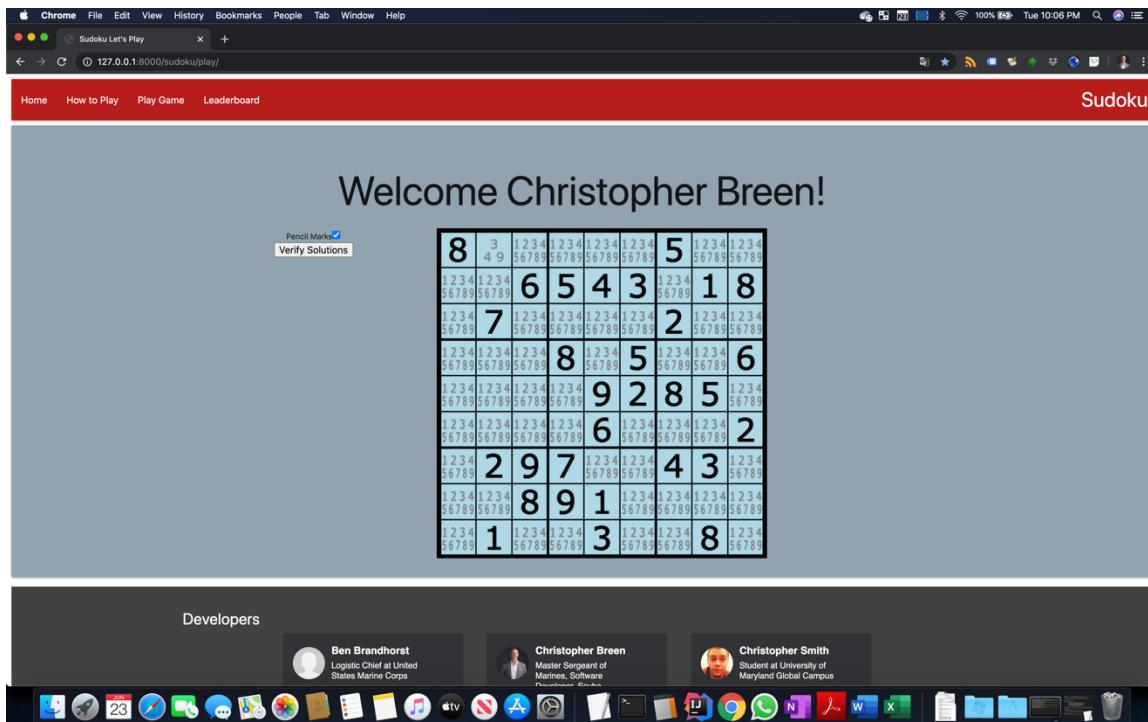


Figure 15 - Test Case #9

Test Case #10. Pass. ‘Verify Solution’ button returns message notifying user that input matches stored solution.

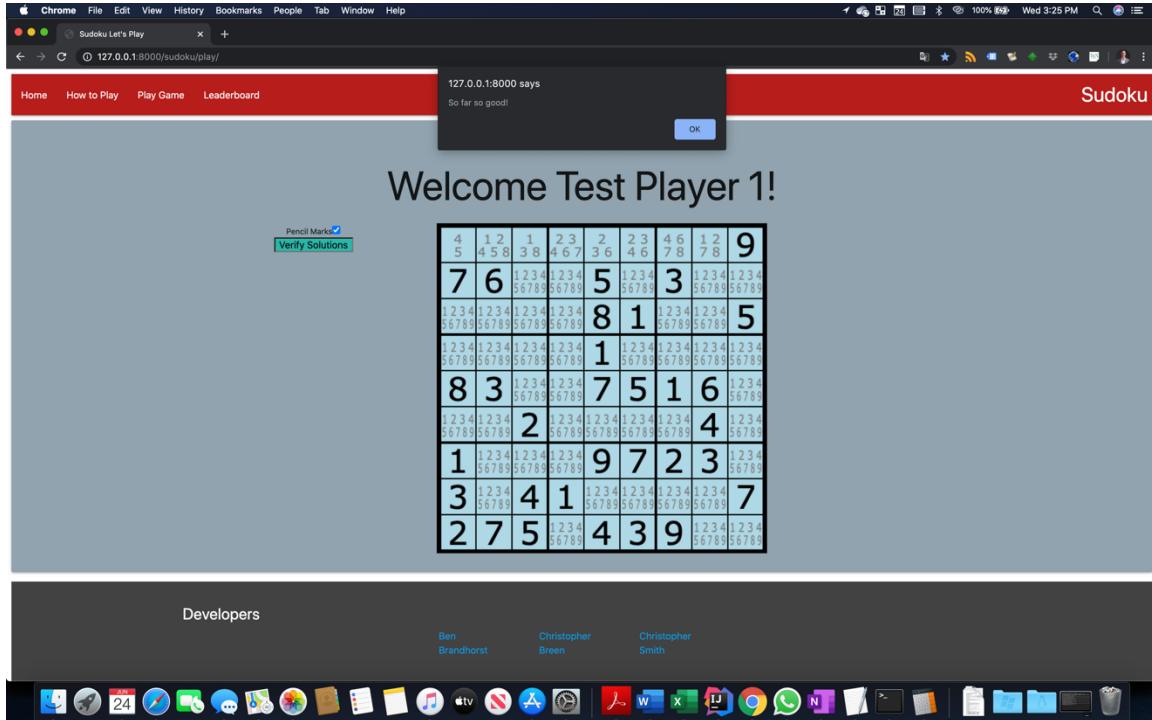


Figure 16 - Test Case #10

Test Case #11. Pass. ‘Verify Solution’ button returns message to user that puzzle is solved correctly. Username, puzzle data, and time elapsed solving puzzle are saved to database.

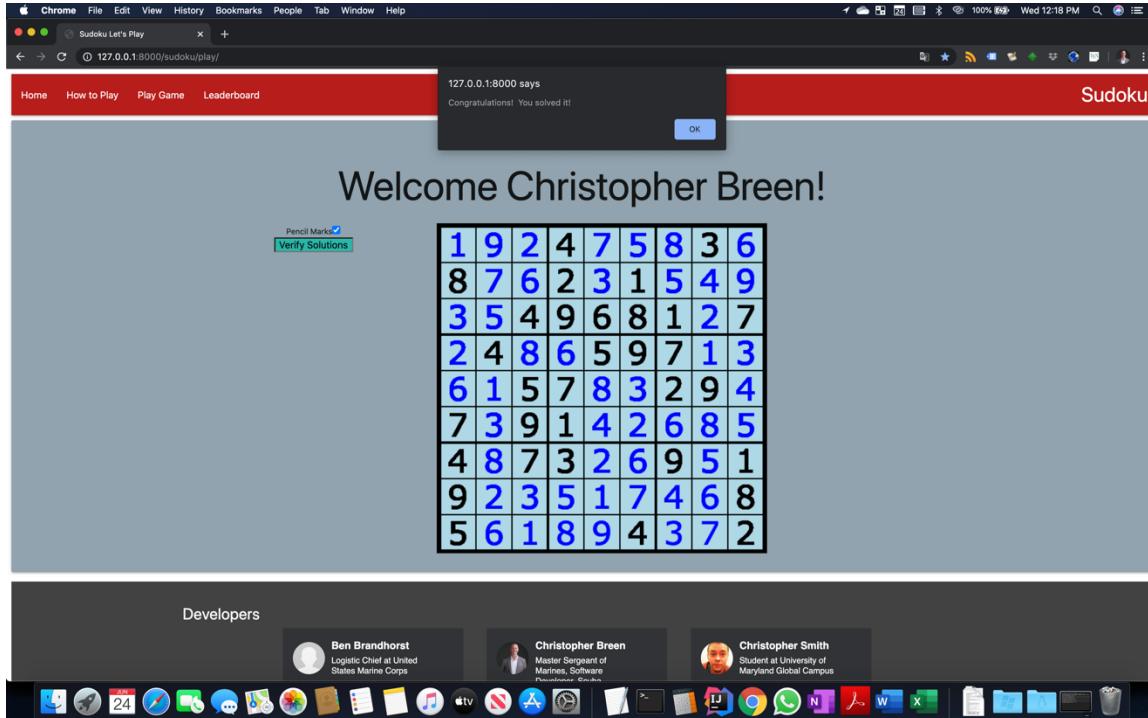


Figure 17 - Test Case #11

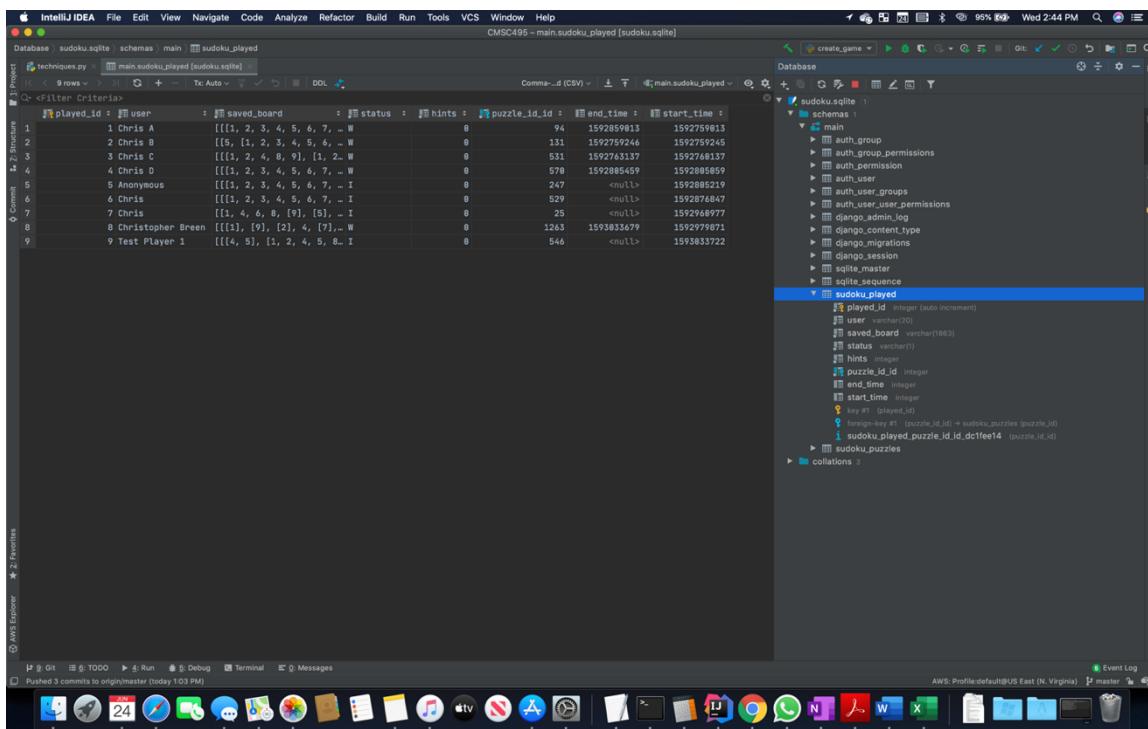


Figure 18 - Test Case #11

Test Case #12. Pass. The five quickest games from various difficulty levels are displayed.

The screenshot shows a web browser window titled "Leaderboard" with the URL "Not Secure | 0.0.0.0:8000/sudoku/leaderboard/". The page has a red header bar with links for "Home", "How to Play", "Play Game", and "Leaderboard". The main content area contains four tables under the heading "Sudoku".

Difficulty Level	Table Title	Username	Puzzle ID	Time to Complete
Easy Puzzles	Easy Puzzles	Chris B	131	0:00:01
		Chris D	570	0:06:40
		Chris C	531	0:50:00
		Christopher Breen	1263	14:56:48
		Chris A	94	1 day, 3:46:40
Hard Puzzles	Hard Puzzles	Anonymous	2570	0:00:00
		Player 2	4348	0:07:48
		Chris	4348	0:22:12
		Chris Breen	2570	7:02:05
		Chris B	2570	7:44:18
Normal Puzzles	Normal Puzzles	Chris	144	0:00:00
		Chris	154	0:09:25
		Chris	26	0:10:00
		Chris B	144	0:22:33
		Chris	21	1:00:00
Expert Puzzles	Expert Puzzles	Chris Breen	5394	0:03:21
		Chris	5407	0:08:57
		Chris Breen	5394	0:16:40
		Chris Breen	5407	1:23:20

At the bottom of the page, there is a dark footer bar with the word "Developers" in white text.

Figure 19 - Test Case #12

Test Case #13. Pass. Play.html is rendered with the custom board entered by the user.

The screenshot shows a web browser window titled "Create Custom Sudoku". The URL is "Not Secure | 0.0.0.8000/sudoku/customgame/". The page has a red header bar with "Sudoku" on the right. Below it, there's a "Custom Sudoku Puzzle" section. It asks for a "Player Name:" (Chris Breen) and displays a "Puzzle:" grid with some numbers and question marks. A "Create Game" button is at the bottom. At the very bottom of the page, there's a dark footer with "Developers" and names: Ben Brandhorst, Christopher Breen, and Christopher Smith. A copyright notice at the bottom states: "© 2020 Copyright Ben Brandhorst, Christopher Breen, and Christopher Smith".

Figure 20 - Custom Puzzle

The screenshot shows a web browser window titled "Sudoku Let's Play". The URL is "Not Secure | 0.0.0.8000/sudoku/play/". The page has a red header bar with "Sudoku" on the right. The main content is a "Welcome Chris Breen!" message above a large 9x9 Sudoku grid. The grid is mostly filled with numbers from 1 to 9. To the left of the grid is an "Options" sidebar with buttons for "Pencil Marks" (checked), "Get Hint", "Erase Obvious", and "Verify Solutions". At the bottom of the page is a dark footer with "Developers" and names: Ben Brandhorst, Christopher Breen, and Christopher Smith.

Figure 21 - Custom Puzzle

Test Case #14. Pass. Application generate games of varying difficulty levels, outputting progress information to the console and saving the puzzles to a textfile based on today's date.

```
Run: create_game
Difficulty: 1 {'naked_single': 'True'} Givens: 30 Total minutes elapsed: 10
Creating game.....
Difficulty: 1 {'naked_single': 'True'} Givens: 30 Total minutes elapsed: 10
Creating game...
Creating game...
Difficulty: 1 {'naked_single': 'True', 'hidden_single': 'True'} Givens: 30 Total minutes elapsed: 10
Creating game....
Difficulty: 1 {'naked_single': 'True'} Givens: 30 Total minutes elapsed: 10
Creating game.....
Difficulty: 1 {'naked_single': 'True', 'hidden_single': 'True'} Givens: 30 Total minutes elapsed: 11
Creating game.....
Difficulty: 2 {'naked_single': 'True', 'hidden_single': 'True', 'naked_pair': 'True', 'omission': 'True'} Givens: 30 Total minutes elapsed: 11
Creating game...
Creating game.....
Difficulty: 1 {'naked_single': 'True', 'hidden_single': 'True'} Givens: 29 Total minutes elapsed: 11
Creating game...
Difficulty: 1 {'naked_single': 'True'} Givens: 30 Total minutes elapsed: 11
Creating game.....
Difficulty: 1 {'naked_single': 'True', 'hidden_single': 'True'} Givens: 30 Total minutes elapsed: 12
Creating game...
```

Figure 22 - Test Case #14

Test Case #15. Pass. Confirmation screen rendered. Manual DB query reveals new puzzles successfully imported.

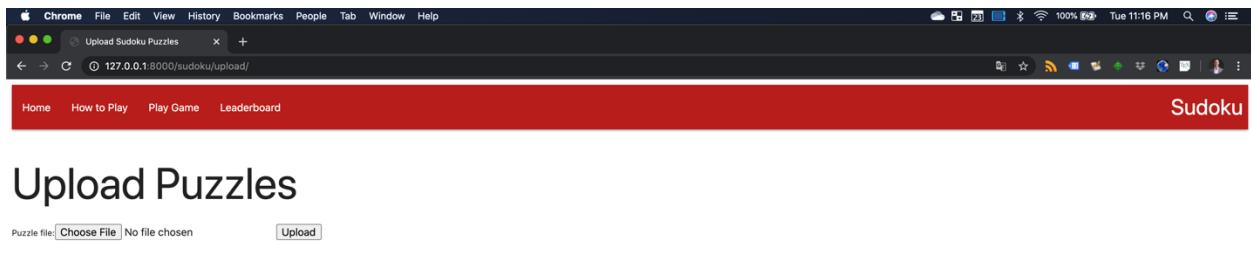
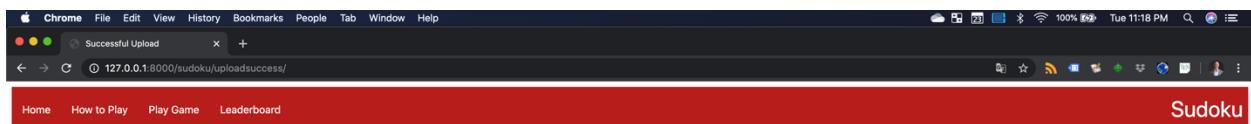


Figure 23 - Test Case #15



Upload Complete
Please manually check the DB for detailed results.

Figure 24 - Test Case #15

Test Case #16. Pass. Message displayed with technique name and general location of where it can be used (which row, column, or block). There is a Hidden Pair in Row 9.

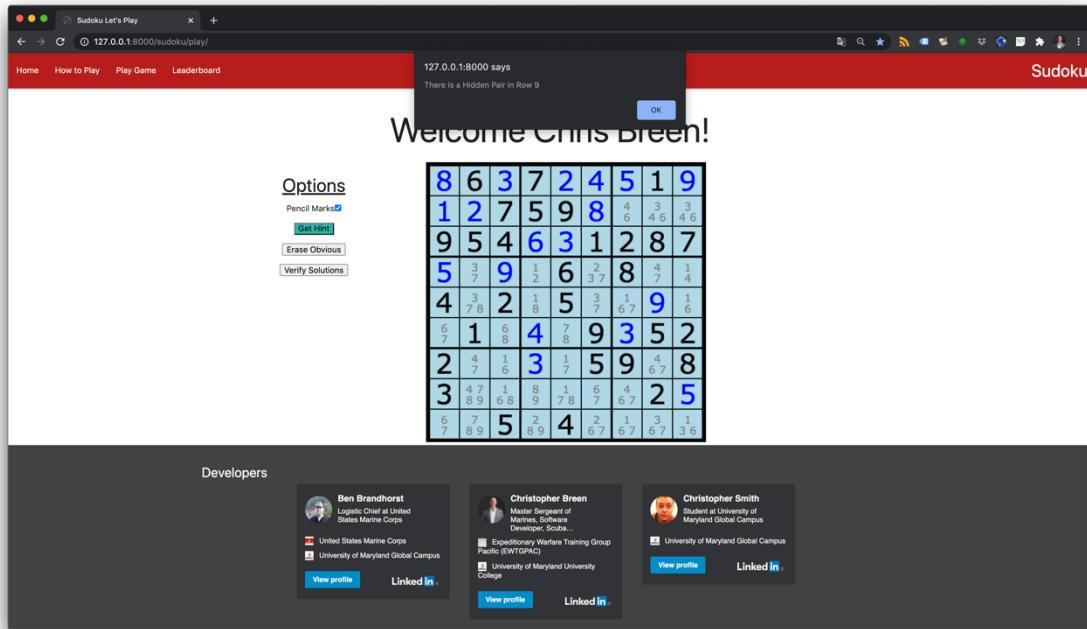


Figure 25 - Test Case #16

INTERFACE CONTROL DOCUMENT

From	To	Name	Type	Value Range	Default Value
User	Input	player_name	string	RegEx: r"^\w\{4,20\}\$"	N/A
Input	make_game	player_name	string	RegEx: r"^\w\{4,20\}\$"	N/A
make_game	create_game	player name	string	RegEx: r"^\w\{4,20\}\$"	Anonymous
User	Input	difficulty	str(int)	'1'-'5'	N/A
Input	make_game	difficulty	str(int)	'1'-'5'	N/A
make_game	create_game	difficulty	str(int)	'1'-'5'	N/A
Input	verifySolutions	solution	9x9 multidimensional list	[1-9]\{9x9\}	N/A
verifySolutions	addGameRecord	solution	9x9 multidimensional list	[1-9]\{9x9\}	N/A
create_game	make_board	board	9x9 multidimensional list with unknown numbers represented as additional nested list	[1-9] or [1, 2, 3, 4, 5, 6, 7, 8, 9]\{9x9\}	N/A
create_game	gamerecords	techniques	dict	{'str(technique_name)': boolean}\{1,13\}	N/A
upload.html	SQLite3 DB	puzzle_file for import	dict	{'board': board, 'solution': solution, 'difficulty': difficulty, 'techniques': {'techniques': techniques}}	techniques: False
addGameRecord	SQLite3 DB	puzzle_state	dict	{'user': string, 'start_time': epoch in seconds (optionally) 'end_time': epoch in seconds, 'status': 'I', 'W', 'L', 'S', 'hints': int, 'current_board': board, 'orig_board': board, }	hints: 0

From	To	Name	Type	Value Range	Default Value
create_game	play.html	request.session	Django Session Middleware	{‘orig_board’:board ‘board’:board ‘solution’:solution ‘start_time’:int(rounded epoch in seconds) (optionally)’end_time’:int(rounded epoch in seconds) ‘status’: ‘I’, ‘W’, ‘L’, or ‘S’, ‘hints’:int}	N/A
Django session	drawBoard	sessionStorage	JavaScript Session Storage	‘board’: board ‘orig_board’: board ‘start_time’:int(rounded epoch in seconds) (optionally)’end_time’:int(rounded epoch in seconds) ‘status’: ‘I’, ‘W’, ‘L’, or ‘S’, ‘hints’:int	status: ‘I’, hints: 0