Quiz Manager Test Plan

Automatic Testing

Automatic testing was implemented alongside the development of the code, which meant code could be regularly tested. The benefit of automatic testing is that it was very quick to run tests on the whole system, and could be repeated as many times as needed, without any extra coding effort.

Tests were written using the PyTest module in Python. The PyTest module allows tests to be written in a separate test folder and integrates well with Flask. Creating a Flask app in testing mode will initialise PyTest to find all test files and run them. Tests are written with some setup, then running some functionality that is the aim of the test, and then finally, using the assert keyword to check that the outputs are correct. A test passes when all the assert statements are correct. When tests are run, PyTest will print the progress to the console and highlight which tests have passed or failed.

PyTest also features additional useful functionality with fixtures and coverage. Fixtures are reusable pieces of code that can be called by other tests, a useful example of this is logging a user in and taking them to the home page. As these steps are necessary for lots of tests, having it in a reusable format was very beneficial. Coverage is a plugin for PyTest and analyses the code coverage within the project when tests are running. Code coverage is a good metric of testing, with the aim of achieving 100% coverage. This helps find faults or errors in the scripts. However, code coverage is not a perfect metric and running a piece of code is not the same as that code doing what was intended. This is why a combination of unit testing and manual testing was done.

Manual Testing

In addition to automatic testing, manual testing was also used. Manual testing allowed testing of a wider range of the system, as well as some of the more complex functionality. It was also the best way to test the user experience, and ensure the UI was working as intended.

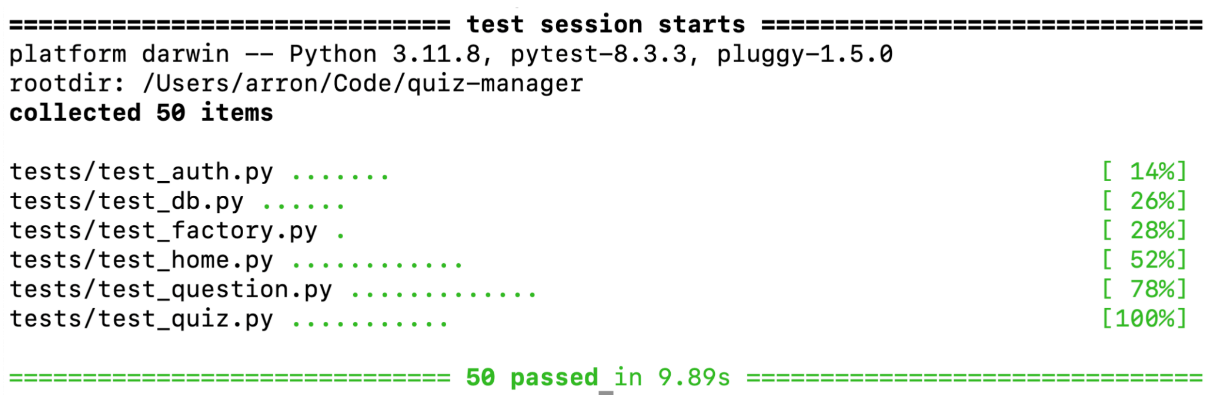
The User Stories created during the design phase of the project (for more information on the user stories, see the Design Plan) were used as manual tests. Each step through the user story was executed on the application and compared the actual output produced by the application with the desired output from the user story and specification. If both outputs were the same, then the manual test was considered a pass. If the expected output and actual output were different, then the manual test was a failure and had to be addressed.

Results

The automatic tests written had the aim of testing all the different functions in the application and achieving 100% code coverage. Tests were written in the tests directory, and split into different files, depending on the functionality they were testing. The setup and expected outcome for each test are shown in the code as comments.

50 automatic tests were written in total. They covered login, accessing pages, error handling and application creation. These tests helped identify bugs in the code and the errors made it

easy to spot where an error occurred and fix it. At the end of the project, all the tests passed and achieved a code coverage of 99%. A detailed view of the results is shown in Figure 1 and a breakdown of the code coverage is also shown in Figure 2.

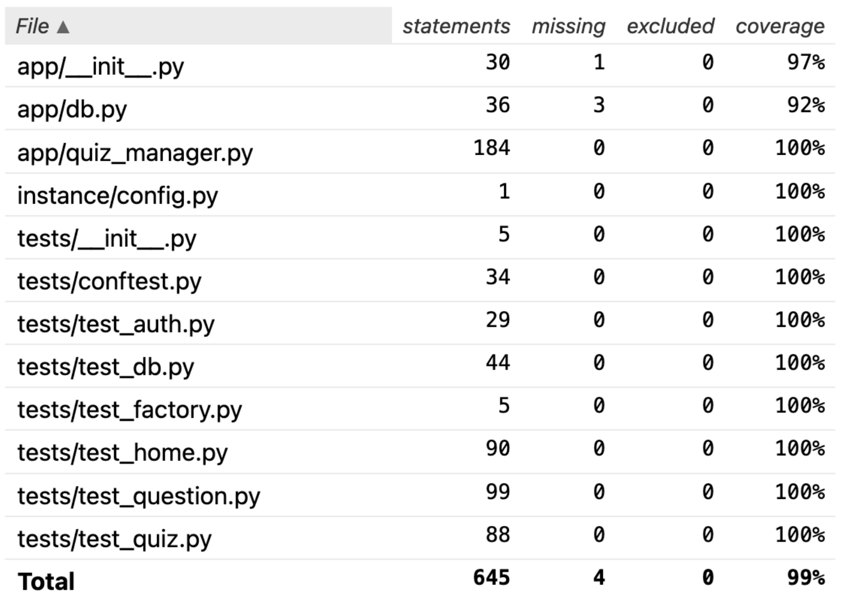


```
============================== test session starts ==============================
platform darwin -- Python 3.11.8, pytest-8.3.3, pluggy-1.5.0
rootdir: /Users/arron/Code/quiz-manager
collected 50 items

tests/test_auth.py .......                                               [ 14%]
tests/test_db.py ......                                                  [ 26%]
tests/test_factory.py .                                                  [ 28%]
tests/test_home.py ............                                          [ 52%]
tests/test_question.py .............                                     [ 78%]
tests/test_quiz.py ...........                                           [100%]

============================== 50 passed in 9.89s ===============================
```

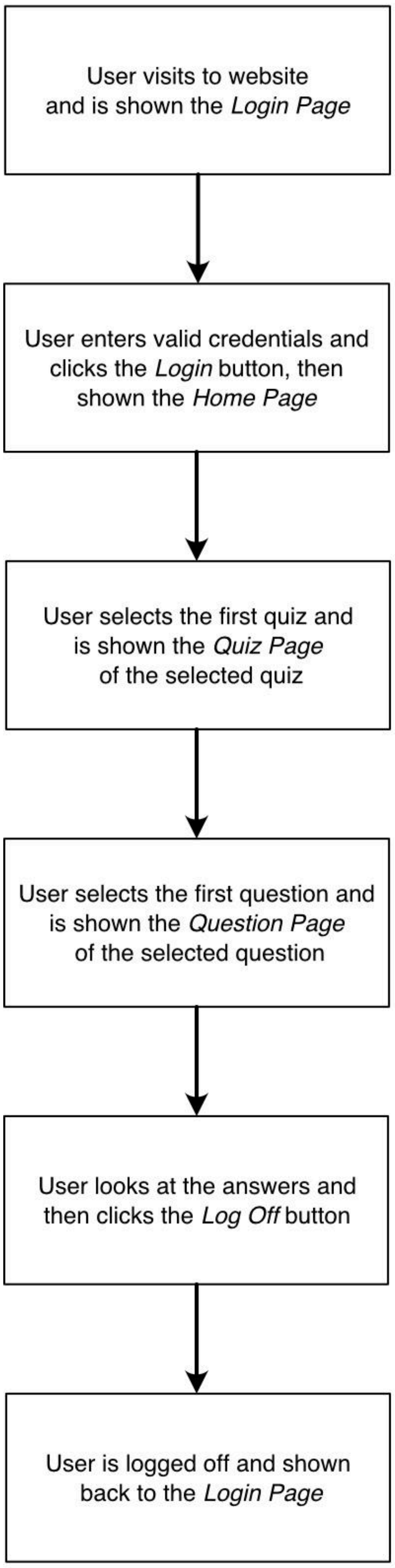
Figure 1: Automated Test Results



File ▲	statements	missing	excluded	coverage
app/__init__.py	30	1	0	97%
app/db.py	36	3	0	92%
app/quiz_manager.py	184	0	0	100%
instance/config.py	1	0	0	100%
tests/__init__.py	5	0	0	100%
tests/conftest.py	34	0	0	100%
tests/test_auth.py	29	0	0	100%
tests/test_db.py	44	0	0	100%
tests/test_factory.py	5	0	0	100%
tests/test_home.py	90	0	0	100%
tests/test_question.py	99	0	0	100%
tests/test_quiz.py	88	0	0	100%
Total	**645**	**4**	**0**	**99%**

Figure 2: Automated Test Coverage

As mentioned, user stories were used as the manual test cases. The result of the first manual test is shown in Figure 3. This test matched the expected outcomes of the user story, and all links between the websites worked as intended. Therefore the test was considered a pass.


User visits to website and is shown the *Login Page*

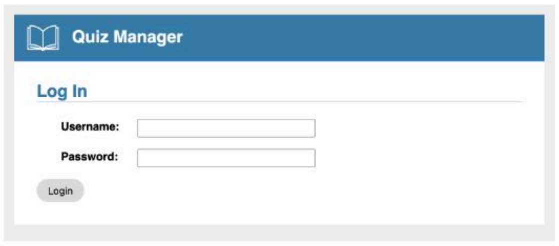
User enters valid credentials and clicks the *Login* button, then shown the *Home Page*

User selects the first quiz and is shown the *Quiz Page* of the selected quiz

User selects the first question and is shown the *Question Page* of the selected question

User looks at the answers and then clicks the *Log Off* button

User is logged off and shown back to the *Login Page*

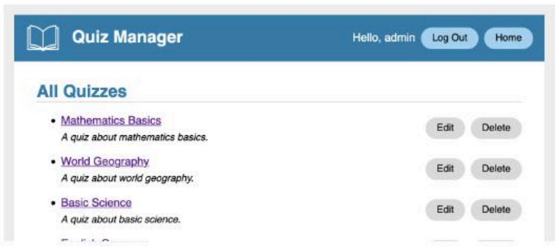

Quiz Manager

Log In

Username:

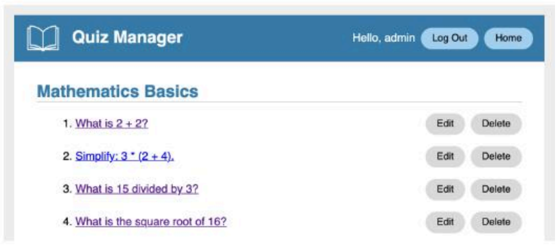
Password:

Login


Quiz Manager Hello, admin Log Out Home

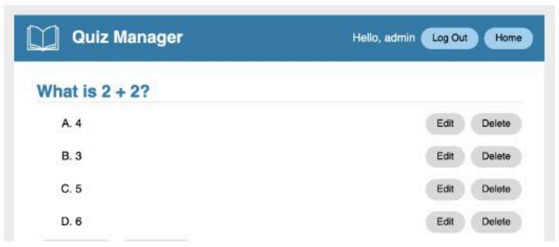
All Quizzes

- Mathematics Basics
  A quiz about mathematics basics. Edit Delete
- World Geography
  A quiz about world geography. Edit Delete
- Basic Science
  A quiz about basic science. Edit Delete


Quiz Manager Hello, admin Log Out Home

Mathematics Basics

1. What is 2 + 2? Edit Delete
2. Simplify: 3 * (2 + 4). Edit Delete
3. What is 15 divided by 3? Edit Delete
4. What is the square root of 16? Edit Delete


Quiz Manager Hello, admin Log Out Home

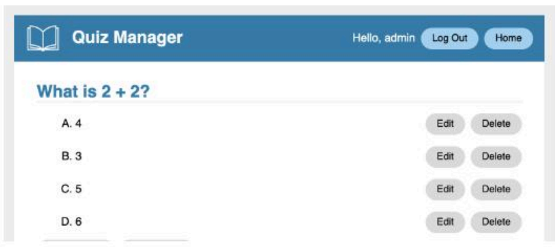
What is 2 + 2?

A. 4 Edit Delete

B. 3 Edit Delete

C. 5 Edit Delete

D. 6 Edit Delete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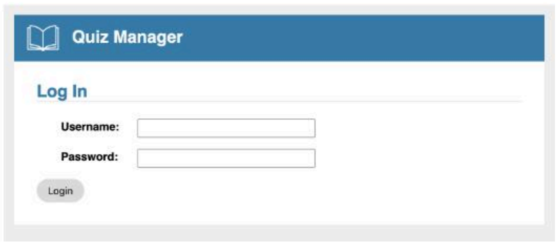
Quiz Manager

Log In

Username:

Password:

Login

Figure 3: Manual Test Results