

# Design Document

WEBBISKOOLS QUIZ MANAGER

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## BACKGROUND INFORMATION

WebbiSkools Ltd is a software company that provides on-line educational solutions for educational establishments and training providers. I have been tasked with designing, building, and testing a database-driven website to manage quizzes, each consisting of a set of multiple-choice questions and their associated answers. The website's capabilities will only be accessible to known users. Users with full permissions will be able to view and edit the questions and answers; users with lesser permissions will be able to view them but not edit them; users with minimal permissions will only be able to see the questions.

## BUSINESS REQUIREMENTS

### USERS AND PERMISSIONS

- The set of users with their usernames, passwords and permissions should be pre-configured. This may be done by manually inputting data into the database, through a separate user-config file (e.g. an XML, JSON or CSV file), or any other mechanism of your choice.
- Stored passwords should be hashed for security, using a suitable hash algorithm.
- Permission levels should be one of {Edit, View, Restricted}, where Edit means the ability to add, delete and change questions and answers, View means the ability to view questions and answers, and Restricted means the ability to view questions only.
- Only known users can log in to the website. Once logged in, a user can only carry out the actions allowed by their permission level.
- The website will need to maintain the user's session state while the user is logged in.
- You may assume that the number of users with edit permissions is small, and the probability of more than one user attempting to edit a quiz simultaneously is negligible.
- A user can logout, which will take them back to the login page.

### QUIZZES

- A quiz has a title and a numbered sequence of questions.
- Each question is formulated as a text string, e.g. "What is the approximate population of London?"
- Each question is associated with a set of between 3 and 5 answers. Each answer is a text string, shown in the user interface indexed by an uppercase character ('A', 'B', 'C' etc). For example, the answers to the above question might appear like this:
  - A. "250 thousand"
  - B. "1 million"
  - C. "9 million"
  - D. "78 million"

### VIEWING AND EDITING

- A user with Restricted permission can select a quiz from all available quizzes. Having selected the quiz, all the questions in that quiz can be viewed on the screen. If the quiz is too large to fit, the user should be able to scroll up and down to see it.
- A user with View permission can select and view a quiz as above. They can also select a question to see the associated answers.
- A user with Edit permission can select a quiz and view questions and answers as above. They can also make and save all the following changes:
  - Create new quizzes and delete existing ones

- Add and delete questions at any point in the numerical sequence of a quiz (which may cause the questions to be re-numbered)
- Edit the text of any questions
- Add and delete answers to any question (which may cause the answers to be re-indexed)
- Edit the text of any answer.

## ASSUMPTIONS

- The ability to register new accounts is not required.
- No more than 1 user at a time will attempt to edit a quiz.
- The web application will be used on desktop devices only.
- Users will not take quizzes on the site (i.e. their score won't be calculated) and instead will reveal the possible answers to each question.
- A user must be signed in in order to view a quiz.
- Quizzes are not owned by users, a user with edit permissions can delete any quiz, no matter which user initially created it.

## USER INTERFACE

### STYLE GUIDE

#### WebbiSkools Quizzes

##### Colors

Selected colours



Figure 1: Style guide

The style guide sets a standard for the font and colours that should be used in the project. I chose these colours as they work well together and are eye-catching to the user.

### SITEMAP



Figure 2: Sitemap

When accessing the site, users will be prompted to log in to an account. If a user tries to access any page of the site without being signed in, they will be redirected back to the login page. From the home page, users will be able to create, read, edit, and delete quizzes depending on their permission level.

## WIREFRAMES

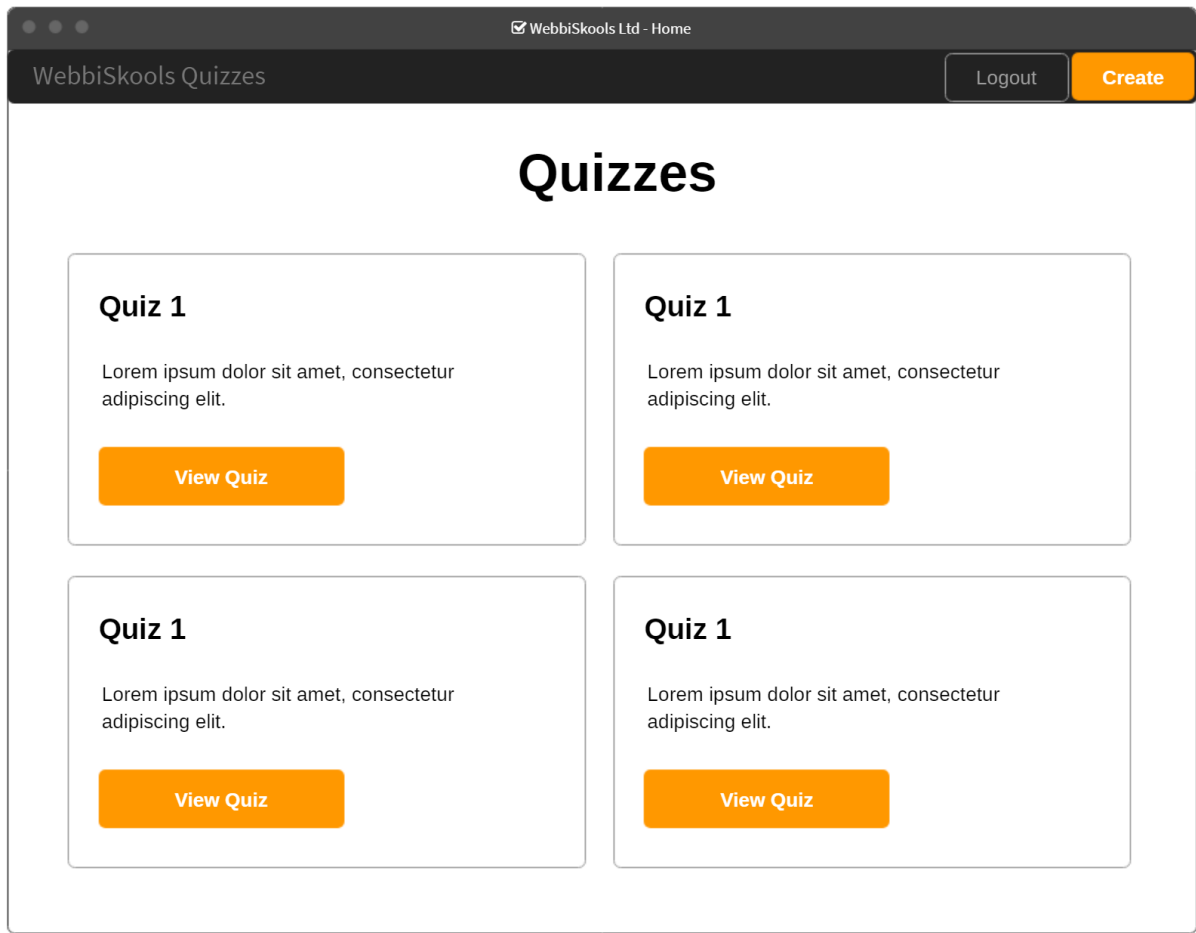


Figure 3: Homepage

Users will see a list of available quizzes on the homepage and the option to view each quiz. Users with the Edit permission level will see a Delete and Edit button above each quiz as well as a Create button on the right hand side of the navbar. The logout button will log the user out and redirect them back to the login page.

WebbiSkools Ltd - Login

WebbiSkools Quizzes Login

### Login

Email

Password

☒ Remember me

Login

Figure 4: Login

The login page allows pre-defined users to log in to their account. Clicking “Login” without inputting valid data into the email and password boxes will not allow the user to log in and instead will display a validation error message. A validation message will also appear if the user inputs a username and password that does not exist in the database.

The “Create” button is not available on this page as the user has not yet logged in. Only a user with the Edit permission level will see the “Create” button in the navbar.

WebbiSkools Ltd - Create Quiz

WebbiSkools Quizzes Logout Create

## Create Quiz

Quiz name

Question

Answer Delete Answer

Answer Delete Answer

Answer Delete Answer

Answer Delete Answer

Add Question Add Answer Delete Question

Question

Answer Delete Answer

Answer Delete Answer

Answer Delete Answer

Answer Delete Answer

Add Question Add Answer Delete Question

Submit

Figure 5: Create quiz

The create quiz page allows edit users to create a new quiz and its associated questions and possible answers. Users will only be able to provide between 3 and 5 answers for each question and any fields left blank will result in an error message being displayed. The quiz will not be saved into the database until the errors have been corrected.

If there are more than 3 answers for any question then all answers underneath that question will have a button labelled “Delete Answer” next to them. If the user clicks this button then the associated answer will be deleted. If the number of answers remaining is 3 then all “Delete Answer” buttons for that question will be removed until there are 4 or more answers for that question present.

Below each question there will be 3 buttons; “Add Question”, “Add Answer”, and “Delete Question”. When the user clicks “Add Question” a new set of input fields for a question and its associated answers will appear below the button. When the user clicks “Add Answer” a new input field for an answer will appear below the other answer inputs for the question above. When the user clicks “Delete Question” the question and its associated answers above will be removed from the page.



WebbiSkools Ltd - Agile

WebbiSkools Quizzes

Logout

Create

## Edit Quiz

The Software Development Lifecycle

At which point in the software development lifecycle is a system design document produced?

Deployment/implementation.

Design.

Code development.

Feasibility study.

Add Question

Add Answer

Delete Question

How many stages are there in the software development lifecycle?

4.

5.

7.

Add Question

Add Answer

Delete Question

Submit

Figure 6: Edit quiz

The edit quiz page functions similarly to the create quiz page, except the quiz title, question texts and answer texts are already filled in. A user can add and delete questions and answers as they do on the create quiz page.

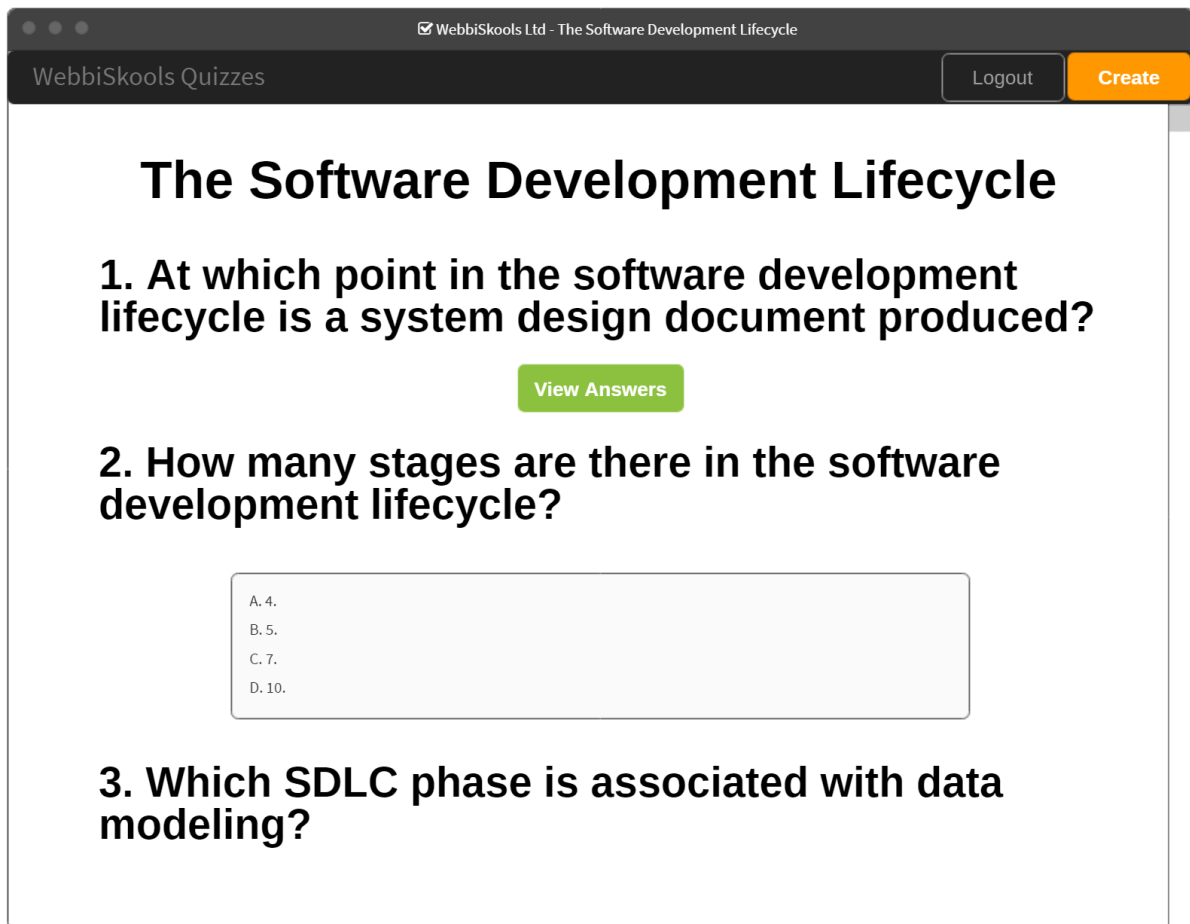


Figure 7: View quiz

Users will view or edit permissions will be able to view all questions in a quiz and their associated answers. Users will be able to click a button labelled “View Answers” that will expand the area underneath the question and display its possible answers. Users will be able to scroll to see all questions. if all questions do not fit on the page.

## ARCHITECTURAL DESIGN

### TECHNICAL STACK

- ASP.NET Core 3
- HTML5
- CSS
- JavaScript
- jQuery
- SQL Server 13
- C#

### DATABASE

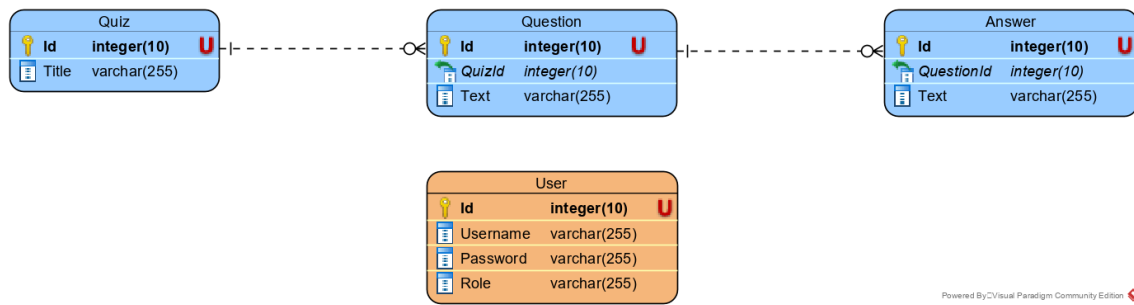


Figure 8: Entity relationship design

The database will be made up of four tables; quizzes, questions, answers, and users. Each answer will contain a QuestionId to tie it to a row in the Questions table. Similarly, each question will contain a QuizId to tie it to a row in the Quizzes table.

The Users table will contain a list of users, each of which will have a username, password, and role. The password field will be hashed before being stored so that the user's password is not stored in plain text. Upon signing in, a user's password will be hashed before being checked against the password stored in the database. If the two hashed values match then we can safely assume that the user has entered the correct password for their account.

## CLASSES

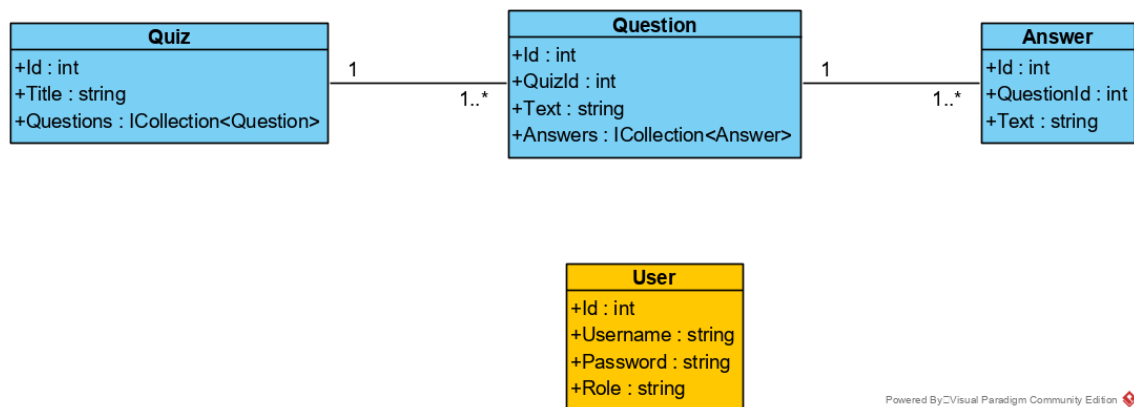


Figure 9: UML class diagram

Quizzes will be made up of an Id that will be generated by the database, a Title that will be provided by the user, and a collection of Questions that will also be provided by the user. Each Quiz must contain at least one Question.

A Question will contain an Id that will be generated by the database, a QuizId that will be auto-populated by the application to match each Question to its respective Quiz, a Text attribute that will be provided by the user and will contain the question to be displayed, and a collection of Answers that will also be provided by the user. Each Question must contain between three and five Answers.

An Answer will contain an Id that will be generated by the database, a QuestionId that will be auto-populated by the application to match each Answer to its respective Question, and a Text attribute that will be provided by the user and will contain the answer to be displayed.

## USER INTERACTIONS

## SEQUENCE DIAGRAM

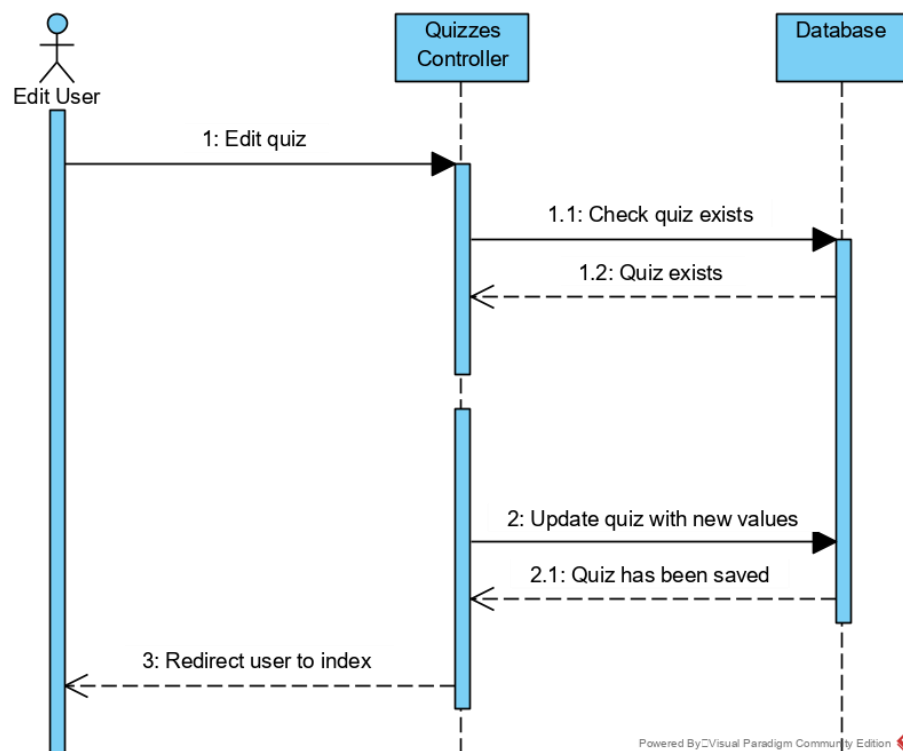


Figure 10: Sequence diagram

The above sequence diagram shows what happens when a user tries to update a quiz. First the amended information is passed to the Quizzes controller, the Quizzes controller then checks with the database that the quiz the user is trying to update exists. If the quiz exists, then the Quizzes controller passes the updated quiz to the database whereby it is saved. The database then lets the Quizzes controller know that the data has been saved successfully and so the Quizzes controller then sends the user back to the index page.

## USE CASE

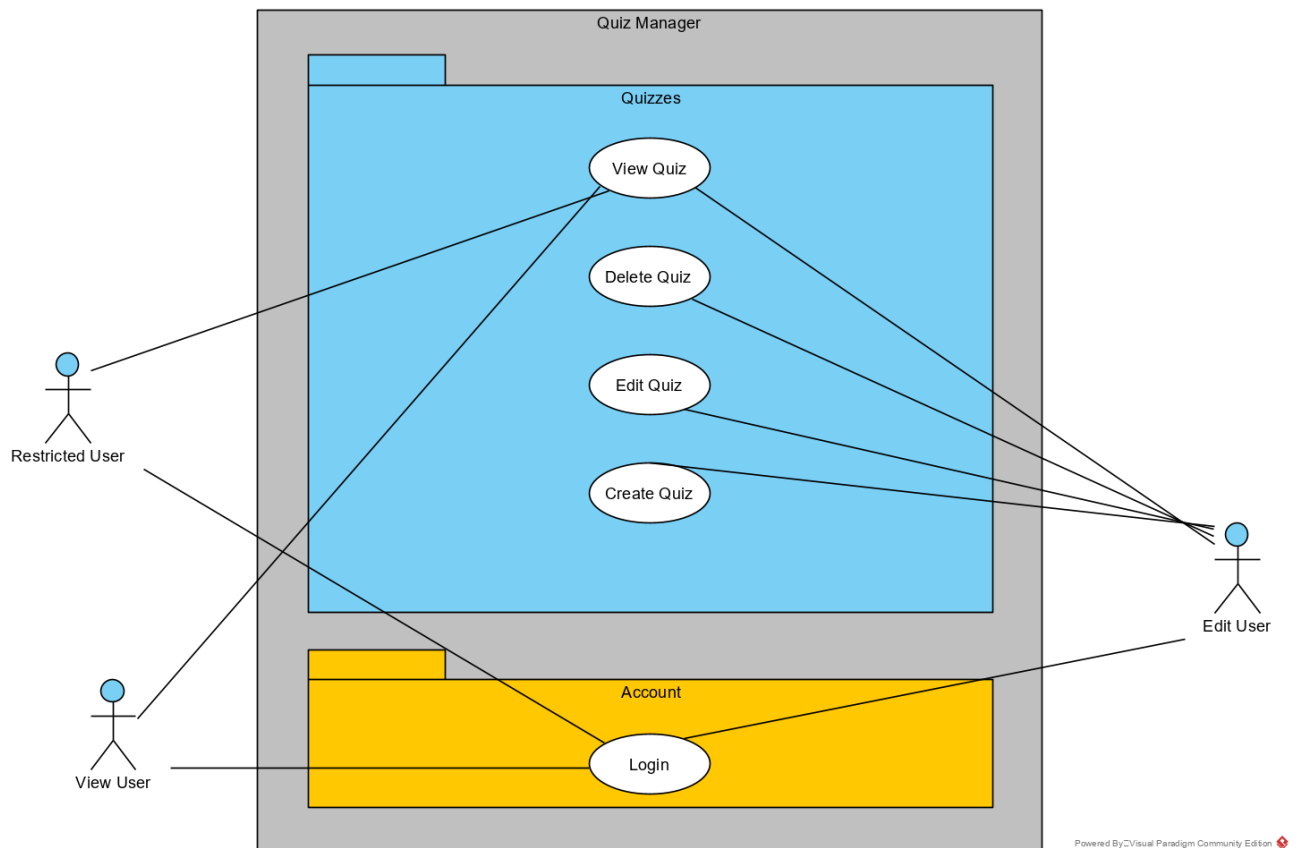


Figure 11: Use case diagram

All registered users can sign in and view quizzes. However, only users with Edit permissions can create, edit and delete quizzes.

#### USER STORIES

No.	User Story	Acceptance Criteria
1	As an administrator, So that I can control who can access the website, I want to only allow registered users to sign in to the website.	1. Only users already present in the database can sign in to the website.
2	As a user, So that I can log in to the website, I want to have a list of pre-configured users with which to log in.	1. Users will be added to the database as the application starts.
3	As a user, So that I can keep my password secure, I want my password to be hashed before it is saved to the database.	1. The password will be salted using the user's username to ensure users sharing the same password will have their passwords hashed differently.
4	As an administrator, So that I can control what certain users can do,	1. Users will be given an attribute labelled "Role" that will contain their permission level.

	I want each user to be given a permission level in the database.	2. The three permission levels available are: restricted, view, and edit.
5	As a user, So that I can browse the website without interruption, I want my session state to be maintained until I am logged out.	1. The user's username will be displayed in the navbar as long as their session is active.
6	As a user, So that I can end my session, I want to log out of the website.	1. Upon logout, the user will be redirected to the login page.
7	As a user, So that I can accurately describe my quiz, I want to be able to give my quiz a title.	1. When creating a quiz, the user will have an input field in which to fill out their quiz title.
8	As a user, So that I can see how many questions there are, I want to see questions in a numbered sequence.	1. Questions will appear indexed with numbers (i.e. "1. What is the approximate population of London?").
9	As a user, So that I can display my questions, I want to see my questions formulated as a text string.	1. Questions will appear as a text string (i.e. "What is the approximate population of London?").
10	As a user, So that I can keep the number of possible answers concise, I want to only be able to have between 3 and 5 answers for each question.	<ol style="list-style-type: none"> <li>1. A user cannot add more than 5 answers to a question when creating a quiz.</li> <li>2. A user cannot remove any more answers once a question has 3 answers when creating a quiz.</li> <li>3. A user cannot add more than 5 answers to a question when editing a quiz.</li> <li>4. A user cannot remove any more answers once a question has 3 answers when editing a quiz.</li> <li>5. When the number of answers for any given questions is 3 then the "Delete Answer" buttons for that question will be disabled.</li> <li>6. When the number of answers for any given questions is 5 then the "Add Answer" button for that question will be disabled.</li> </ol>
11	As a user, So that I can display the answers to my question nicely, I want to see my answers indexed with an uppercase character.	1. Answers will be displayed prefixed with an uppercase character on the display page (i.e. "A. '250 thousand'").
12	As a restricted user, So that I can view a quiz,	1. When a restricted user views a quiz, they should only be able to see the questions within that quiz and not any of the answers.

	I want to be able to select a quiz and view all the questions within that quiz.	
13	As a user, So that I can easily view a quiz, I want to be able to scroll up and down to see all the questions within a quiz.	1. A user should see a scrollbar when the quiz does not fit on one page.
14	As a view user, So that I can see the answers to a question, I want to be able to select a question and see its associated answers.	<ol style="list-style-type: none"> <li>Each question on the page will have a button called "See Answers".</li> <li>When the user clicks on that button, the question will expand to show all available answers.</li> <li>This button will not appear for restricted users.</li> <li>This functionality will be the same for edit users.</li> </ol>
15	As an edit user, So that I can add quizzes, I want to be able to create a quiz.	<ol style="list-style-type: none"> <li>A button labelled "Create" will appear in the navbar for edit users when they are signed in.</li> <li>This button will not be available to restricted or view users.</li> <li>If a restricted or view user tries to navigate to the create page, they will be shown an access denied page instead.</li> <li>The create page will show a form with inputs for the quiz title, 1 question and 3 answers.</li> <li>A button labelled "Add Question" will appear below each question, when clicked this will add a new set of inputs for 1 question and 3 answers below the question the button was clicked on.</li> <li>A button labelled "Add Answer" will appear below each question, when clicked this will add a new input for answer for the question the button was clicked on.</li> <li>A button labelled "Delete Question" will appear below each question, when clicked this will remove the question the button was clicked on.</li> <li>A button labelled "Delete Answer" will appear on the right side of each answer in each question, providing that the question has more than 3 answers.</li> </ol>
16	As an edit user, So that I can keep quizzes up-to-date, I want to be able to delete a quiz.	<ol style="list-style-type: none"> <li>A button labelled "Delete" will appear above every quiz on the homepage.</li> <li>This button will only be available to edit users. Restricted and view users will not be able to see this button.</li> <li>If a restricted or view user navigates to the delete page, they will be shown an access denied page instead.</li> </ol>

		<ol style="list-style-type: none"> <li>When clicking the delete button, users will be taken to a confirmation page that shows the questions and answers of the quiz. There will be a button at the bottom of the page that asks users to confirm that they want to delete the quiz.</li> </ol>
17	<p>As an edit user,</p> <p>So that I can keep quizzes up-to-date,</p> <p>I want to be able to add questions at any point in the sequence of questions for a quiz.</p>	<ol style="list-style-type: none"> <li>When an edit user edits a quiz, there will be a button labelled "Add Question" in between each question and again at the end of the list of questions.</li> <li>Upon clicking the button, the user will be provided with a new set of input fields with which to specify a question and its possible answers.</li> <li>The inputs will be added with 3 inputs for answers.</li> <li>The new question will contain an "Add Answer" button that will function as it normally does.</li> <li>Upon submitting the form, the questions will be renumbered in order to keep their order.</li> </ol>
18	<p>As an edit user,</p> <p>So that I can keep quizzes up-to-date,</p> <p>I want to be able to edit the text of any question.</p>	<ol style="list-style-type: none"> <li>When editing a quiz, the questions will appear as input fields with their current value already populated. The user can then change this value and resubmit the quiz.</li> <li>The quiz will be updated in the database to include the change to the question text.</li> <li>If a restricted or view user navigates to the edit page, they will be shown an access denied page instead.</li> <li>An "Edit" button will appear above each quiz on the QuizzesController index view only for users with edit permissions.</li> </ol>
19	<p>As an edit user,</p> <p>So that I can keep quizzes up-to-date,</p> <p>I want to be able to edit the text of any answer.</p>	<ol style="list-style-type: none"> <li>When editing a quiz, the answers will appear as input fields with their current value already populated. The user can then change this value and resubmit the quiz.</li> <li>The quiz will be updated in the database to include the change to the answer text.</li> </ol>
20	<p>As an administrator,</p> <p>So that I can restrict access to known users,</p> <p>I want users to be forced to sign in to use the site.</p>	<ol style="list-style-type: none"> <li>When landing on the site, the user should be prompted to sign in</li> <li>If a user tries to access any page on the site (apart from login), they should be redirected to the login page.</li> </ol>
21	<p>As a user,</p> <p>So that I can be informed,</p>	<ol style="list-style-type: none"> <li>When a user inputs a username and password combination that does not exist in the database, they should be redirected back to the login page with a</li> </ol>



	I want an error message to be displayed if my credentials are not correct on login.	message that reads, "Invalid username/password combination."
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