



EduCross QA Test Suite

1. Functional Testing

Focus: Verifying core logic, data integrity, and security.

Test ID	Category	Feature	Description	Expected Result	Pass/Fail Criteria
FT-001	Functional	Authentication	Register a new user with a valid email and strong password.	User is created in MongoDB; refreshToken is set in HttpOnly cookie; redirected to Dashboard.	Pass if the user object is returned and login is persistent.
FT-002	Functional	Authentication	Attempt login with incorrect credentials.	System returns 401 Unauthorized with "Invalid password" or "User not found" message.	Pass if no token is issued and error toast appears.
FT-003	Functional	Security	Verify "Silent Refresh" when Access Token expires (15m).	Axios interceptor catches 401, calls /refreshToken, and retries the original request successfully.	Pass if the user experience is uninterrupted during expiry.
FT-004	Functional	Game Logic	Input a correct word into the active grid slots.	Word turns green in Clue Panel; letters stay fixed on grid; Score increases by 100.	Pass if state updates correctly and word is marked as solved.
FT-005	Functional	Hint System	Click the "HINT" button for an unsolved word.	One letter is revealed; Hint count decreases; Score is penalized (-10 points).	Pass if penalty is applied and hint count does not go below zero.

FT-006	Functional	Performance	Complete all words in a puzzle category.	Win modal appears with final stats; Score is successfully saved to MongoDB via /api/score.	Pass if score record exists in DB with correct userId and category.
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2. UI/UX Testing

Focus: Responsiveness and intuitive navigation (Success Criterion #1).

Test ID	Category	Feature	Description	Expected Result	Pass/Fail Criteria
UI-001	UI/UX	Responsiveness	View "Game" page on a mobile device (width < 768px).	Layout stacks vertically; Crossword grid is at the top; Clue panel is below.	Pass if no horizontal scrolling or overlapping elements occur.
UI-002	UI/UX	Intuitive UI	Click a cell on the grid that belongs to two intersecting words.	First click selects "Across", second click toggles to "Down". Active word highlights in neon teal.	Pass if the selection toggle is smooth and visual feedback is clear.
UI-003	UI/UX	Navigation	Click the "Back" button during an active game session.	A confirmation dialog "Are you sure? Progress will be lost" appears.	Pass if navigation is blocked until the user confirms or cancels.
UI-004	UI/UX	Accessibility	Navigate the Dashboard using only the tab key.	Focus rings appear on category cards (Science, Math, etc.) and buttons are clickable via Enter.	Pass if all interactive elements are reachable via keyboard.

3. Content Validation Methodology

Focus: Ensuring 95% accuracy and difficulty alignment (Success Criterion #3).

Test ID	Category	Feature	Description	Expected Result	Pass/Fail Criteria
CV-001	Content	Generation	Run the generateLevel function 100 times for each category.	At least 95/100 attempts must produce a valid, intersecting grid without crashing.	Pass if failure rate (RNG failure) is <= 5%.
CV-002	Content	Accuracy	Compare wordBank.js entries against 10th-grade educational standards for "Science" and "History".	Definitions/Clues correctly describe the word without typos or misleading hints.	Pass if 100% of the word bank matches verified educational sources.
CV-003	Content	Difficulty	Verify "Math" category terms (e.g., Geometry vs Arithmetic).	The Arithmetic category contains simpler terms; Geometry/Algebra contains advanced terms.	Pass if category complexity is appropriately tiered.

4. Usability Testing & Satisfaction Goal

Focus: Measuring 85% user satisfaction (Success Criterion #4).



Satisfaction Survey Checklist

To measure the 85% satisfaction goal, users will be presented with a 5-point Likert scale (1-5) after completing their first 3 games.

ID	Metric	Survey Question/Checklist Item	Target
US-01	Intuition	"On a scale of 1-5, how easy was it to understand how to input letters?"	Avg Score > 4.25
US-02	Visuals	"Did the Dark Mode/Neon theme enhance your experience?"	85% "Yes"

US-03	Performance	Checklist: Check if the game loaded in under 2 seconds on 4G/LTE.	100% Pass
US-04	Value	"Would you use this platform to study for an actual exam?"	80% "Likely/Very Likely"

Execution Recommendation

As a Senior QA, I recommend implementing Playwright or Cypress for automated regression of FT-001 through FT-004. For CV-001, a simple Jest unit test script can be used to stress-test the [generateLevel.js] algorithm by running it in a loop and logging success/failure ratios.