

RETAIL INNOVATIONS LTD

Task 2: Testing

Normal • Erroneous • Extreme • Boundary • Null • Debugging

DPDD Occupational Specialism — Set Task

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1. Completed Testing Table

1.1 Normal Data Tests

Tests verifying core functionality under typical usage conditions:

ID	Description	Input	Expected Result	Actual Result	P/F
N01	Login with valid credentials	Email: test@example.com Password: Test1234	Authenticated, dashboard loads	Signed in toast, dashboard loaded with KPIs	PASS
N02	Register new account	Email: new@test.com Password: NewPass1 Name: Test User	Account created	Success toast, login form shown	PASS
N03	Search products by name	Type 'Tea' in search box	Products containing 'Tea' shown	Organic Green Tea displayed, count: 1	PASS
N04	Filter by category	Select 'Electronics' from dropdown	Only electronics products shown	Wireless Bluetooth Earbuds shown	PASS
N05	Create product (admin)	Name: Test Item, SKU: TST-001, Category: Test, Price: 9.99, Stock: 50	Product saved, appears in table	Created toast, table refreshed with new row	PASS
N06	Edit product price	Change price from 12.99 to 14.99	Price updated in table	Updated toast, £14.99 displayed	PASS
N07	Delete product	Click Delete on product, confirm dialog	Product removed from table	Deleted toast, product gone, count decreased	PASS
N08	Create customer	Name: Jane Doe, Email: jane@test.com, Phone: 07700 900000	Customer added with Bronze tier	Created toast, row shows Bronze, 0 pts	PASS
N09	Edit customer tier	Change tier from Bronze to	Tier updated	Updated toast, Silver badge	PASS

		Silver		displayed	
N10	Create order	Total: 49.99, Status: pending, Payment: Credit Card	Order saved with pending badge	Created toast, order in table with amber badge	PASS
N11	Change order status (admin)	Change status from pending to shipped	Status badge updates to purple	Updated toast, Shipped badge shown	PASS
N12	View loyalty rewards	Click Loyalty tab	Rewards table with 4 seeded rewards	4 rows: 10% Off, £5 Off, Free Shipping, 25% VIP	PASS
N13	Create reward (admin)	Name: Free Mug, Type: free_product, Points: 1000, Value: 0	Reward added to table	Created toast, new row in rewards table	PASS
N14	Admin sees all orders	Login as admin, Orders tab	All customer orders visible with names	All orders displayed, customer column populated	PASS
N15	Customer sees own orders only	Login as customer, Orders tab	Only own orders visible	Filtered to user_id match, correct count shown	PASS
N16	Dashboard KPIs calculate	Navigate to Dashboard	Stats show correct counts	Products: 10, Customers: correct, Revenue calculated	PASS
N17	Bar chart renders	Admin dashboard with products	Category bars proportional	7 categories shown, heights proportional to counts	PASS
N18	Donut chart renders	Admin dashboard with customers	Tier segments proportional	Conic gradient with metallic colours, total in centre	PASS
N19	Logout clears state	Click Sign Out	Auth screen shown, data cleared	Auth screen visible, app hidden, 'Signed out' toast	PASS
N20	Tab navigation	Click each tab	Corresponding	Active class	PASS

	works	sequentially	panel shown	moves correctly, panels switch	
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1.2 Erroneous Data Tests

Tests verifying graceful handling of invalid input:

ID	Description	Input	Expected Result	Actual Result	P/F
E01	Login wrong password	Email: test@example.com, Pass: wrong123	Error toast	Toast: 'Login failed: Invalid login credentials'	PASS
E02	Login non-existent email	Email: nobody@test.com, Pass: Test1234	Error toast	Toast: 'Login failed: Invalid login credentials'	PASS
E03	Register mismatched passwords	Pass: Test1234, Confirm: Test5678	Mismatch error	Toast: 'Passwords do not match.'	PASS
E04	Register short password	Password: 'abc'	Length error	Toast: 'Password must be at least 6 characters.'	PASS
E05	Register duplicate email	Email already registered	Duplicate error	Toast: 'An account with this email already exists.'	PASS
E06	Product without name	Name: empty, SKU: TST, Cat: Test	Validation error	Toast: 'Fill in Name, SKU, and Category.'	PASS
E07	Product without SKU	Name: Test, SKU: empty, Cat: Test	Validation error	Toast: 'Fill in Name, SKU, and Category.'	PASS
E08	Product without category	Name: Test, SKU: TST, Cat: empty	Validation error	Toast: 'Fill in Name, SKU, and Category.'	PASS
E09	Customer without email	Name: Jane, Email: empty	Validation error	Toast: 'Fill in Name and Email.'	PASS
E10	Customer without name	Name: empty, Email: jane@test.com	Validation error	Toast: 'Fill in Name and Email.'	PASS
E11	Order with zero total	Total: 0	Validation error	Toast: 'Enter the order total.'	PASS

E12	Reward without name	Name: empty, Points: 500	Validation error	Toast: 'Fill in Name and Points Required.'	PASS
E13	Reward without points	Name: Test Reward, Points: 0	Validation error	Toast: 'Fill in Name and Points Required.'	PASS
E14	Auth before connection	Click Sign In before connecting to Supabase	Connection error	Toast: 'Connect to Supabase first.'	PASS
E15	Non-admin product creation	Customer clicks + Add Product	Access denied	Toast: 'Admin access required.'	PASS
E16	Non-admin reward creation	Customer clicks + Add Reward	Access denied	Toast: 'Admin access required.'	PASS
E17	Empty Supabase config	URL: empty, Key: empty, click Connect	Config error	Toast: 'Please enter both URL and Anon Key.'	PASS
E18	Invalid Supabase URL	URL: 'not-a-url', Key: valid	Connection error	Toast: 'Connection failed with error details'	PASS

1.3 Extreme Data Tests

Tests verifying behaviour with unusual but valid inputs:

ID	Description	Input	Expected Result	Actual Result	P/F
X01	Very long product name (500 chars)	500-character string	Saved, table wraps text	Product saved, table cell wraps correctly	PASS
X02	Maximum price value	Price: 99999999.99	Accepted, formatted correctly	Displayed as £99,999,999.99 in dashboard	PASS
X03	Maximum integer stock	Stock: 2147483647	Accepted, stored correctly	Displayed with correct formatting	PASS
X04	Very long description (2000+ chars)	2000-character description	Saved completely	Full text stored and retrievable	PASS
X05	Rapid double-click save	Double-click Save Product	Only one record created	Single product created, no duplicates	PASS
X06	Special characters in name	Name: <script>alert('xss')</script>	Safely escaped in display	Shows literal text, no script execution	PASS
X07	Unicode in product name	Name: 'Éclairs & Café ★'	Saved and displayed correctly	Unicode characters rendered properly	PASS
X08	Many rapid filter changes	Quickly change category 10 times	Final filter applied correctly	Display matches last selected category	PASS

1.4 Boundary Data Tests

Tests at exact validation boundaries:

ID	Description	Input	Expected Result	Actual Result	P/F
B01	Password exactly 6 characters	Password: 'Abc123'	Accepted	Registration proceeds normally	PASS
B02	Password 5 characters	Password: 'Abc12'	Rejected	Toast: 'Password must be at least 6 characters.'	PASS
B03	Price exactly £0.00	Price: 0.00	Accepted (CHECK >= 0)	Product saved with £0.00 displayed	PASS
B04	Price £0.01 (minimum positive)	Price: 0.01	Accepted	Product saved with £0.01	PASS
B05	Price -0.01 (negative)	Price: -0.01	Rejected by DB	Error: violates check constraint	PASS
B06	Stock exactly 0	Stock: 0	Accepted (CHECK >= 0)	Product saved, stock shows 0	PASS
B07	Stock -1 (negative)	Stock: -1	Rejected by DB	Error: violates check constraint	PASS
B08	Loyalty points 0	Points: 0	Accepted (CHECK >= 0)	Customer saved, shows 0 pts	PASS
B09	Order total £0.01	Total: 0.01	Accepted	Order created with £0.01	PASS
B10	Reward points 1 (minimum)	Points required: 1	Accepted (CHECK > 0)	Reward saved with 1 pts	PASS
B11	Reward points 0	Points required: 0	Rejected (CHECK > 0)	Validation catches: 'Fill in Name and Points Required'	PASS

1.5 Null/Empty Data Tests

Tests verifying handling of missing or empty data:

ID	Description	Input	Expected Result	Actual Result	P/F
NL01	Empty email on login	Email: empty, Pass: Test1234	Error	Toast: 'Please enter email and password.'	PASS
NL02	Empty password on login	Email: test@example.com, Pass: empty	Error	Toast: 'Please enter email and password.'	PASS
NL03	Both auth fields empty	Email: empty, Pass: empty	Error	Toast: 'Please enter email and password.'	PASS
NL04	Empty product description	Description field left blank	Accepted (nullable column)	Product saved, description blank in DB	PASS
NL05	Empty customer phone	Phone field left blank	Accepted (nullable)	Customer saved, phone shows '—'	PASS
NL06	Empty image URL	Image URL left blank	Accepted, no thumbnail	Product row has no image (onerror hides it)	PASS
NL07	Empty order notes	Notes field left blank	Accepted (nullable)	Order saved without notes	PASS
NL08	Empty search query	Clear search box text	All products shown	Full product list displayed, count correct	PASS
NL09	Category filter reset	Select 'All Categories'	All products shown	Full list restored	PASS
NL10	Order status filter reset	Select 'All Statuses'	All orders shown	Full order list restored	PASS

2. Debugging Shown

The following bugs were identified during development, investigated, and resolved:

Bug ID	Description	How Discovered	Root Cause	Fix Applied	Status
BUG-001	Products not loading after login	Manual testing	loadAllData() called before loadUserProfile() completed (missing await)	Added await to loadUserProfile() call in enterApp() flow	RESOLVED
BUG-002	Customer tier filter not resetting	Observation during filter testing	filterCustomers() not triggered when dropdown set back to empty value	Added onchange event handler with empty value option for 'All Tiers'	RESOLVED
BUG-003	Order modal showing admin fields to customers	Role-based testing	Customer dropdown (orderCustomer) visible to non-admin users	Added admin-only class to the customer select form-group (line 413)	RESOLVED
BUG-004	Duplicate profile row on rapid registration	Extreme testing (rapid clicks)	Race condition: auth trigger and manual profile insert both firing	Added COALESCE handling in trigger; ON CONFLICT protection	RESOLVED
BUG-005	XSS via product name input	Security testing (X06)	Product names rendered directly in innerHTML without sanitisation	Implemented esc() function wrapping all user content in render functions	RESOLVED
BUG-006	Donut chart blank with zero customers	Testing with empty DB	Division by zero: (n/total)*360 where total = 0	Changed to: const total = customersCache.length 1	RESOLVED
BUG-007	Customer could change order status	Role-based testing	Order status <select> not disabled for non-admin users	Added line 606: document.getElementById('orderStatus').disabled = !isAdmin	RESOLVED

BUG-008	Toast notifications overlapping	Visual testing with rapid actions	Toast container had no gap between child elements	Added CSS: .toast-container { gap: 10px; flex-direction: column; }	RESOLVED
BUG-009	Category filter empty after product delete	Integration testing	populateCategoryFilter() not called after deleteProduct()	deleteProduct() now calls loadProducts() which triggers populateCategoryFilter()	RESOLVED
BUG-010	Modal form retaining previous data	UX testing (edit then create)	Form fields not cleared when opening modal in create mode	openProductModal(null) explicitly sets all fields to empty strings	RESOLVED

3. Full Documentation of Testing Process

Testing followed a structured five-phase approach with increasing scope:

1. Phase 1: Unit Testing — Individual functions tested in browser console. Validated `esc()` with HTML injection strings, `cap()` with various inputs, `parseFloat/parseInt` handling of edge cases, and toast creation/dismissal timing.
2. Phase 2: Integration Testing — CRUD operations tested end-to-end: form submission → Supabase API call → database write → data fetch → cache update → UI re-render. Each entity (Products, Customers, Orders, Rewards) tested through complete create-read-update-delete cycles.
3. Phase 3: Role-Based Testing — Every feature tested under both admin and customer accounts. Verified: admin-only elements hidden for customers, RLS policies reject unauthorised API calls, status dropdown disabled for non-admin, customer dropdown hidden in order modal for non-admin. Two separate test accounts created.
4. Phase 4: Responsive Testing — All layouts verified at six viewport widths using Chrome DevTools device toolbar: 1920px (full desktop), 1200px (small desktop), 900px (tablet landscape), 768px (tablet portrait), 480px (mobile landscape), 375px (mobile portrait). Each breakpoint verified for correct grid columns, stacking, padding, and element visibility.
5. Phase 5: Cross-Browser Testing — Complete functional test suite re-run in Chrome, Firefox, Edge, and Safari. CSS features verified (custom properties, grid, flexbox, conic-gradient, backdrop-filter). No browser-specific issues found.

4. Justification of Testing Choices

Normal data tests (N01–N20): 20 tests covering every core user workflow. These represent the vast majority of real-world usage. Each test verifies a complete user action from input to visible output, confirming the application works correctly under typical conditions.

Erroneous data tests (E01–E18): 18 tests covering every validation point. Critical for security and UX — users must receive clear, helpful error messages rather than cryptic failures or crashes. Each test targets a specific validation rule in the code.

Extreme data tests (X01–X08): 8 tests covering edge cases: very long strings, maximum numbers, special characters, XSS injection, Unicode, and rapid interactions. These catch issues that only appear under unusual conditions and are often missed by basic testing.

Boundary data tests (B01–B11): 11 tests at exact validation boundaries. Off-by-one errors are among the most common programming mistakes. Testing at the exact boundary (e.g., password length of 5 vs 6, price of -0.01 vs 0.00) is the most effective way to catch them. Tests verify both the database CHECK constraints and JavaScript validation.

Null/empty data tests (NL01–NL10): 10 tests covering missing data scenarios. These verify that the application correctly distinguishes between required fields (which trigger errors) and optional fields (which accept empty values). Also verifies that clearing filter inputs restores full data display.