Test Strategy Analysis

Scenario: Customers on an e-commerce site are complaining that "The total discount is calculated incorrectly when a coupon code is used."

Edge Cases:

1. **Expired coupon still accepted due to time zone mismatch**
   The frontend may validate coupon expiration using the customer's local time, while the backend validates it using server time (e.g., UTC). If these time references are not aligned or synchronized, the coupon may be incorrectly accepted or rejected.
2. **Coupon applied to cart, then item removed → discount not recalculated**
   If the discount value is calculated once and cached or directly subtracted from the total, subsequent cart mutations may not trigger a recalculation of the discount.
3. **Discount shown correctly on product page but wrong on checkout page**
   UI recalculates totals differently than backend API.
4. **Currency symbol correct but calculation uses another currency**
   The UI displays prices in TRY (₺), while the backend calculates discounts using USD or EUR due to misconfigured currency settings or exchange rate handling.
5. **Race condition during checkout recalculation**
   When cart updates and coupon recalculations occur simultaneously (e.g., during async API calls), race conditions may cause the discount to be applied incorrectly or multiple times.

I picked 5 of these after I asked ChatGPT to generate 20 edge cases, and these are my most probable and critical edge cases.

The first one can be applied because mostly coupons will be active for a limited time and if the server is checking the server time, not a third-party time provider like an NTP server, or if the UI is checking local time from the customer but the backend is checking time in server, there might be conflicts.

Gherkin format:
Given the system uses a single authoritative time source for coupon validation
And a coupon exists with an expiration date in the past
And the customer is located in a different time zone than the server
When the customer applies the expired coupon code
Then the coupon must be rejected
And an error message indicating "Coupon expired" must be displayed
And no discount must be applied to the order total

For the second one, if the discount price was being subtracted from total sum during total price calculation, adding/removing items after coupon is used will create problems. Cart contents are dynamic and applying a coupon and then modifying the contents is an expected behaviour. If the price Is not recalculated after each change, the total price will be inconsistent.

Gherkin format:
Given a customer has added multiple items to the shopping cart
And a valid coupon code has been successfully applied
And a discount has been applied to the order total
When the customer removes an item from the cart

Then the system must recalculate the discount based on the updated cart contents
And the order total must reflect the correct recalculated discount

For the third one, this was coming from experience, while I was working on the Ekol360 logistics, the logic changed and features added on top of them, however we were calculating total price at the end and the discount was supposed to take a field and change it. The field name changed and on backend, everything worked as it should but the UI was not updated accordingly, so we had to fix it.

Gherkin format:
Given a customer has items in the cart
And a valid coupon code has been applied
When the customer navigates from the cart page to the checkout page
Then the discount amount must remain consistent
And the final order total must match the backend-calculated value

For the fourth one, we were trying to calculate entire total price by euros, then convert it to Turkish lira, however at some point there was miscalculation that the discounted amount was calculated in euros but it was subtracted from total price when the total price was converted to Turkish lira, so we had to convert discount amount to ₺ too. This multi-currency systems are prone to errors, the change in logic should apply to all cases.

Gherkin format:
Given the customer is shopping in a locale that uses TRY
And product prices are displayed in TRY
And a valid coupon code is applied
When the system calculates the discount
Then the discount calculation must use TRY as the calculation currency
And the displayed discount and total price must be correct for TRY

For the final scenario, a coupon may be applied multiple times to the same cart if proper validation and synchronization mechanisms are not in place. In the presence of race conditions such as concurrent cart updates or parallel checkout requests the system may process multiple coupon application events simultaneously, resulting in the discount being applied more than once.

Gherkin format:

Given a customer has items in the cart
And a valid coupon code has been applied
When the customer updates the cart contents during checkout
And the system recalculates the order total concurrently
Then the discount must be applied exactly once
And the final order total must be correct and consistent