**Project Report:**

# Portfolio Milestone Module 8 – Online Shopping Cart V3

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CSC500: Principles of Programming

Professor: Dr. Brian Holbert

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**Project Report:**

**Portfolio Milestone Module 8 – Online Shopping Cart V3**

This documentation is part of the Portfolio Milestone Module 6 from CSC500: Principles of Programming at Colorado State University Global. This Project Report is an overview of the program's functionality and testing scenarios, including console output screenshots. The program is coded in Python 3.13, and it is called Portfolio Milestone Module 6 – Online Shopping Cart V2

**The Assignment Direction:**

**Online Shopping Cart**

From Milestone 1:

**Step 1:**

Build the ItemToPurchase class with the following specifications:

- Attributes
- item_name (string)
- item_price (float)
- item_quantity (int)
- Default constructor
- Initializes item's name = "none", item's price = 0, item's quantity = 0
- Method
- print_item_cost()

**Example of print_item_cost() output:**
Bottled Water 10 @ $1 = $10

**Step 2:**

In the main section of your code, prompt the user for two items and create two objects of the ItemToPurchase class.

**Example:**
Item 1
**Enter the item name:**
Chocolate Chips
**Enter the item price:**
3
**Enter the item quantity:**
1
Item 2
**Enter the item name:**
Bottled Water
**Enter the item price:**
1

**Enter the item quantity:**
10

**Step 3:**

Add the costs of the two items together and output the total cost.

**Example:**
TOTAL COST
Chocolate Chips 1 @ $3 = $3
Bottled Water 10 @ $1 = $10
Total: $13
Fix any issues from milestone 1 submission prior to submitting the Portfolio Project.

**From Milestone 2:**

**Step 4:**

Build the ShoppingCart class with the following data attributes and related methods. Note: Some can be method stubs (empty methods) initially, to be completed in later steps.
Parameterized constructor, which takes the customer name and date as parameters

- Attributes
- customer_name (string) - Initialized in default constructor to "none"
- current_date (string) - Initialized in default constructor to "January 1, 2020"
- cart_items (list)
- Methods
- add_item()
    - Adds an item to cart_items list. Has parameter ItemToPurchase. Does not return anything.
- remove_item()
    - Removes item from cart_items list. Has a string (an item's name) parameter. Does not return anything.
    - If item name cannot be found, output this message: Item not found in cart. Nothing removed.
- modify_item()
    - Modifies an item's description, price, and/or quantity. Has parameter ItemToPurchase. Does not return anything.
    - If item can be found (by name) in cart, check if parameter has default values for description, price, and quantity. If not, modify item in cart.
    - If item cannot be found (by name) in cart, output this message: Item not found in cart. Nothing modified.
- get_num_items_in_cart()
    - Returns quantity of all items in cart. Has no parameters.
- get_cost_of_cart()
    - Determines and returns the total cost of items in cart. Has no parameters.
- print_total()
    - Outputs total of objects in cart.
    - If cart is empty, output this message:
      SHOPPING CART IS EMPTY

- print_descriptions()
    - Outputs each item's description.

**Example of print_total() output:**
John Doe's Shopping Cart - February 1, 2020
Number of Items: 8
Nike Romaleos 2 @ $189 = $378
Chocolate Chips 5 @ $3 = $15
Powerbeats 2 Headphones 1 @ $128 = $128
Total: $521

**Example of print_descriptions() output:**
John Doe's Shopping Cart - February 1, 2020
Item Descriptions
Nike Romaleos: Volt color, Weightlifting shoes
Chocolate Chips: Semi-sweet
Powerbeats 2 Headphones: Bluetooth headphones

**Step 5:**

In the main section of your code, implement the print_menu() function. print_menu() has a ShoppingCart parameter and outputs a menu of options to manipulate the shopping cart. Each option is represented by a single character. Build and output the menu within the function.

If an invalid character is entered, continue to prompt for a valid choice. *Hint:* Implement Quit before implementing other options. Call print_menu() in the main() function. Continue to execute the menu until the user enters q to Quit.

**Example:**
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option:

**Step 6:**

Implement Output shopping cart menu option. Implement Output item's description menu option.

**Example of shopping cart menu option:**
OUTPUT SHOPPING CART
John Doe's Shopping Cart - February 1, 2020
Number of Items: 8
Nike Romaleos 2 @ $189 = $378
Chocolate Chips 5 @ $3 = $15
Powerbeats 2 Headphones 1 @ $128 = $128
Total: $521

**Example of item description menu option.**

OUTPUT ITEMS' DESCRIPTIONS
John Doe's Shopping Cart - February 1, 2020
Item Descriptions
Nike Romaleos: Volt color, Weightlifting shoes
Chocolate Chips: Semi-sweet
Powerbeats 2 Headphones: Bluetooth headphones

Fix any issues from milestone 2 submission prior to submitting the Portfolio Project.

**Additional tasks for the final project submission:**

**Step 7:**

In the main section of your code, prompt the user for a customer's name and today's date. Output the name and date. Create an object of type ShoppingCart.

**Example:**

Enter customer's name:
John Doe
Enter today's date:
February 1, 2020
Customer name: John Doe
Today's date: February 1, 2020

**Step 8:**

Implement Add item to cart menu option.

**Example:**

ADD ITEM TO CART
Enter the item name:
Nike Romaleos
Enter the item description:
Volt color, Weightlifting shoes
Enter the item price:
189
Enter the item quantity:
2

**Step 9:**

Implement remove item menu option.

**Example:**

REMOVE ITEM FROM CART
Enter name of item to remove:
Chocolate Chips

**Step 10:**

Implement Change item quantity menu option. Hint: Make new ItemToPurchase object before using ModifyItem() method.

**Example:**
CHANGE ITEM QUANTITY
Enter the item name:
Nike Romaleos
Enter the new quantity:
3

Compile and submit your pseudocode, source code, screenshots of the application executing the code, the results and GIT repository in a single document (Word is preferred).

**My Program Description:**

The Online Shopping Cart Version 3 is a console online shopping cart program that implements the functionality of an online shopping cart:
- it displays simple banners and a menu.
- it provides a menu for the shopping cart.
- it allows users to add, remove, and modify items through a menu.

⚠️ My notes:
As I was using some of the same code lines for my critical assignments, I created several small utility functions and classes that I can reuse; they are found in the following Python files:

- validation_utilities.py: user input prompt and validation functions
- menu_banner_utilities.py: ASCII banner and menu UI classes

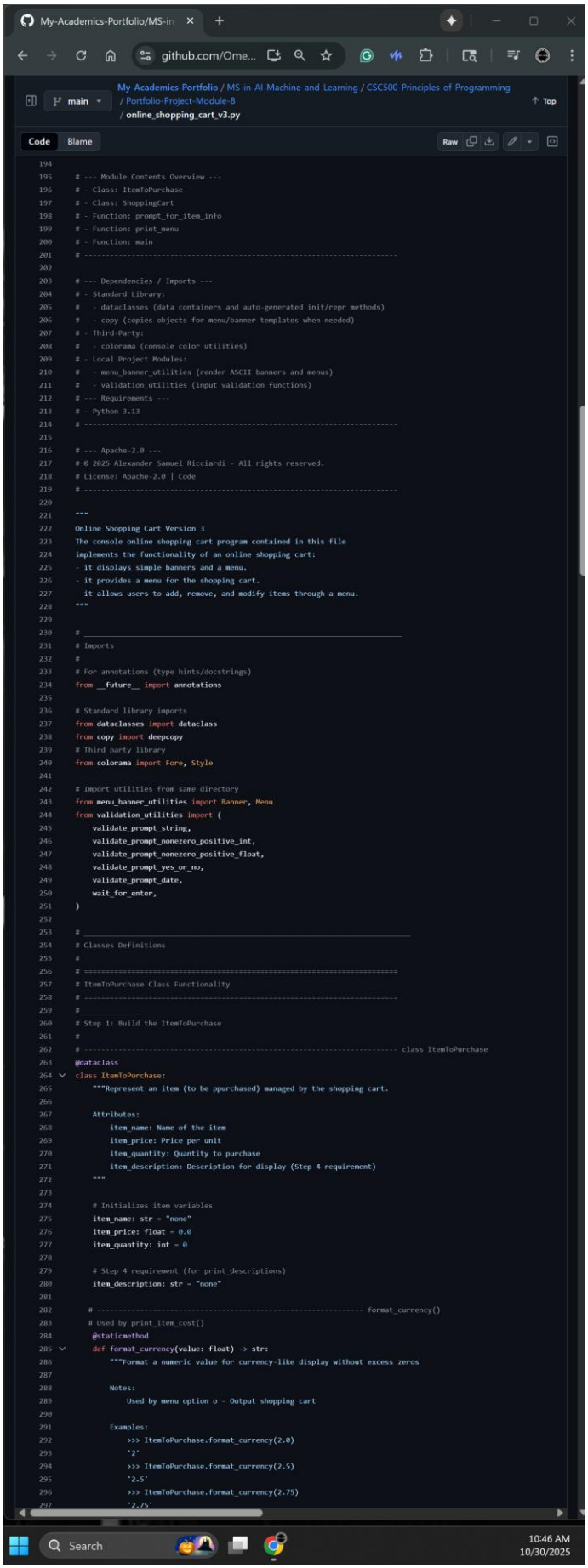
See the code for the utility functions and classes, which can be found at the end of this document

**Git Repository:**

I use GitHub as my Distributed Version Control System (DVCS).
The following is a link to my GitHub profile, Omega.py.


The link to this specific assignment is: https://github.com/Omegapy/My-Academics-Portfolio/tree/main/MS-in-AI-Machine-and-Learning/CSC500-Principles-of-Programming/Portfolio-Project-Module-8

**Figure-1**
*Code on GitHub*



**Code Snippet 1**

*Main Project Code: average_rain_and_csu_book.py*

```
#------------------------------------------------------------------------
# File: online_shopping_cart_v3.py
# Project:
# Author: Alexander Ricciardi
# Date: 2025-11-02
# File Path: Portfolio-Project-Module-6/online_shopping_cart_v2.py
# ------------------------------------------------------------------------
# Course: CSS-500 Principles of Programming
# Professor: Dr. Brian Holbert
# Fall C-2025
# Sep-Nov 2025
# ------------------------------------------------------------------------
# Assignment:
# Portfolio Project Module 8
#
# Directions:
# Online Shopping Cart
# From Milestone 1:
# Step 1:
# Build the ItemToPurchase class with the following specifications:
#
# Attributes
# item_name (string)
# item_price (float)
# item_quantity (int)
# Default constructor
# Initializes item's name = "none", item's price = 0, item's quantity = 0
# Method
# print_item_cost()
# Example of print_item_cost() output:
# Bottled Water 10 @ $1 = $10
#
# Step 2:
# In the main section of your code, prompt the user for two items and create two objects of
the ItemToPurchase class.
#
# Example:
# Item 1
# Enter the item name:
# Chocolate Chips
# Enter the item price:
# 3
# Enter the item quantity:
```

```
# 1
# Item 2
# Enter the item name:
# Bottled Water
# Enter the item price:
# 1
# Enter the item quantity:
# 10
#
# Step 3:
# Add the costs of the two items together and output the total cost.
#
# Example:
# TOTAL COST
# Chocolate Chips 1 @ $3 = $3
# Bottled Water 10 @ $1 = $10
# Total: $13
# Fix any issues from milestone 1 submission prior to submitting the Portfolio Project.
#
# From Milestone 2:
# Step 4:
# Build the ShoppingCart class with the following data attributes and related methods. Note:
Some can be method stubs (empty methods) initially, to be completed in later steps.
# Parameterized constructor, which takes the customer name and date as parameters
#
# Attributes
# customer_name (string) - Initialized in default constructor to "none"
# current_date (string) - Initialized in default constructor to "January 1, 2020"
# cart_items (list)
# Methods
# add_item()
# Adds an item to cart_items list. Has parameter ItemToPurchase. Does not return anything.
# remove_item()
# Removes item from cart_items list. Has a string (an item's name) parameter. Does not return
anything.
# If item name cannot be found, output this message: Item not found in cart. Nothing removed.
# modify_item()
# Modifies an item's description, price, and/or quantity. Has parameter ItemToPurchase. Does
not return anything.
# If item can be found (by name) in cart, check if parameter has default values for
description, price, and quantity. If not, modify item in cart.
# If item cannot be found (by name) in cart, output this message: Item not found in cart.
Nothing modified.
# get_num_items_in_cart()
# Returns quantity of all items in cart. Has no parameters.
```

```
# get_cost_of_cart()
# Determines and returns the total cost of items in cart. Has no parameters.
# print_total()
# Outputs total of objects in cart.
# If cart is empty, output this message:
# SHOPPING CART IS EMPTY
# print_descriptions()
# Outputs each item's description.
# Example of print_total() output:
# John Doe's Shopping Cart - February 1, 2020
# Number of Items: 8
# Nike Romaleos 2 @ $189 = $378
# Chocolate Chips 5 @ $3 = $15
# Powerbeats 2 Headphones 1 @ $128 = $128
# Total: $521
#
# Example of print_descriptions() output:
# John Doe's Shopping Cart - February 1, 2020
# Item Descriptions
# Nike Romaleos: Volt color, Weightlifting shoes
# Chocolate Chips: Semi-sweet
# Powerbeats 2 Headphones: Bluetooth headphones
#
# Step 5:
# In the main section of your code, implement the print_menu() function. print_menu() has a
ShoppingCart parameter and outputs a menu of options to manipulate the shopping cart. Each
option is represented by a single character. Build and output the menu within the function.
#
# If an invalid character is entered, continue to prompt for a valid choice. Hint: Implement
Quit before implementing other options. Call print_menu() in the main() function. Continue to
execute the menu until the user enters q to Quit.
#
# Example:
# MENU
# a - Add item to cart
# r - Remove item from cart
# c - Change item quantity
# i - Output items' descriptions
# o - Output shopping cart
# q - Quit
# Choose an option:
#
# Step 6:
# Implement Output shopping cart menu option. Implement Output item's description menu option.
#
```

```
# Example of shopping cart menu option:
# OUTPUT SHOPPING CART
# John Doe's Shopping Cart - February 1, 2020
# Number of Items: 8
# Nike Romaleos 2 @ $189 = $378
# Chocolate Chips 5 @ $3 = $15
# Powerbeats 2 Headphones 1 @ $128 = $128
# Total: $521
#
# Example of item description menu option.
# OUTPUT ITEMS' DESCRIPTIONS
# John Doe's Shopping Cart - February 1, 2020
# Item Descriptions
# Nike Romaleos: Volt color, Weightlifting shoes
# Chocolate Chips: Semi-sweet
# Powerbeats 2 Headphones: Bluetooth headphones
#
# Fix any issues from milestone 2 submission prior to submitting the Portfolio Project.
#
# Additional tasks for the final project submission:
# Step 7:
# In the main section of your code, prompt the user for a customer's name and today's date.
Output the name and date. Create an object of type ShoppingCart.
#
# Example:
# Enter customer's name:
# John Doe
# Enter today's date:
# February 1, 2020
# Customer name: John Doe
# Today's date: February 1, 2020
#
# Step 8:
# Implement Add item to cart menu option.
#
# Example:
# ADD ITEM TO CART
# Enter the item name:
# Nike Romaleos
# Enter the item description:
# Volt color, Weightlifting shoes
# Enter the item price:
# 189
# Enter the item quantity:
# 2
```

```
#
# Step 9:
# Implement remove item menu option.
#
# Example:
# REMOVE ITEM FROM CART
# Enter name of item to remove:
# Chocolate Chips
#
# Step 10:
# Implement Change item quantity menu option. Hint: Make new ItemToPurchase object before
using ModifyItem() method.
#
# Example:
# CHANGE ITEM QUANTITY
# Enter the item name:
# Nike Romaleos
# Enter the new quantity:
# 3
# ------------------------------------------------------------------------
# Project:
# Online Shopping Cart
#
# Project description:
# The program is a small console app. that implements the functionality of
# an online shopping cart.
# ------------------------------------------------------------------------

# --- Module Contents Overview ---
# - Class: ItemToPurchase
# - Class: ShoppingCart
# - Function: prompt_for_item_info
# - Function: print_menu
# - Function: main
# ------------------------------------------------------------------------

# --- Dependencies / Imports ---
# - Standard Library:
#   - dataclasses (data containers and auto-generated init/repr methods)
#   - copy (copies objects for menu/banner templates when needed)
# - Third-Party:
#   - colorama (console color utilities)
# - Local Project Modules:
#   - menu_banner_utilities (render ASCII banners and menus)
#   - validation_utilities (input validation functions)
```

```python
# --- Requirements ---
# - Python 3.13
# ------------------------------------------------------------------------

# --- Apache-2.0 ---
# © 2025 Alexander Samuel Ricciardi - All rights reserved.
# License: Apache-2.0 | Code
# ------------------------------------------------------------------------

"""
Online Shopping Cart Version 3
The console online shopping cart program contained in this file
implements the functionality of an online shopping cart:
- it displays simple banners and a menu.
- it provides a menu for the shopping cart.
- it allows users to add, remove, and modify items through a menu.
"""

# ____________________________________________________________________________
# Imports
#
# For annotations (type hints/docstrings)
from __future__ import annotations

# Standard library imports
from dataclasses import dataclass
from copy import deepcopy
# Third party library
from colorama import Fore, Style

# Import utilities from same directory
from menu_banner_utilities import Banner, Menu
from validation_utilities import (
    validate_prompt_string,
    validate_prompt_nonezero_positive_int,
    validate_prompt_nonezero_positive_float,
    validate_prompt_yes_or_no,
    validate_prompt_date,
    wait_for_enter,
)

# ____________________________________________________________________________
# Classes Definitions
#
# ============================================================================
```

```python
# ItemToPurchase Class Functionality
# ========================================================================
#_______________
# Step 1: Build the ItemToPurchase
#
# ------------------------------------------------------------------ class ItemToPurchase
@dataclass
class ItemToPurchase:
    """Represent an item (to be ppurchased) managed by the shopping cart.

    Attributes:
        item_name: Name of the item
        item_price: Price per unit
        item_quantity: Quantity to purchase
        item_description: Description for display (Step 4 requirement)
    """

    # Initializes item variables
    item_name: str = "none"
    item_price: float = 0.0
    item_quantity: int = 0

    # Step 4 requirement (for print_descriptions)
    item_description: str = "none"

   # ------------------------------------------------------------ format_currency()
   # Used by print_item_cost()
    @staticmethod
    def format_currency(value: float) -> str:
        """Format a numeric value for currency-like display without excess zeros

        Notes:
            Used by menu option o - Output shopping cart

        Examples:
            >>> ItemToPurchase.format_currency(2.0)
            '2'
            >>> ItemToPurchase.format_currency(2.5)
            '2.5'
            >>> ItemToPurchase.format_currency(2.75)
            '2.75'
        """
        # if the value is a whole number, it drops the decimal portion
        if value == int(value):
            return str(int(value))
```

```
        # else format to the two decimal places and remove trailing zeros
        return f"{value:.2f}".rstrip("0")
    # ------------------------------------------------------------

    #_______________
    # Step 3: One items cost
    #
    # ------------------------------------------------------------ print_item_cost()
    def print_item_cost(self, display_name: str | None = None) -> str:
        """Print and return the formatted cost line for this item.

        Examples:
            >>> ItemToPurchase(item_name="W", item_price=2.0,
                                                        item_quantity=3).print_item_cost())
            'W 3 @ $2 = $6'
        """
        # Use provided display name or default to item_name
        name_to_display = display_name if display_name is not None else self.item_name

        # compute the item total based on price and quatity
        total_cost = self.item_price * self.item_quantity
        # Format item info into a string to be displayed
        cost_statement = (
            Fore.LIGHTYELLOW_EX +
            f"{name_to_display.title()} {self.item_quantity} @ "
            f"${self.format_currency(self.item_price)} = "
            f"${self.format_currency(total_cost)}"
            + Style.RESET_ALL
        )
        # Echo the formatted cost to the console for immediate feedback.
        print(cost_statement)
        # Return the cost so it can be reuse or used for testing
        return cost_statement
     # ------------------------------------------------------------

# ------------------------------------------------------------------- end class ItemToPurchase

# ==========================================================================
# ShoppingCart Class Functionality
# ==========================================================================
#_______________
# Step 4: ShoppingCart class
#
# ------------------------------------------------------------------------ class ShoppingCart
class ShoppingCart:
```

```
    """Manage customer shopping cart items (ItemToPurchase instances).

    This class simulates an online shopping cart functionality

    Attributes:
        customer_name: Name of the customer that owns the cart.
        current_date: Date associated with the shopping session.
        cart_items: Mutable list of tracked items.
    """

    # __________________________
    # Constructor
    #
    # ------------------------------------------------------------- __init__()
    def __init__(
        self,
        customer_name: str = "none",
        current_date: str = "January 1, 2020"
    ) -> None:
        """Initialize cart with customer info.

        Args:
            customer_name: customer name associated with the cart
            current_date:  date associated with the cart
        """
        self.customer_name = customer_name
        self.current_date = current_date
        self.cart_items: list[ItemToPurchase] = []
    # ------------------------------------------------------------------

    # __________________________
    # Getters
    #

    # ------------------------------------------------------------- get_num_items_in_cart()
    def get_num_items_in_cart(self) -> int:
        """Return total quantity of all items.

        Returns:
            Combined quantity count across every tracked item.

        Examples:
            >>> cart = ShoppingCart("User", "February 1, 2020")
            >>> cart.add_item(
            ...     ItemToPurchase(item_name="Tomatos",
```

```
                                item_description = "fruit"
                                item_quantity=2,
                                item_price=1.5
                            )
        ... )
        >>> cart.get_num_items_in_cart()
        2
    """
    return sum(item.item_quantity for item in self.cart_items)
# -----------------------------------------------------------

# ------------------------------------------------------------ get_cost_of_cart()
def get_cost_of_cart(self) -> float:
    """Return total cost of all items.

    Note:
        Used by menu option a - Add item to cart

    Examples:
        >>> cart = ShoppingCart("User", "February 1, 2020")
        >>> cart.add_item(
        ...     ItemToPurchase(item_name="Widget", item_price=2.5, item_quantity=2),
        ... )
        >>> cart.get_cost_of_cart()
        5.0
    """
    return sum(item.item_price * item.item_quantity for item in self.cart_items)
# -----------------------------------------------------------

# ____________________
# Setters
#
# ____________________
#  Step 8: Implement Add item to cart menu option.
#
# ------------------------------------------------------------ add_item()
def add_item(self, item: ItemToPurchase) -> None:
    """Add item to cart.

    Notes:
        Used by menu option a - Add item to cart

    Examples:
        >>> cart = ShoppingCart("User", "February 1, 2020")
        >>> cart.add_item(
```

```
        ...     ItemToPurchase(item_name="Orange", item_price=5.0, item_quantity=1),
        ... )
    """
    self.cart_items.append(item)
# -----------------------------------------------------------

# _________________________
#  Step 10: Implement rImplement Change item quantity menu option.
#
# ------------------------------------------------------------ modify_item()
def modify_item(self, item: ItemToPurchase) -> None:
    """Modify an existing item by name, updating only non-default fields.

    Note:
        Used by menu option c - Change item quantity

    Notes: --- Meets the assignment Requirement about the modify_item() method ---
        Default values to check:
            item_description: "none"
            item_price: 0.0
            item_quantity: 0

        Error message: "Item not found in cart. Nothing modified."
    """

    # Format customer name and date into a colorized string
    print(Fore.LIGHTYELLOW_EX +
                 f"\n{self.customer_name.title()}'s Shopping Cart - {self.current_date}")

    # Loops through all the items present in the cart
    # to find an item with a name matching the function parameter name value
    # if match is found, modify the item's values from the parameter item object
    # --- Meets the assignment Requirement about the modify_item() method ---
    for cart_item in self.cart_items:
        # Compare names if names match, modify values
        if cart_item.item_name == item.item_name:
            # update description in cart item if the given item description
            # is NOT None - default value
            if item.item_description != "none":
                cart_item.item_description = item.item_description
            # update price in cart item if the given item price
            # is NOT equal to 0 - default value
            if item.item_price != 0.0:
                cart_item.item_price = item.item_price
            # update quantity in cart item if the given item quantity
```

```
            # is NOT equal to 0 - default value
            # to remove item from cart use the ShoppingCart.remove_item()
            if item.item_quantity != 0:
                # Replace old quantity with new one
                cart_item.item_quantity = item.item_quantity
                # Confirm message
                print(Fore.YELLOW +
                            f"\nThe {cart_item.item_name.title()}'s quantity is now:
                                                                {cart_item.item_quantity}")
            return # exit functions
        # Error message
        print(Fore.YELLOW + "\nItem not found in cart. Nothing modified.")
    # ------------------------------------------------------------

    # _____________________
    #  Step 9: Implement remove item menu option.
    #
    # ------------------------------------------------------------ remove_item()
    def remove_item(self, item_name: str) -> None:
        """Remove item by name and report when the lookup fails."""

        # Format customer name and date into a colorized string
        print(Fore.LIGHTYELLOW_EX +
                    f"\n{self.customer_name.title()}'s Shopping Cart - {self.current_date}")

        # Loops through all the items present in the cart
        # to find an item with a name matching the function parameter item name value
        # if match is found, removes items from cart
        # matching the function parameter item name value
        for i, item in enumerate(self.cart_items):
            # Check if it is the item that needs to be removed
            if item.item_name == item_name.lower():
                # Store item to be removed in a temp var.
                # to be used by confirmation message
                temp_item = deepcopy(item)
                # Remove item from cart
                self.cart_items.pop(i)
                # Check quantity of the item to be removed
                # to format the confirmation message
                if (temp_item.item_quantity == 1):
                    print(Fore.YELLOW +
                                    f"\n1 {temp_item.item_name.title()} was removed from cart")
                    return # exit function
                # else
```

```
            # Confirm message plural
            print(Fore.YELLOW +
                        f"\n{temp_item.item_quantity}
                                {temp_item.item_name.title()}s were removed from cart")
            return # exit function
        # Error message
        print(Fore.YELLOW + "\nItem not found in cart. Nothing removed.")
    # ------------------------------------------------------------

    # ____________________________________________________________
    # Printers
    #
    # ________________________
    #  Step 6: Implement Output item's description menu option
    #
    # ------------------------------------------------------------ print_total()
    def print_total(self) -> None:
        """Print cart summary or "SHOPPING CART IS EMPTY" (Step 4).

        Notes:
            Used by menu option o - Output shopping cart

        Format:
            John Doe's Shopping Cart - February 1, 2020
            Number of Items: 8
            Nike Romaleos 2 @ $189 = $378
            Chocolate Chips 5 @ $3 = $15
            Total: $521
        """

        # Format customer name and date into a colorized string
        print(Fore.LIGHTYELLOW_EX +
                    f"\n{self.customer_name.title()}'s Shopping Cart - {self.current_date}")

        #---- Assignment requirement ----
        # Check if cart is empty
        if not self.cart_items:
            print(Fore.YELLOW + "\nSHOPPING CART IS EMPTY")
            return # Exit method

        # ---- Number of items in cart
        # Get and format total with colors
        num_items = Fore.LIGHTYELLOW_EX + f"{self.get_num_items_in_cart()}" + Style.RESET_ALL
        print(f"Number of Items: {num_items}")
        # Print each item total cost, quantity, description
```

```
        for item in self.cart_items:
            item.print_item_cost(item.item_name)
        # Format cart total into colorized string
        total = Fore.LIGHTGREEN_EX +
               f"${ItemToPurchase.format_currency(self.get_cost_of_cart())}" + Style.RESET_ALL
        print(f"Total: {total}")
    # ------------------------------------------------------------

    # ------------------------------------------------------------ print_descriptions()
    def print_descriptions(self) -> None:
        """Print item descriptions required in Step 4.

        Notes:
            Used by menu option a i - Output items' descriptions

        Format (with items):
            John Doe's Shopping Cart - February 1, 2020
            Item Descriptions
            Nike Romaleos: Volt color, Weightlifting shoes
            Chocolate Chips: Semi-sweet

        Format
            John Doe's Shopping Cart - February 1, 2020
            Item Descriptions

        """

        # Format customer name and date into colorized string
        print(Fore.LIGHTYELLOW_EX +
                     f"\n{self.customer_name.title()}'s Shopping Cart - {self.current_date}")

        #-- Get  and display description
        print("Item Descriptions")
        # Loops through all the items present in the cart
        # and print each item name and description
        for item in self.cart_items:
             # Get item name and description and format with colors
            item_desc = Fore.LIGHTWHITE_EX + item.item_description + Style.RESET_ALL
            print(f"{item.item_name.title()}: {item_desc}")
    # ------------------------------------------------------------

    # ------------------------------------------------------------ print_items_with_quantity()
    def print_items_with_quantity(self) -> None:
        """Print all items in cart with their names and quantities.
```

```
        Format (with items):
            Apples: 3
            Bananas: 2
            Orange Juice: 1

        """

        # Format customer name and date into a colorized string
        print(Fore.LIGHTYELLOW_EX +
                    f"\n{self.customer_name.title()}'s Shopping Cart - {self.current_date}")


        # Loop through all items in cart and print name with quantity
        for item in self.cart_items:
            item_name = Fore.LIGHTWHITE_EX + item.item_name.title() + Style.RESET_ALL
            item_qty = Fore.LIGHTYELLOW_EX + str(item.item_quantity) + Style.RESET_ALL
            print(f"{item_name}'s quantity: {item_qty}")
    # --------------------------------------------------------------

# ------------------------------------------------------------------ end class ShoppingCart

# ____________________________________________________________________________
# Helper Functions
#
# ============================================================================
# Item Prompt Function
# ============================================================================
# ----------------------------------------------------------------------------
prompt_for_item_info()
def prompt_for_item_info() -> ItemToPurchase:
    """Collects item info

    Notes:
        Used by menu option a - Add item to cart

    Examples:
        >>> item = prompt_for_item_info()
        >>> item.item_name  # doctest: +SKIP
        'Widget'
    """
    # Prompt user to enter the item info.
    name = validate_prompt_string("Enter the item name:\n").lower()

    description = validate_prompt_string("Enter the item description:\n")
    price = validate_prompt_nonezero_positive_float("Enter the item price:\n")
```

```
    quantity = validate_prompt_nonezero_positive_int("Enter the item quantity:\n")

    # Create an item with input info and returns it
    return ItemToPurchase(
        item_name=name,
        item_description=description,
        item_price=price,
        item_quantity=quantity,
    )
# ------------------------------------------------------------ end prompt_for_item_info()

# ========================================================================
# Menu Function
# ========================================================================
#_______________
# Steps 2-10
# Implemented within the print_menu() function
#_______________
# Step 5: Menu
#
# ------------------------------------------------------------------------ print_menu()
def print_menu(cart: ShoppingCart) -> None:
    """Display Online Shopping Cart menu (Steps 5-6).

    Menu options:
        a - Add item to cart.
        r - Remove item from cart (shows empty message if cart is empty)
        c - Change item quantity (shows empty message if cart is empty)
        i - Output items' descriptions (shows empty message if cart is empty)
        o - Output shopping cart (shows empty message if cart is empty)
        q - Quit.

    """

    # Create menu with letter-based options using the Menu class
    # Step 5
    menu = Menu(
        "MENU",
        [
            "Add item to cart", # Steps: 2, 8
            "Remove item from cart", # Steps: 9
            "Change item quantity", # Steps: 10
            "Output items' descriptions", # Steps: 6
            "Output shopping cart", # Steps: 3,4
            "Quit",
```

```
    ],
    prefixes=["a", "r", "c", "i", "o", "q"],
)
# Render the menu and store it in a string variable to be displayed
menu_display = Fore.LIGHTCYAN_EX + menu.render()

# Create a Add Itme banner instance
add_item_banner = Banner(["Add Itme"])
# Render the description banner and store it in a string variable to be displayed
add_item_banner_display = Fore.LIGHTCYAN_EX + add_item_banner.render()

desc_banner = Banner(["OUTPUT ITEMS' DESCRIPTIONS"])
# Render the description banner and store it in a string variable to be displayed
desc_banner_display = Fore.LIGHTCYAN_EX + desc_banner.render()

# Create a cart output banner instance
cart_output_banner = Banner(["OUTPUT SHOPPING CART"])
# Render the cart output banner and store it in a string variable to be displayed
cart_output_banner_display = Fore.LIGHTCYAN_EX + cart_output_banner.render()

# Create a Remove item banner instance
remove_banner = Banner(["REMOVE ITEM"])
# Render the Remove banner and store it in a string variable to be displayed
remove_banner_display = Fore.LIGHTCYAN_EX + remove_banner.render()

# Create a Modify Quantity item banner instance
mod_quantity_banner = Banner(["MODIFY QUANTITY"])
# Render the Remove banner and store it in a string variable to be displayed
mod_quantity_banner_display = Fore.LIGHTCYAN_EX + mod_quantity_banner.render()

#_______________
# Step 5: Menu
#
# Menu loop
while True:
    print()
    print(menu_display)

    # Prompt the user for selection and captures it
    selection = input("\nChoose an option: ").strip().lower()

    match selection:
        case 'a': # Launch the add item feature
            print()
            print(add_item_banner_display)
```

```
            print()
            # Creat a n item instance and prompt user for item info
            new_item = prompt_for_item_info()
            # Add the new populated item to cart
            cart.add_item(new_item)
            # Confimation message
            print(Fore.LIGHTGREEN_EX +
                        f"\n{new_item.item_quantity} \"{new_item.item_name.title()}\"
                                                                    added to cart.")
            wait_for_enter()

        case 'r': # Launch the remove item feature
            print()
            print(remove_banner_display)

            # Check if cart is empty
            if not cart.cart_items:
                # Format customer name and date into a colorized string
                print(Fore.LIGHTYELLOW_EX +
                            f"\n{cart.customer_name.title()}'s Shopping Cart -
                                                                {cart.current_date}")
                print(Fore.YELLOW + "\nSHOPPING CART IS EMPTY")
            else:
                # Display items in cart descriptions
                cart.print_descriptions()
                print()
                # Prompt user for the name of the item to remove
                name = validate_prompt_string("Enter the item name to remove:\n").lower()
                # Remove item from cart
                cart.remove_item(name)

            wait_for_enter()

        case 'c': # Launch the item change quantity feature
            print()
            print(mod_quantity_banner_display)

            # Check if cart is empty
            if not cart.cart_items:
                # Format customer name and date into a colorized string
                print(Fore.LIGHTYELLOW_EX +
                            f"\n{cart.customer_name.title()}'s Shopping Cart -
                                                                {cart.current_date}")
                print(Fore.YELLOW + "\nSHOPPING CART IS EMPTY")
            else:
```

```
                # Display the items in cart name and quantity
                cart.print_items_with_quantity()
                # Prompt user for the name of the item to change quantity
                name = validate_prompt_string("\nEnter the item name:\n").lower()
                new_qty = validate_prompt_nonezero_positive_int("Enter the new quantity:
                                                                                    ")
                # --- Meets the assignment Requirement about the modify_item() method ---
                # Create item with only name and quantity set --(others default)--
                temp_item = ItemToPurchase(item_name=name, item_quantity=new_qty)
                # Modify item
                cart.modify_item(temp_item)

            wait_for_enter()

        case 'i': # Launch the item output description feature
            print()
            print(desc_banner_display)

            # Check if cart is empty
            if not cart.cart_items:
                # Format customer name and date into a colorized string
                print(Fore.LIGHTYELLOW_EX +
                              f"\n{cart.customer_name.title()}'s Shopping Cart –
                                                                {cart.current_date}")
                print(Fore.YELLOW + "\nSHOPPING CART IS EMPTY")
            else:
                # Output the items' descriptions present in cart
                cart.print_descriptions()

            wait_for_enter()

        case 'o': # Launch the item Output cart feature
            print()
            print(cart_output_banner_display)

            # --- Assignment requirement ---
            # Built-in check for empty cart
            # Display the formatted cart info and total
            cart.print_total()

            wait_for_enter()

        case 'q': # Launch the item quit feature
            if (validate_prompt_yes_or_no("Are you sure that you want to exist? ")):
                print("\nThank you for shopping!")
```

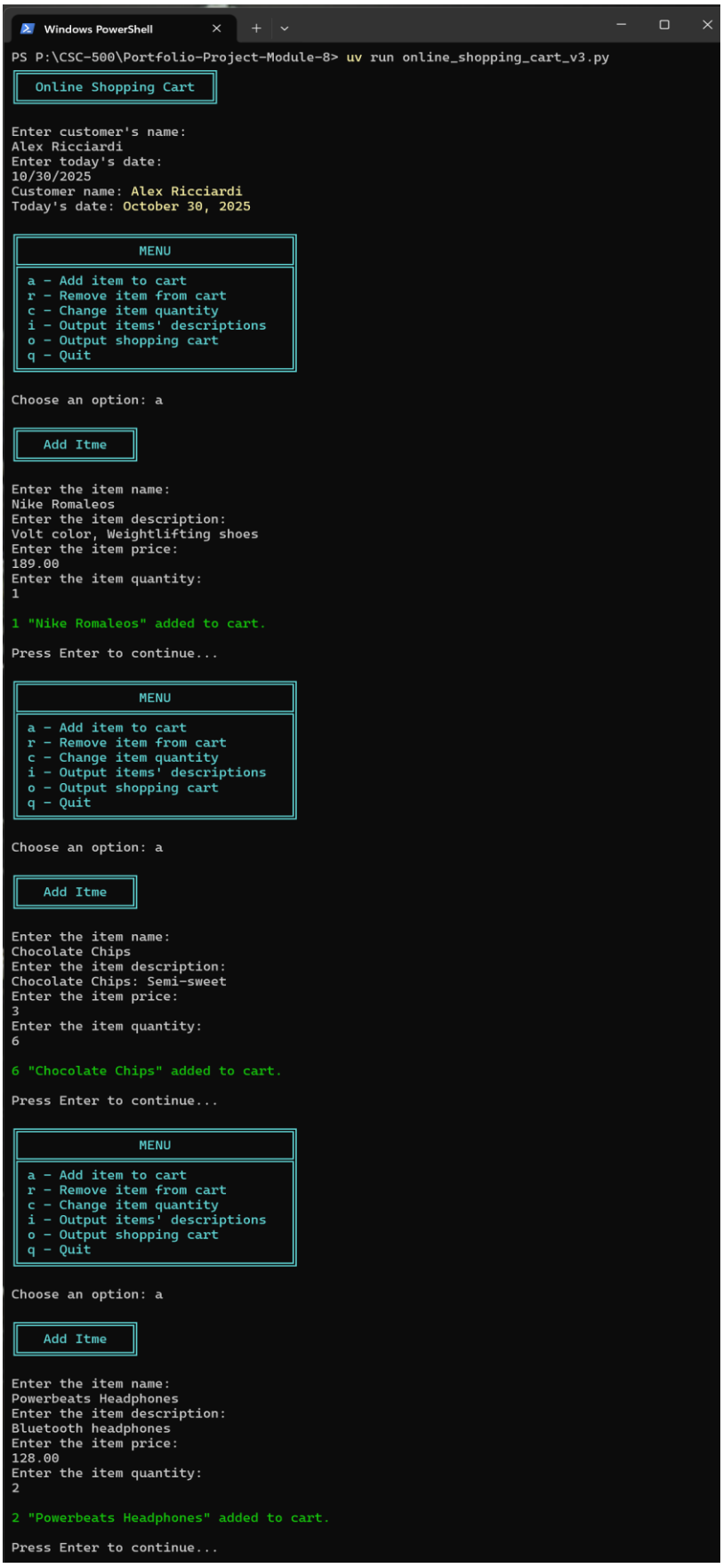
```
                    # Exits while loop
                    break

            case _:
                # Invalid input
                print(Fore.LIGHTRED_EX + "\nInvalid selection, please enter a, r, c, i, o, or
                                                                                    q.")
                wait_for_enter()
# ------------------------------------------------------------------------ end print_menu()

# ____________________________________________________________________________
# ------------- Main Function -------------
#
# ============================================================================
# Main Application Flow Functionality (program entry and user interaction)
# ============================================================================
# ------------------------------------------------------------------------ main()
def main() -> None:
    """Run the shopping cart program (Steps 4-6).

    Program:
        1. Display header.
        2. Prompt for customer name and date
        3. Create ShoppingCart (empty)
        4. Enter menu loop (Steps 5-6)
        5. Display exit message

    Examples:
        >>> main()

    """

    # Display program header
    header = Banner(["Online Shopping Cart"])
    print(Fore.LIGHTCYAN_EX + header.render())
    print()

    #_______________
    # Step 7: Prompt for customer info
    #
    # Prompt for customer info
    customer_name = validate_prompt_string("Enter customer's name:\n")
    current_date = validate_prompt_date("Enter today's date:\n")
    # Create shopping cart (empty - no items added initially)
    cart = ShoppingCart(customer_name, current_date)
```

```
    # Add color to customer name and date
    display_name = Fore.LIGHTYELLOW_EX + f"{cart.customer_name.title()}"
    display_date = Fore.LIGHTYELLOW_EX + f"{cart.current_date}"
    # Display customer name and date
    print(f"Customer name: {display_name}")
    print(f"Today's date: {display_date}")

    #_______________
    # Step 2-9
    #
    # The print-menu() function implements
    # the main functionality of the Online Shopping Cart
    print_menu(cart)

    # Exit program message
    print("\nBye! 👋\n")

# ------------------------------------------------------------------------ end main()

# ____________________________________________________________________________
# Module Initialization / Main Execution Guard
#
# ------------------------------------------------------------------------ main_guard
if __name__ == "__main__":
    main()
# ----------------------------------------------------------------------------

# ____________________________________________________________________________
# End of File
#
```

*See next page*

**Figure 2**

*Project Outputs on Terminal – User Flow*



```
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit

Choose an option: o

OUTPUT SHOPPING CART

Alex Ricciardi's Shopping Cart - October 30, 2025
Number of Items: 9
Nike Romaleos 1 @ $189 = $189
Chocolate Chips 6 @ $3 = $18
Powerbeats Headphones 2 @ $128 = $256
Total: $463

Press Enter to continue...

MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit

Choose an option: i

OUTPUT ITEMS' DESCRIPTIONS

Alex Ricciardi's Shopping Cart - October 30, 2025
Item Descriptions
Nike Romaleos: Volt color, Weightlifting shoes
Chocolate Chips: Chocolate Chips: Semi-sweet
Powerbeats Headphones: Bluetooth headphones

Press Enter to continue...

MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit

Choose an option: r

REMOVE ITEM

Alex Ricciardi's Shopping Cart - October 30, 2025
Item Descriptions
Nike Romaleos: Volt color, Weightlifting shoes
Chocolate Chips: Chocolate Chips: Semi-sweet
Powerbeats Headphones: Bluetooth headphones

Enter the item name to remove:
Nike Romaleos

Alex Ricciardi's Shopping Cart - October 30, 2025

1 Nike Romaleos was removed from cart

Press Enter to continue...

MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit

Choose an option: o

OUTPUT SHOPPING CART

Alex Ricciardi's Shopping Cart - October 30, 2025
Number of Items: 8
Chocolate Chips 6 @ $3 = $18
Powerbeats Headphones 2 @ $128 = $256
Total: $274

Press Enter to continue...
```

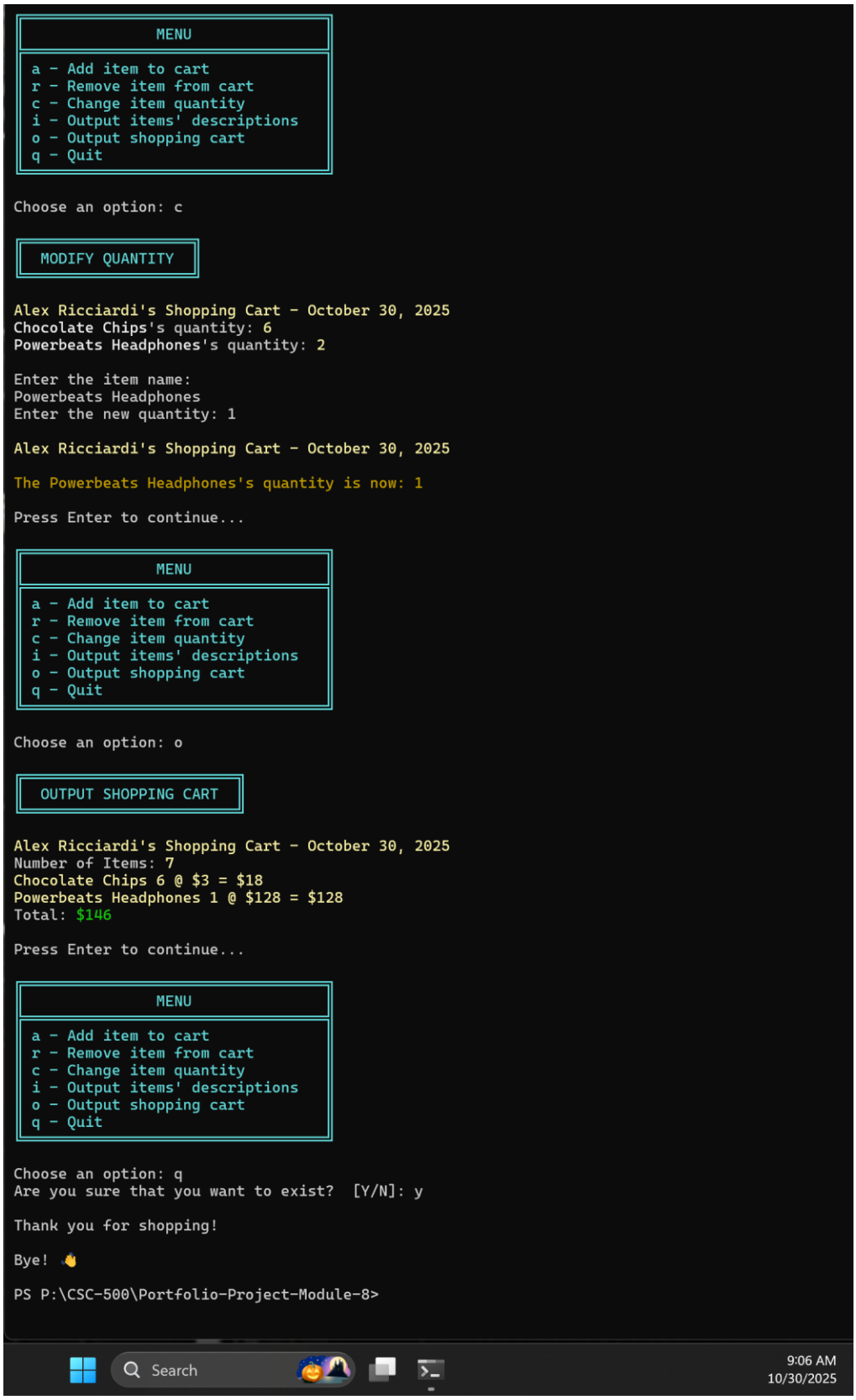
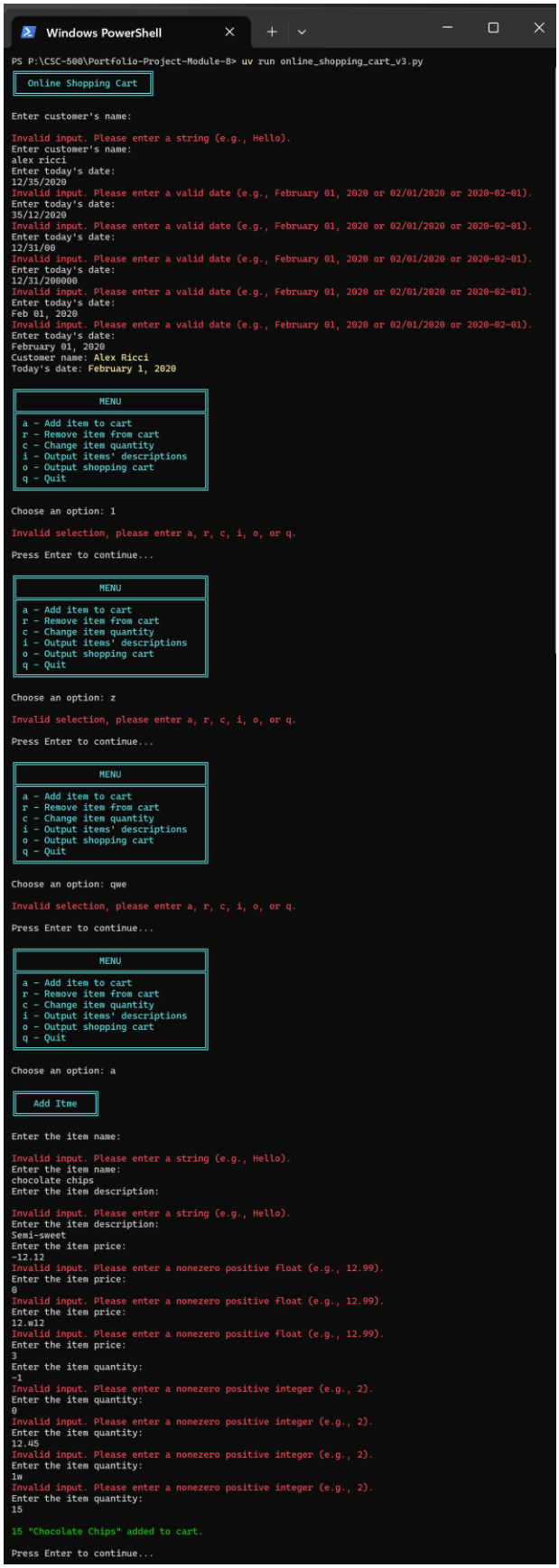
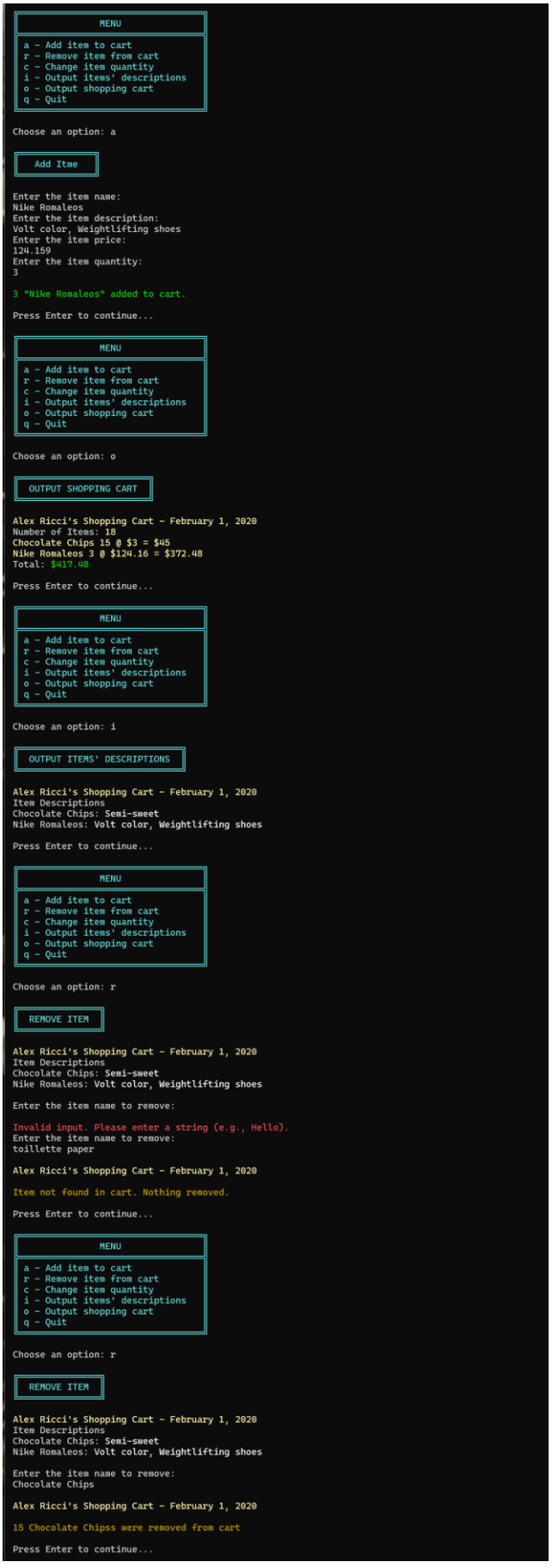
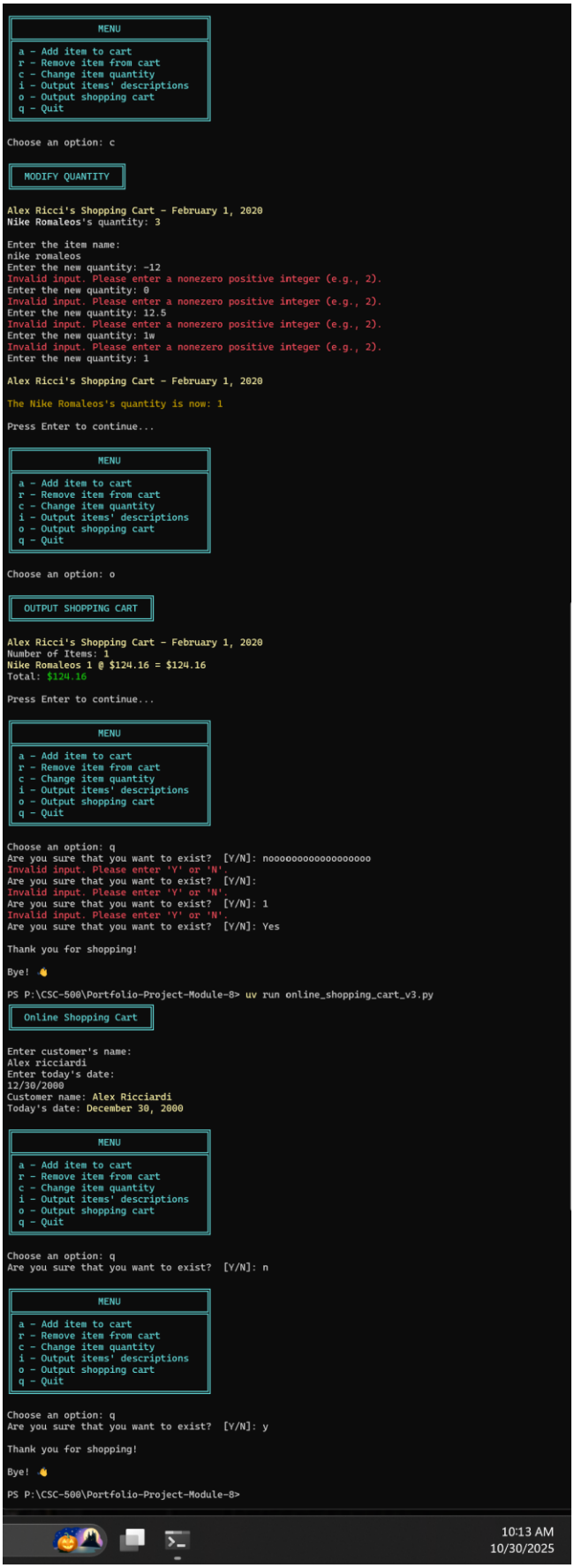

MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: c
MODIFY QUANTITY
Alex Ricciardi's Shopping Cart - October 30, 2025
Chocolate Chips's quantity: 6
Powerbeats Headphones's quantity: 2
Enter the item name:
Powerbeats Headphones
Enter the new quantity: 1
Alex Ricciardi's Shopping Cart - October 30, 2025
The Powerbeats Headphones's quantity is now: 1
Press Enter to continue...
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: o
OUTPUT SHOPPING CART
Alex Ricciardi's Shopping Cart - October 30, 2025
Number of Items: 7
Chocolate Chips 6 @ $3 = $18
Powerbeats Headphones 1 @ $128 = $128
Total: $146
Press Enter to continue...
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: q
Are you sure that you want to exist? [Y/N]: y
Thank you for shopping!
Bye!
PS P:\CSC-500\Portfolio-Project-Module-8>
Search
9:06 AM
10/30/2025

**Figure 3**

*Project Outputs Troubleshooting: The Cart is Empty, Data Type, and Numeric Nonzero Type*




MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: a
Add Itme
Enter the item name:
Nike Romaleos
Enter the item description:
Volt color, Weightlifting shoes
Enter the item price:
124.159
Enter the item quantity:
3
3 "Nike Romaleos" added to cart.
Press Enter to continue...
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: o
OUTPUT SHOPPING CART
Alex Ricci's Shopping Cart - February 1, 2020
Number of Items: 18
Chocolate Chips 15 @ $3 = $45
Nike Romaleos 3 @ $124.16 = $372.48
Total: $417.48
Press Enter to continue...
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: i
OUTPUT ITEMS' DESCRIPTIONS
Alex Ricci's Shopping Cart - February 1, 2020
Item Descriptions
Chocolate Chips: Semi-sweet
Nike Romaleos: Volt color, Weightlifting shoes
Press Enter to continue...
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: r
REMOVE ITEM
Alex Ricci's Shopping Cart - February 1, 2020
Item Descriptions
Chocolate Chips: Semi-sweet
Nike Romaleos: Volt color, Weightlifting shoes
Enter the item name to remove:
Invalid input. Please enter a string (e.g., Hello).
Enter the item name to remove:
toillette paper
Alex Ricci's Shopping Cart - February 1, 2020
Item not found in cart. Nothing removed.
Press Enter to continue...
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: r
REMOVE ITEM
Alex Ricci's Shopping Cart - February 1, 2020
Item Descriptions
Chocolate Chips: Semi-sweet
Nike Romaleos: Volt color, Weightlifting shoes
Enter the item name to remove:
Chocolate Chips
Alex Ricci's Shopping Cart - February 1, 2020
15 Chocolate Chipss were removed from cart
Press Enter to continue...


MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: c
MODIFY QUANTITY
Alex Ricci's Shopping Cart - February 1, 2020
Nike Romaleos's quantity: 3
Enter the item name:
nike romaleos
Enter the new quantity: -12
Invalid input. Please enter a nonezero positive integer (e.g., 2).
Enter the new quantity: 0
Invalid input. Please enter a nonezero positive integer (e.g., 2).
Enter the new quantity: 12.5
Invalid input. Please enter a nonezero positive integer (e.g., 2).
Enter the new quantity: 1w
Invalid input. Please enter a nonezero positive integer (e.g., 2).
Enter the new quantity: 1
Alex Ricci's Shopping Cart - February 1, 2020
The Nike Romaleos's quantity is now: 1
Press Enter to continue...
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: o
OUTPUT SHOPPING CART
Alex Ricci's Shopping Cart - February 1, 2020
Number of Items: 1
Nike Romaleos 1 @ $124.16 = $124.16
Total: $124.16
Press Enter to continue...
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: q
Are you sure that you want to exist? [Y/N]: nooooooooooooooo
Invalid input. Please enter 'Y' or 'N'.
Are you sure that you want to exist? [Y/N]:
Invalid input. Please enter 'Y' or 'N'.
Are you sure that you want to exist? [Y/N]: 1
Invalid input. Please enter 'Y' or 'N'.
Are you sure that you want to exist? [Y/N]: Yes
Thank you for shopping!
Bye!
PS P:\CSC-500\Portfolio-Project-Module-8> uv run online_shopping_cart_v3.py
Online Shopping Cart
Enter customer's name:
Alex ricciardi
Enter today's date:
12/30/2000
Customer name: Alex Ricciardi
Today's date: December 30, 2000
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: q
Are you sure that you want to exist? [Y/N]: n
MENU
a - Add item to cart
r - Remove item from cart
c - Change item quantity
i - Output items' descriptions
o - Output shopping cart
q - Quit
Choose an option: q
Are you sure that you want to exist? [Y/N]: y
Thank you for shopping!
Bye!
PS P:\CSC-500\Portfolio-Project-Module-8>
10:13 AM
10/30/2025

All other input types of validation have been troubleshooted in previous assignments

As shown in Figures 2, 3, and Code Snippet 1, the program runs without any issues, displaying the correct outputs as expected.

*See the next pages for added functions and classes utilities.*

**Code Snippet 2**
*User Input Validation Functions: validation_utilities.py*

```
# ------------------------------------------------------------------------
# File: validation_utilities.py
# Author: Alexander Ricciardi
# Date: 2025-10-05
# ------------------------------------------------------------------------
# Course: CSS-500 Principles of Programming
# Professor: Dr. Brian Holbert
# Fall C-2025
# Sep.-Nov. 2025

# --- Module Functionality ---
# The file provides user input validation utility functions.
# ------------------------------------------------------------------------

# --- Functions ---
# - validate_prompt_yes_or_no(): request a yes/no confirmation, until a valid input is entered
# - wait_for_enter(): pause program until the user presses Enter
# - validate_prompt_int(): prompt user until a valid integer is entered
# - validate_prompt_positive_int(): prompt user until a valid positive integer is entered
# - validate_prompt_nonezer_positive_int(): prompt user until a valid nonezero positive
                                                                    integer is entered
# - validate_prompt_float(): prompt user until a valid float is entered
# - validate_prompt_positive_float(): prompt user until a valid positive float is entered
# - validate_prompt_nonezero_positive_float(): prompt user until a valid nonezero positive
                                                                        float is entered.
# - validate_prompt_string(): prompt user until a non-empty string is entered
# - validate_prompt_date(): prompt user until a valid date is entered

# --- Imports ---
# - __future__.annotations to simplify forward typing references.
# - colorama (Fore, init) for cross-platform colored terminal
# ------------------------------------------------------------------------

# --- Apache-2.0 ---
# Copyright 2025 Alexander Samuel Ricciardi - All rights reserved.
# License: Apache-2.0 | Code
```

```python
# ---------------------------------------------------------------------

"""
The file provides input validation utility functions.

Each function contains a validation loop for prompting user, capturing input,
and validating input (ints, floats, or strings). The loop will loop until a valid
input is entered, and then the function will validate the input.
"""

# _________________
# Imports
#

from __future__ import annotations

from colorama import Fore, init
# Initialize colorama primarily to make it work on Windows
init(autoreset=True)

# ____________________________________________________________________________
#  Miscellaneous user-input validation functions
#

# ------------------------------------------------------------ validate_prompt_yes_or_no()
def validate_prompt_yes_or_no(prompt: str) -> bool:
    """Prompt the user until a valid yes/no answer is provided.

    Args:
        prompt: text to display before the "[Y/N]".

    Returns:
        True if the user selects yes ("y"/"yes"); False if no ("n"/"no").

    Examples:
        user input shown after [prompts]:

            >>> result = validate_prompt_yes_or_no("Continue?")
            Continue? [Y/N]: maybe
            Invalid input. Please enter 'Y' or 'N'.
            Continue? [Y/N]: y
            >>> result
            True
    """
    # Loop until a yes/no input is provided.
```

```
    while True:
        choice = input(f"{prompt} [Y/N]: ").strip().lower()
        # confirmations
        if choice in ("y", "yes"):
            return True
        # reinforce confirmations
        if choice in ("n", "no"):
            return False
        # invalid input message
        print(Fore.LIGHTRED_EX + "Invalid input. Please enter 'Y' or 'N'.")
# ------------------------------------------------------------ end validate_prompt_yes_or_no()

# ------------------------------------------------------------------ wait_for_enter()
def wait_for_enter() -> None:
    """Pause execution until the user presses Enter.

    Examples:
            >>> wait_for_enter()

            Press Enter to continue...
            <user presses Enter>
    """
    input("\nPress Enter to continue...")
# ------------------------------------------------------------------

# ____________________________________________________________________________
# Integer validation functions
#

# ------------------------------------------------------------ validate_prompt_int()
def validate_prompt_int(prompt: str) -> int:
    """Ask the user until a valid integer is entered.

    Args:
        prompt: text to display to the user

    Returns:
        The validated integer value

    Behavior:
        - Re-prompts when the input cannot be validated as an integer

    Examples:
       user input shown after [prompts]:
```

```
            >>> value = validate_prompt_int("Enter an integer:")
            Enter an integer:
            three
            Invalid input. Please enter an integer (e.g., 2).
            Enter the integer entered is: 2
            >>> value
            2
    """
    # Keep asking until a valid int is entered
    while True:
        raw = input(f"{prompt}").strip()
        try:
            return int(raw)
        except ValueError:
            # Invalid input error message
            print(Fore.LIGHTRED_EX + "Invalid input. Please enter an integer (e.g., 2).")
# ------------------------------------------------------------ end validate_prompt_int()

# ------------------------------------------------------- validate_prompt_positive_int()
def validate_prompt_positive_int(prompt: str) -> int:
    """Ask the user until a valid positive integer is entered.

    Args:
        prompt: text to display to the user

    Returns:
        The validated positive integer value

    Behavior:
        - Re-prompts when the input cannot be validated as a positive integer

    Examples:
       user input shown after [prompts]:

            >>> value = validate_prompt_positive_int("Enter the item quantity:")
            Enter the item quantity:
            three
            Invalid input. Please enter a positive integer (e.g., 2).
            Enter the item quantity: 2
            >>> value
            2
    """
    # Keep asking until a valid positive int is entered
    while True:
        raw = input(f"{prompt}").strip()
```

```
        try:
            if int(raw) >= 0: # 0 is both + and -
                return int(raw)
            raise  ValueError
        except ValueError:
            # Invalid input error message
            print(Fore.LIGHTRED_EX + "Invalid input. Please enter a positive integer (e.g.,
                                     2).")
# ------------------------------------------------------- end validate_prompt_positive_int()

# ------------------------------------------------ validate_prompt_nonezero_positive_int()
def validate_prompt_nonezero_positive_int(prompt: str) -> int:
    """Ask the user until a valid nonezero positive integer is entered.

    Args:
        prompt: text to display to the user

    Returns:
        The validated nonezero positive integer value

    Behavior:
        - Re-prompts when the input cannot be validated as a nonezero positive integer

    Examples:
       user input shown after [prompts]:

            >>> value = validate_prompt_positive_int("Enter the item quantity:")
            Enter the item quantity:
            three
            Invalid input. Please enter a positive integer (e.g., 2).
            Enter the item quantity: 2
            >>> value
            2
    """
    # Keep asking until a valid positive int is entered
    while True:
        raw = input(f"{prompt}").strip()
        try:
            if int(raw) > 0:
                return int(raw)
            raise  ValueError
        except ValueError:
            # Invalid input error message
            print(Fore.LIGHTRED_EX + "Invalid input. Please enter a nonezero positive integer
                                                                                (e.g., 2).")
```

```
# ------------------------------------------- end validate_prompt_nonezero_positive_int()

# ____________________________________________________________________________
# Float validation functions
#

# ------------------------------------------------------------- validate_prompt_float()
def validate_prompt_float(prompt: str) -> float:
    """Asks the user until a valid float is entered.

    Args:
        prompt: text to display to the user

    Returns:
        The validated float value

    Behavior:
        - Re-prompts when the input cannot be validated as a float

    Examples:
        user input shown after [prompts]:

            >>> price = validate_prompt_float("Enter the item price:")
            Enter the item price:
            price
            Invalid input. Please enter a valid float (e.g., 12.99).
            Enter the item price: 12.99
            >>> price
            12.99
    """
    # Keep asking until valid float is entered
    while True:
        raw = input(f"{prompt}").strip()
        try:
            return float(raw)
        except ValueError:
            # Invalid input error message
            print(Fore.LIGHTRED_EX + "Invalid input. Please enter a valid float (e.g.,
                  12.99).")
# ------------------------------------------------------------ end validate_prompt_float()

# ---------------------------------------------------- validate_prompt_positive_float()
def validate_prompt_positive_float(prompt: str) -> float:
    """Ask the user until a valid positive integer is entered.
```

```
    Args:
        prompt: text to display to the user

    Returns:
        The validated positive float value

    Behavior:
        - Re-prompts when the input cannot be validated as a positive integer

    Examples:
       user input shown after [prompts]:

            >>> price = validate_prompt_float("Enter the item price:")
           Enter the item price:
           price
           Invalid input. Please enter a valid float (e.g., 12.99).
           Enter the item price: 12.99
           >>> price
           12.99
    """
    # Keep asking until a valid positive int is entered
    while True:
        raw = input(f"{prompt}").strip()
        try:
            if float(raw) >= 0.0: # 0.0 is both + and -
                return float(raw)
            raise  ValueError
        except ValueError:
            # Invalid input error message
            print(Fore.LIGHTRED_EX + "Invalid input. Please enter a positive float (e.g.,
                  12.99).")
# ------------------------------------------------------ end validate_prompt_positive_float()

# ------------------------------------------------ validate_prompt_nonezero_positive_float()
def validate_prompt_nonezero_positive_float(prompt: str) -> float:
    """Ask the user until a valid nonezero positive float is entered.

    Args:
        prompt: text to display to the user

    Returns:
        The validated positive float value

    Behavior:
        - Re-prompts when the input cannot be validated as a nonzero positive float
```

```
    Examples:
       user input shown after [prompts]:

            >>> price = validate_prompt_float("Enter the item price:")
           Enter the item price:
           price
           Invalid input. Please enter a valid float (e.g., 12.99).
           Enter the item price: 12.99
           >>> price
           12.99
    """
    # Keep asking until a valid nonezero positive float is entered
    while True:
        raw = input(f"{prompt}").strip()
        try:
            if float(raw) > 0.0:
                return float(raw)
            raise  ValueError
        except ValueError:
            # Invalid input error message
            print(Fore.LIGHTRED_EX + "Invalid input. Please enter a nonezero positive float
                                                                                (e.g., 12.99).")
# ---------------------------------------- end validate_prompt_nonezero_positive_float()

# ____________________________________________________________________________
# String validation functions
#

# ------------------------------------------------------------ validate_prompt_string()
def validate_prompt_string(prompt: str) -> str:
    """Ask the user until a non-empty string is entered.

    Args:
        prompt: text to display to the user

    Returns:
        A validated string value

    Behavior:
        - when the input cannot be validated as a non-empty string

    Examples:
        user input shown after [prompts]:
```

```
            >>> name = validate_prompt_string("Enter the item name:")
            Enter the item name:

            Invalid input. Please enter a string (e.g., Hello).
            Enter the item name:
            Apples
            >>> name
            'Apples'
    """
    # Keep asking until a non-empty string is entered
    while True:
        raw = input(f"{prompt}").strip()
        try:
            if raw == "":
                # raise error if input string is empty
                raise ValueError()
            return str(raw)
        except ValueError:
            # Keep asking until a none-empty is entered
            print(Fore.LIGHTRED_EX + "Invalid input. Please enter a string (e.g., Hello).")
# ------------------------------------------------------------ end validate_prompt_string()

# ____________________________________________________________________________
# Date validation functions
#

# ------------------------------------------------------------ validate_prompt_date()
def validate_prompt_date(
    prompt: str,
    *,
    formats: list[str] | None = None,
    normalize_format: str = "%B %d, %Y"
) -> str:
    """Prompt user until valid date is entered.

    Args:
        prompt: Text to display to the user
        formats: List of accepted input formats -> (default: ["%B %d, %Y", "%m/%d/%Y", "%Y-%m-
                                                                                    %d"])
        normalize_format: Output format for the date string (default: "%B %d, %Y")

    Returns:
        Date string in normalize_format (e.g., "February 1, 2020")

    Examples:
```

```
        user input shown after [prompts]:

            >>> date = validate_prompt_date("Enter date:\\n")
            Enter date:
            2/1/2020
            >>> date
            'February 1, 2020'

            >>> date = validate_prompt_date("Enter date:\\n")
            Enter date:
            February 1, 2020
            >>> date
            'February 1, 2020'

            >>> date = validate_prompt_date("Enter date:\\n")
            Enter date:
            2020-02-01
            >>> date
            'February 1, 2020'

            >>> date = validate_prompt_date("Enter date:\\n")
            Enter date:
            invalid
            Invalid input. Please enter a valid date (e.g., February 1, 2020 or 2/1/2020 or
                                                                                2020-02-01).
            Enter date:
            2/1/2020
            >>> date
            'February 1, 2020'
    """
    # Default formats if none provided
    if formats is None:
        formats = ["%B %d, %Y", "%m/%d/%Y", "%Y-%m-%d"]

    # Build example string from formats
    examples = []
    try:
        example_date = datetime(2020, 2, 1)
        for fmt in formats[:3]:  # Show up to 3 examples
            examples.append(example_date.strftime(fmt))
    except Exception:
        examples = ["February 1, 2020", "2/1/2020", "2020-02-01"]

    example_str = " or ".join(examples)
```

```
    while True:
        raw = input(f"{prompt}").strip()

        # Try each format until one works
        date_obj = None
        for fmt in formats:
            try:
                date_obj = datetime.strptime(raw, fmt)
                break
            except ValueError:
                continue

        if date_obj is not None:
            # Successfully parsed - return normalized format
            # Use %-d for non-zero-padded day on Unix/Mac, %#d on Windows
            # But %B %d, %Y with manual formatting is more portable
            formatted = date_obj.strftime(normalize_format)
            # Remove leading zero from day if present (e.g., "February 01" -> "February 1")
            parts = formatted.split()
            if len(parts) >= 2 and parts[1].endswith(',') and parts[1][:-1].startswith('0'):
                parts[1] = parts[1][1:]  # Remove leading zero
            return ' '.join(parts)
        else:
            # No format matched - show error
            print(Fore.LIGHTRED_EX + f"Invalid input. Please enter a valid date (e.g.,
                                                                    {example_str}).")
# ------------------------------------------------------------ end validate_prompt_date()

# ____________________________________________________________________________
# End of File
#
```

*See next page for classes*

**Code Snippet 3**

*Banner and Menu Classes: validation_utilities.py*

```
# ------------------------------------------------------------------------
# File: menu_banner_utilities.py
# Author: Alexander Ricciardi
# Date: 2025-10-05
# ------------------------------------------------------------------------
# Course: CSS-500 Principles of Programming
# Professor: Dr. Brian Holbert
# Fall C-2025
# Sep.-Nov. 2025

# --- Module Functionality ---
# Provides console UI classes that render bordered banners and numbered menus.
# ------------------------------------------------------------------------

# --- Classes ---
# - Banner: Creates an ASCII-styled boxes with alignment, dividers, and sizing functionality.
# - Menu: Creates a console menus using Banner.
# ------------------------------------------------------------------------

# --- Imports ---
# - __future__.annotations for postponed evaluation of type hints.
# - typing (Literal, Sequence, TypeAlias) to annotate alignment options and content.
# ------------------------------------------------------------------------

# --- Apache-2.0 ---
# Copyright 2025 Alexander Samuel Ricciardi - All rights reserved.
# License: Apache-2.0 | Code
# ------------------------------------------------------------------------

"""
The file provides a console banner and a menu console-based UI.

The Banner and Menu use ASCII formatting to display UI on the console.
The Banner renders banner-style titles, and the Menu class uses the Banner class
to render menus.
"""
```

```python
# _________________
# Imports
#

from __future__ import annotations

from typing import Literal, Sequence, TypeAlias

# ____________________________________________________________________________
# Utility Classe Banner
#
# ============================================================================
# Banner Class (box headers)
# ============================================================================
# ---------------------------------------------------------------------------- class Banner
class Banner:
    """Instantiate box banner for the console from one or more text lines

    The banner consists of a top border, one header line
    and maybe more text lines with alignment (left/center/right), and a bottom border.
    The inner_width of the box automatically expands to fit the text length.


    Examples:
                ╔═══════════════╗
                ║  First line   ║
                ╚═══════════════╝

    """

    Alignment: TypeAlias = Literal["left", "center", "right"]

    # _________________________
    #  Class constants
    #
    # Default title text when no content is provided
    DEFAULT_TEXT = "Banner"
    # Default alignment
    DEFAULT_ALIGNMENT = "center"
    # Whether divider is applied to the line
    DEFAULT_ISDIVIDER = False
    # Default banner content tuple
    DEFAULT_CONTENT: list[tuple[str, Alignment, bool]] = [(DEFAULT_TEXT, DEFAULT_ALIGNMENT,
                                                           DEFAULT_ISDIVIDER)]
    # Minimum Banner inner width
```

```
    MINIUM_WIDTH: int = 10

    # ____________________
    # Constructor
    #
    # ------------------------------------------------------------ __init__()
    def __init__(
        self,
        content: Sequence[object] = DEFAULT_CONTENT,
        inner_width: int = MINIUM_WIDTH,
    ) -> None:
        """Construct and initialize a new banner with default values if none are entered

        Args:
            text: text lines inside the banner
            alignment: Alignment of text lines ("left", "center", or "right")
            inner_width: the minimum inner width of the banner (auto-expands for longer text)

        example:
             >>> banner_1 = Banner([("First line"),
                                    (),
                                    ("Third Line", "left", True),
                                    ("Fourth Line", "Right")
                                ])
            >>> print(banner_1.render())

                ╔═══════════════╗
                ╠  First line   ╠ # Default alignment and isDivider
                ╠               ╠ # Second Line empty
                ╠ Third Line    ╠ # Aligns to the left and adds a divider
                ╠═══════════════╣
                ╠ Fourth Line   ╠ # Aligns to the right and default isDividerr
                ╚═══════════════╝


        """
        # Initialize the banner lines to default content
        self._lines: list[object] = list(content)
        # Check if the first line tuple is a default to string,
        # as a tuple with just one element, and if the element is a string defaults to a
          string type
        # if the line tuple is a string, the inner width is the maximum comparison between
          inner_width and the string length
        if isinstance(self._lines[0], str):
            # Compare and return the largest value + 4
            self.inner_width = max(
```

```
                                len(self._lines[0]),inner_width
                            ) + 4 # inner padding
        else:
            # Compare lines text elements and return the text element largest length value + 4
            self.inner_width = max(
                                # Compare and return the largest value
                                max(# if the line tuple is empty it returns 0
                                    # else it iterates through all the line tuple text
                                      elements
                                    # and return the length of each line tuple text
                                      element
                                    (0 if not t else len(t[0])) for t in self._lines
                                ),
                                self.MINIUM_WIDTH
                            ) + 4
    # ------------------------------------------------------------ end __init__()

    # _________________________
    # Banner render helper methods

    # -----------------
    # line render helper method
    def _text_line(self, text: str, alignment: Alignment) -> str:
        """Build a text line, aligned inside the banner borders

        Examples:
            ‖  First line (Header)  ‖
        """
        # Left align the text by adding spaces to the right of the text
        if alignment == "left":
            return f"‖ {text.ljust(self.inner_width -2)} ‖"
        # Right align the text by adding spaces to the left of the text
        if alignment == "right":
            return f"‖ {text.rjust(self.inner_width -2)} ‖"
        # Center align the text by adding spaces on both sides of the text
        return f"‖ {text.center(self.inner_width - 2)} ‖"

    # -----------------
    # Banner borders render helper methods

    # ------------------------------------------------------------ _top()
    # Top border line for the banner
    def _top(self) -> str:
        """Build top banner border.
```

```
        Examples:
            ╔═══════════════════════╗
        """

        return f"╔{'=' * self.inner_width}╗"
    # ------------------------------------------------------------

    # ------------------------------------------------------------ _divider()
    def _divider(self) -> str:
        """Build borderline divider after the first text line.

        Notes: if the Banner has one line it gets replaced by
            the Banner bottom line in the render method

        Examples:
            ╠═══════════════════════╣
        """
        return f"╠{'=' * self.inner_width}╣"
    # ------------------------------------------------------------

    # ------------------------------------------------------------ _bottom()
    def _bottom(self) -> str:
        """Return the bottom border line for the banner.

        Examples:
            ╚═══════════════════════╝
        """
        return f"╚{'=' * self.inner_width}╝"
    # ------------------------------------------------------------

    # _________________________
    # Render banner to one string
    #
    # ------------------------------------------------------------ render()
    def render(self) -> str:
        """Render the full banner as a single string, including first lines, other lines if
            any, border elements.

        Example:
                ╔═══════════════╗
                ║  First line   ║ # Default alignment and isDivider
                ║               ║ # Second Line empty
                ║ Third Line    ║ # Aligns to the left and adds a divider
                ╠═══════════════╣
                ║ Fourth Line   ║ # Aligns to the right and default isDivider
```

```
                ╚═══════════════╝
        """
        # Add top border (e.g., "╔═══╗") banner string
        banner = [self._top()]
        # For each Loop, loops over the line tuple list (_lines)
        for line in self._lines:
            # Empty line tuple e.g., ()
            if not line:
                txt = ""
                align = self.DEFAULT_ALIGNMENT
                isDiv = self.DEFAULT_ISDIVIDER
            # Check if the line tuple has defaulted to string,
            # as a tuple with just one element, and if the element is a string, defaults to a
             string type
            # ("Option")
            elif isinstance(line, str):
                txt = line
                align = self.DEFAULT_ALIGNMENT
                isDiv = self.DEFAULT_ISDIVIDER
            # Line tuple with more than one element set
            # e.g. ("Option", "left") or ("Option", "left", True)
            else:
                txt = line[0]
                align = line[1]
                # set the divider flag to the default value if no flag value was set, else to
                  the set value
                isDiv = self.DEFAULT_ISDIVIDER if len(line) < 3 else line[2]
            # add text line (e.g., "║  First line  ╠" ) to banner string
            banner.append(self._text_line(txt, align))
            # add border divider (e.g., "╠═══╣") if flag is true to banner string
            if isDiv: banner.append(self._divider())
        # add bottom (e.g.,"╚═══╝") border to banner string
        banner.append(self._bottom())
        return "\n".join(banner) # add a return in the front of banner string
    # ------------------------------------------------------------- end render()

# ------------------------------------------------------------------------ end class Banner

# ____________________________________________________________________________
# Utility Classe Menu
#
# ============================================================================
# Menu Class Functionality (uses the Banner class)
# ============================================================================
# ------------------------------------------------------------------------ class Menu
```

```python
class Menu:
    """The menu class renders a console menu using the Banner class.

    Examples:
        >>> menu = Menu("Menu Example", ["Option", "Option", "Option"])
        >>> print(menu.render())
            ╔═══════════════════════╗
            ║     Menu Example      ║
            ╠═══════════════════════╣
            ║ 1. Option             ║
            ║ 2. Option             ║
            ║ 3. Option             ║
            ╚═══════════════════════╝
    """
    # ______________________
    # Constructor
    #
    # ------------------------------------------------------------- __init__()
    def __init__(
        self,
        title: str = "Menu",
        options: Sequence[str] = ["Option", "Option", "Option"],
        inner_width: int = 10,
    ) -> None:
        """Create a new menu.

        Args:
            title: title text displayed in the menu header
            options: option lines
            inner_width: the minimum inner banner width

        Examples:
            >>> menu = Menu("Menu", ["Start", "Exit"], inner_width=25)
        """
        # Validate we have at least one option; otherwise selection makes no sense
        if not options:
            raise ValueError("Menu requires at least one option.")
        # Initialize Variables with entered values
        self._title = title
        self._options = list(options)
        self._inner_width = inner_width
        # Add indices to the option using the list index, to be used as a selection choice
        self._numbered_options = [
            f"{index}. {text}" for index, text in enumerate(self._options, start=1)
        ]
```

```
        # Initialize banner first line by adding the menu header
        self._menu_lines = [ # First line of the Banner object
                (self._title, "center", True)
            ]
        # Initialize banner additional line by adding the menu options
        for option in self._numbered_options:
            self._menu_lines.append((option, "left"))

        # Instantiate the menu as a Banner object
        self._menu = Banner(self._menu_lines)
    # ------------------------------------------------------------ end __init__()

    # _________________________
    # Menu constructor helper methods
    #
    # ------------------------------------------------------------ _choices()
    def _choices(self) -> list[str]:
        """Return available choice indices as strings (e.g., ["1", "2"])

        Examples:
            >>> Menu("Menu Range", ["Option-1", "Obtion-2"])._choices()
            ['1', '2']
        """
        return [str(index) for index in range(1, len(self._options) + 1)]
    # ------------------------------------------------------------

    # ------------------------------------------------------------ _choice_index_range()
    def _choice_index_range(self) -> str:
        """Return a string of the index range (e.g., "1-3" or "1")

        Can be used to prompt user to enter a number related to the wanted option

        Examples:
            >>> Menu("Menu List", ["Option"])._choice_index_range()
            "1"
            >>> Menu("Menu List", ["Option-1", "Obtion-2"])._choice_index_range()
            "1-3"
        """
        options = self._choices() # List of choice indices
        # If there is only one option
        if len(options) == 1:
            return options[0] # "1"
        # Else range (e.g., "1-3")
        return f"{options[0]}-{options[-1]}"
```

```
    # ------------------------------------------------------------

    # ------------------------------------------------------------ _choice_index_list()
    def _choice_index_list(self) -> str:
        """Return a list of choices based on option indices (e.g., "1, 2, or 3")

        Can be used to prompt to enter a number related to the wanted option

        Examples:
            >>> menu = Menu("Menu list", ["Option"])._choice_index_list()
            "1"
            >>> Menu("Pair", ["First", "Second"])._choice_index_list()
            "1, or 2"
        """
        options = self._choices() # List of choice indices
        # only one choice index exists
        if len(options) == 1:
            return options[0] # "1"
        # Else list (e.g., "1, 2, or 3")
        return ", ".join(options[:-1]) + f", or {options[-1]}"
    # ------------------------------------------------------------

    # ------------------------------------------------------------ render()
    def render(self) -> "Banner Rendered":
        """Render the menu, including title and numbered options

        Examples:
            >>> menu = Menu("Menu Example", ["Option", "Option", "Option"])
            >>> print(menu.render())
            ╔═══════════════════════╗
            ║     Menu Example      ║
            ╠═══════════════════════╣
            ║ 1. Option             ║
            ║ 2. Option             ║
            ║ 3. Option             ║
            ╚═══════════════════════╝
        """
        return self._menu.render()
    # ------------------------------------------------------------

# ------------------------------------------------------------------------ end class Menu
```