

Applied Artificial Intelligence Project -1

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Domain: Product Cart Discount System (PCDS)

Product Cart Discount System is a rule-based expert system designed using JESS Rule Engine and can apply various discounts according to the admin input, customer input and coded rules.

In this system, the user is able to selectively modify certain rules through the Admin option and also add products to his/her cart through the Customer option. The system goes through several rules to apply various discounts and offers for items in the cart. Apart from the above-mentioned parameters, the customer also has the option to use store loyalty card, partner program discounts, student discount, frequent customer discount, VIP discount and coupons. Furthermore, shipping costs are also calculated based on various factors like address zone, free shipping on the particular product to certain countries and free shipping for purchase cost above a certain threshold.

Structure of the system – The system was designed to interact with the user by letting the user enter customer attributes, add products to the cart and checkout.

Due to the various rules and the complexity of the project, the system requires certain rules to be followed by user strictly.

1) The system is designed to be used in the following order:

- a) Select Admin option and modify rules
- b) Test it through Customer option
- c) Quit

Failure to do so might result in an undesirable output. a) and b) can be looped in that order.

2) The system requires input answer for a yes–no question as “y” or “n”.

3) The system requires the user to enter a number for a certain question where minimum cart cost to qualify for free shipping. Failure to do so might result in an undesirable output.

4) The country of residence of the user should be added as abbreviated initial form. Example: US, CA etc. The system supports free shipping to US and Canada (CA) only.

5) The system also ships every item separately.

Specifications:

The system has certain specification for discounts built into it. I'll attempt to specify these below:

- 1) All items that do not qualify for free shipping cost 10\$ for shipping.
- 2) There's a buy-one-get-one free offer on the pack of pens and erasers
- 3) Buy X get Y free offer is applied on pencil pack. Buying a pencil pack gets you a free sharpener.

- 4) Spending over a minimum threshold can get you free shipping. Default value is 35\$. It can be changed in admin page.
- 5) Frequent customers get 5% or 25\$ discount. (whichever is lower)
- 6) Product Bundles Offer: 100\$ off when buying both iPhone and Macbook.
- 7) Buy X items, Get Y items free: Buy 4 Levi's Tshirts and get 2 free.
- 8) Buy X items, Get discount on next item: Buy 3 Adidas T shirt and get 4th for 50%
- 9) Coupons "CXLRI" and "CXLRF" provide 20\$ off. Make sure you set all options for availing coupons.
- 10) Provides Customers with store membership with a 5% discount or 25\$ off whichever is lower. Only if admin has set it as TRUE.
- 11) Provides Customers with Partner membership with a 2% discount or 10\$ off whichever is lower. Only if admin has set it as TRUE.
- 12) Provides VIP Customer with a 20% discount. Only if admin has set it as TRUE.
- 13) Provides Student Customers with a 10% discount or 25\$ off whichever is lower.
- 14) The user gets to choose from the following menu of 28 products:

Product Menu

(product(cost 600) (item_no 1)(category "Electronics")(sale "y")(free_shipping "y")(free_shipping_zones "CA"))

(product(cost 1000) (item_no 2)(category "Electronics")(free_shipping "y")(free_shipping_zones "CA"))

(product(cost 1400) (item_no 3)(category "Electronics")(sale "y")(free_shipping "y")(free_shipping_zones "CA"))

(product(cost 90) (item_no 4)(category "Home Appliances")(sale "y"))

(product(cost 8) (item_no 5)(category "Home Appliances")(sale "y")(free_shipping "y")(free_shipping_zones "US"))

(product(cost 160) (item_no 6)(category "Home Appliances")(sale "y")(free_shipping "y")(free_shipping_zones "US"))

(product(cost 80) (item_no 7)(category "Home Appliances")(sale "y")(free_shipping "y")(free_shipping_zones "US"))

(product(cost 15) (item_no 8)(category "Clothing")(sale "y")(free_shipping "y")(free_shipping_zones "CA"))

(product(cost 20) (item_no 9)(category "Clothing")(sale "y")(free_shipping "y")(free_shipping_zones "CA"))

(product(cost 30) (item_no 10)(category "Clothing")(sale "y")(free_shipping
"y")(free_shipping_zones "CA"))

(product(cost 25) (item_no 11)(category "Clothing")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 25) (item_no 12)(category "Clothing")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 20) (item_no 13)(category "Clothing")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 17) (item_no 14)(category "Back to School")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 3) (item_no 15)(category "Back to School")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 3) (item_no 16)(category "Back to School")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 5) (item_no 17)(category "Back to School")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 20) (item_no 18)(category "Back to School")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 1) (item_no 19)(category "Back to School")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 1) (item_no 20)(category "Back to School")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 2) (item_no 21)(category "Back to School")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 35) (item_no 22)(category "Books")(free_shipping "y")(free_shipping_zones "CA"))

(product(cost 85) (item_no 23)(category "Books")(free_shipping "y")(free_shipping_zones "CA"))

(product(cost 110) (item_no 24)(category "Books")(sale "y")(free_shipping
"y")(free_shipping_zones "US"))

(product(cost 80) (item_no 25)(category "Books")(sale "y")(free_shipping "y")(free_shipping_zones "US"))

(product(cost 70) (item_no 26)(category "Books")(sale "y")(free_shipping "y")(free_shipping_zones "US"))

(product(cost 30) (item_no 27)(category "Books")(sale "y")(free_shipping "y")(free_shipping_zones "CA"))

(product(cost 90) (item_no 28)(category "Books")(sale "y")(free_shipping "y")(free_shipping_zones "CA"))

Admin Rules

The system allows the user to change the nature of certain rules in the admin section. I'll attempt to specify these below:

- 1) Option to accept multiple coupons in one transaction
- 2) Option to exclude discounted/marketed down products from using in conjunction with coupons. Coupons cannot be applied if there is sale product in your product cart.
- 3) Option to add discounts for frequent customers
- 4) Option to add discounts for VIP customers
- 5) Option to add discounts for partner programs and loyalty members
- 6) Alter free shipping threshold

Future Work

- 1) Need to make order of selection in user menu more robust.
- 2) Multiple free shipping countries need to be supported. Current free shipping countries are only US and Canada unless the cart exceeds a threshold.
- 3) Bonus points from loyalty programs can't be applied yet as no session is available.
- 4) The option for admin to set student discounts off needs to be added..
- 5) In multiple coupons scenario, an option to set maximum number of coupons that can be used in conjunction needs to be added.
- 6) A more complicated AI system can determine insights from shopping trends.
- 7) A portal to market to customers through discounts in off-peak seasons needs to be added.
- 8) Needs to create feature to add flash sales to urge customers to buy and for clearance.
- 9) Need to provide option to provide discount when product left in cart for long.
- 10) Need to give option to include expiration date for some discounts.
- 11) Delete,update products and other database persistence and storage features can be included, if required.

- 12) Only simple QA has been conducted and in-depth QA needs to be conducted for ironing out other bugs.
- 13) Validation for different aspects of product discounts Example: Student validation, address validation etc.

Test Cases:

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bash jess cartDiscount.clp
User Selection
1. Customer
2. Admin
3. Quit
Select the type of user and press Enter> 2
You can go ahead and change following rules.
Would you like to accept multiple coupons in one transaction?
y
Would you like to exclude discounted products from using in conjunction with coupons?
n
Would you like to give discounts to frequent customers?
y
Would you like to give discounts to VIP customers?
y
Would you like to add discounts for partner programs and loyalty members?
y
Would you like to provide free shipping for purchases above certain threshold?
y
Please specify the threshold over which it is consitituted as free shipping.
50
Welcome to IntelliBuy Store!
We bring you the best discounts and offers in USA!
User Selection
1. Customer
2. Admin
3. Quit
Select the type of user and press Enter> 1
Please provide some required information about yourself.
Are you a VIP customer?
y
Are you a student?
y
Country of Residence
US
Would you like to use your loyalty card for the Loyal Member Discount?
y
Are you part of our partner programs: Chase Credit Card Discount or Emirates Skywards?
y
Do you qualify for our frequent customer program?
y
Do you have any coupon codes that would like to use?
y
Products
Electronics
1. iPad Pro 9" Price:600
2. iPhone X Price:1000
3. Macbook Pro 2015 13" Price:1400
Home Appliances
4. Dirt Devil Vacuum Cleaner Price:90
5. Room Essentials Torcherie Lamp Price:8
6. Zinus Mattress Price:160
7. Zinus Bed Frame Price:80
Clothing
8. Adidas T-shirt Striped Price:15
9. Gap Shirt Price:20
10. Levi's Jeans Price:30
11. Giordano Jeans Price:25
12. Levi's T-shirt Price:25

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8. Adidas T-shirt Striped Price:15
9. Gap Shirt Price:20
10. Levi's Jeans Price:30
11. Giordano Jeans Price:25
12. Levi's T-shirt Price:25
13. Adidas Track pants Price:20

Back to School

14. Adidas School Bag Price:17
15. Reynolds Pen (14pack) Price:3
16. Faber Castell Pencil Set (12 pack) Price:3
17. Whiteboard Marker Price:5
18. Scientific Calculator Price:20
19. Eraser Price:1
20. Sharpener Price:1
21. Ruler Price:2

Books

22. Godel, Escher, Bach: An Eternal Golden Braid Price:35
23. Deep Learning Price:85
24. Artificial Intelligence: A Modern Approach Price:110
25. Algorithms Price:80
26. Introduction to Algorithms Price:70
27. Fundamentals of Digital Image Processing Price:30
28. Computer Vision: Algorithms and Applications Price:90

99. Checkout

100. Quit

2

Product added!

Enter your next selection

8

Product added!

Enter your next selection

8

Product added!

Enter your next selection

8

Product added!

Enter your next selection

8

Product added!

Enter your next selection

12

Product added!

Enter your next selection

12

Product added!

Enter your next selection

12

Product added!

Enter your next selection

12

Product added!

Enter your next selection

2

Product added!

Enter your next selection

15

Product added!

bash jess cartDiscount.clp

bash jess cartDiscount.clp 231x

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Enter your next selection
2
Product added!
Enter your next selection
15
Product added!
Enter your next selection
16
Product added!
Enter your next selection
19
Product added!
Enter your next selection
99
Item no.: 19 Quantity: 1 Added. Total Cart Shipping Cost: 0
Item no.: 19 Quantity: 1 Cart Cost: 1
Buy One Get One Offer Applied
New Quantity: 2
Item no.: 16 Quantity: 1 Cart Cost: 4
Item no.: 16 Quantity: 1 Added. Total Cart Shipping Cost: 0
Item no.: 15 Quantity: 1 Added. Total Cart Shipping Cost: 0
Item no.: 15 Quantity: 1 Cart Cost: 7
Buy One Get One Offer Applied
New Quantity: 2
Item no.: 2 Quantity: 2 Cart Cost: 2007
Item no.: 2 Quantity: 2 Added. Total Cart Shipping Cost: 20
Item no.: 12 Quantity: 4 Cart Cost: 2107
Item no.: 12 Quantity: 4 Added. Total Cart Shipping Cost: 20
Buy X items Get Y items Free Offer Applied
Item no.: 12 New Quantity: 6
Item no.: 8 Quantity: 4 Cart Cost: 2167
Item no.: 8 Quantity: 4 Added. Total Cart Shipping Cost: 60
Buy X Get Y Free Offer Applied
Item no.: 20 Quantity: 1 Added Free
Store Loyalty Members Offer Applied
Previous Cart Cost: 2167
New Cart Cost: 2142 Shipping Cost: 60
New Total Cost: 2202
Free Shipping Offer Applied
Previous Shipping Cost: 60
New Cart Cost: 2142 Shipping Cost: 0
New Total Cost: 2142
Item no.: 20 Quantity: 1 Added. Total Cart Shipping Cost: 0
Frequent Customer Offer Applied
Previous Cart Cost: 2142
New Cart Cost: 2117 Shipping Cost: 0
New Total Cost: 2117
Partner Loyalty Members Offer Applied
Previous Cart Cost: 2117
New Cart Cost: 2107 Shipping Cost: 0
New Total Cost: 2107
How many coupons do you have?
2
Enter coupon code:
CXLRI
Enter coupon code:
CXLRF
Coupons Applied
Total cost: 2067
VIP Customer Offer Applied
Previous Cart Cost: 2067
New Cart Cost: 1653.6000000000001 Shipping Cost: 0
New Total Cost: 1653.6000000000001
Student Discount Offer Applied
Previous Cart Cost: 1653.6000000000001
New Cart Cost: 1628.6000000000001 Shipping Cost: 0
New Total Cost: 1628.6000000000001
Welcome to IntelliBuy Store!
We bring you the best discounts and offers in USA!
```

Expected Output:

- The expert system would give you various discount for the user based on the products checked out and the customer attributes. Rules be set by admin are mostly False by default. Setting it to true allows the user to get more discount. The cart cost is recalculated after each discount is applied and displayed to user.

Instructions to run the system:

- Save the "cartDiscount.clp" file in the "Jess71p2\bin\" folder on your local system.
- On Windows, go to the command line interface for Jess and execute the file using the batch command along with the correct location of the file on the system (batch "cartDiscount.clp"). On Linux machines, go to CLI and execute file by entering "batch jess cartDiscount.clp"