Program 2, 5 and 8 (Boundary, Equivalence and Decision Table for Commission Problem)

/* Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of boundary value, derive test cases, execute these test cases and discuss the test results */

/* Assumption price for lock=45.0, stock=30.0 and barrels=25.0, production limit that could be sold in a month is 70 locks, 80 stocks and 90 barrels. Commission on sales = 10 % on sales <= 1000 and 15 % on 1001 to 1800 and 20 % on above 1800*/

```
#include<stdio.h>
int main()
{
        Int locks, stocks, barrels, tlocks, tstocks, tbarrels;
        float lprice, sprice, bprice, sales, comm;
        int c1,c2,c3,temp;
        lprice=45.0;
        sprice=30.0;
        bprice=25.0;
        tlocks=0;
        tstocks=0;
        tbarrels=0;
        printf("\n enter the number of locks and to exit the loop enter -1 for locks\n");
        scanf("%d", &locks);
        while (locks! = -1)
        {
              c1= (locks<=0 || locks>70);
              printf("enter the number of stocks and barrels\n");
              scanf("%d%d", &stocks, &barrels);
              c2=(stocks<=0 || stocks>80);
              c3=(barrels<=0 || barrels>90);
              if(c1)
                    printf("value of locks not in the range 1..70  ");
              else
              {
                    temp=tlocks+locks;
                    if(temp>70)
                          printf("new total locks =%d not in the range 1..70 ", temp);
                    else
                           tlocks=temp;
              }
               printf("total locks = %d\n", tlocks);

               if(c2)
                    printf("value of stocks not in the range 1..80  ");
               else
               {
                    temp=tstocks+stocks;
```

```
                if(temp>80)
                    printf("new total stocks =%d  not in the range 1..80 ", temp);

                else
                        tstocks=temp;
            }
            printf("total stocks=%d\n", tstocks);

            if(c3)
                printf("value of barrels not in the range 1..90  ");
            else
              {
                temp=tbarrels+barrels;
                if(temp>90)
                        printf("new total barrels =%d not in the range 1..90 ", temp);
                else
                         tbarrels=temp;
               }
            printf("total barrels=%d", tbarrels);
            printf("\n enter the number of locks and to exit the loop enter -1 for locks \n");
            scanf("%d", &locks);
    }
    printf("\n total locks = %d\n total stocks =%d\n total barrels =%d\n", tlocks, tstocks, tbarrels);
    sales = lprice*tlocks + sprice*tstocks + bprice*tbarrels;
    printf("\n the total sales=%f\n", sales);
    if(sales > 0)
    {
          if(sales > 1800.0)
          {
              comm=0.10*1000.0;
              comm=comm+0.15*800;
              comm=comm+0.20*(sales-1800.0);
          }
         else if(sales > 1000)
         {
               comm =0.10*1000;
               comm =comm+0.15*(sales-1000.0);
         }
          else
               comm=0.10*sales;
                printf("the commission is=%f\n", comm);
     }
    else
          printf("there is no sales\n");
          return 0;
}
```

Test Case Name : Boundary Value for Commission Problem
Experiment Number : 2
Test data : price for lock = 45.0 , stock = 30.0 and barrel = 25.0
sales = total locks * lock price + total stocks * stock price + total barrels * barrel price
commission : 10% up to sales Rs 1000 , 15 % for the next Rs 800 and 20 % on any sales in excess of 1800
Pre-condition : lock = -1 to exit and 1< =lock < = 70 , 1<=stock <=80 and 1<=barrel<=90
Brief Description: The salesperson had to sell at least one complete rifle per month.

Commission Problem Boundary Value Analysis Test Cases

Case Id	Description	Input Data			Expected Output		Actual output		Status	Comment
		Total Locks	Total Stocks	Total Barrels	Sales	Comm-ission	Sales	Comm-ission		
1	Set locks and stocks as nominal value and vary barrels value.	35	40	1	2800					
2	Set locks and stocks as nominal value and vary barrels value.	35	40	2	2825					
3	Set locks and stocks as nominal value and vary barrels value.	35	40	45	3900					
4	Set locks and stocks as nominal value and vary barrels value.	35	40	89	5000					
5	Set locks and stocks as nominal value and vary barrels value.	35	40	90	5025					
6	Set locks and barrels as nominal value and vary stocks value	35	1	45	2730					
7	Set locks and barrels as nominal value and vary stocks value	35	2	45	2760					
8	Set locks and barrels as nominal value and vary stocks value	35	40	45	3900					
9	Set locks and barrels as nominal value and vary stocks value	35	79	45	5070					
10	Set locks and barrels as nominal value and vary stocks value	35	80	45	5100					

11	Set stocks and barrels as nominal value and vary locks value	1	40	45	2370					
12	Set stocks and barrels as nominal value and vary locks value	2	40	45	2415					
13	Set stocks and barrels as nominal value and vary locks value	35	40	45	3900					
14	Set stocks and barrels as nominal value and vary locks value	69	40	45	5430					
15	Set stocks and barrels as nominal value and vary locks value	70	40	45	5475					

Commission Problem Output Boundary Value Analysis Test Cases

Case Id	Description	Input Data			Expected Output		Actual output		Status	
		Total Locks	Total Stocks	Total Barrels	Sales	Comm-ission	Sales	Comm-ission		Comment
1	Enter the min value for locks, stocks and barrels	1	1	1	100	10				output minimum
2	Enter the min value for 2 items and min +1 for any one item	1	1	2	125	12.5				output minimum +
3		1	2	1	130	13				output minimum +
4		2	1	1	145	14.5				output minimum +
5	Enter the value sales approximately mid value between 100 to 1000	5	5	5	500	50				Midpoint
6	Enter the values to calculate the commission for sales nearly less than 1000	10	10	9	975	97.5				Border point -
7		10	9	10	970	97				Border point -
8		9	10	10	955	95.5				Border point -
9	Enter the values sales exactly equal to 1000	10	10	10	1000	100				Border point

10	Enter the values to calculate the commission for sales nearly greater than 1000	10	10	11	1025	103.75				Border point +
11		10	11	10	1030	104.5				Border point +
12		11	10	10	1045	106.75				Border point +
13	Enter the value sales approximately mid value between 1000 to 1800	14	14	14	1400	160				Midpoint
14	Enter the values to calculate the commission for sales nearly less than 1800	18	18	17	1775	216.25				Border point -
15		18	17	18	1770	215.5				Border point -
16		17	18	18	1755	213.25				Border point -
17	Enter the values sales exactly equal to 1800	18	18	18	1800	220				Border point
18	Enter the values to calculate the commission for sales nearly greater than 1800	18	18	19	1825	225				Border point +
19		18	19	18	1830	226				Border point +
20		19	18	18	1845	229				Border point +
21	Enter the value sales approximately mid value between 1800 to 7800	48	48	48	4800	820				Midpoint
22	Enter the max value for 2 items and max - 1 for any one item	70	80	89	7775	1415				Output maximum -
23		70	79	90	7770	1414				Output maximum -
24		69	80	90	7755	1411				Output maximum -
25	Enter the max value for locks, stocks and barrels	70	80	90	7800	1420				Output maximum

Output Special Value Test Cases

Case Id	Description	Input Data			Expected Output		Actual output			
		Total Locks	Total Stocks	Total Barrels	Sales	Comm-ission	Sales	Comm -ission	Status	Comment
1	Enter the random values such that to calculate commission for sales nearly less than 1000	11	10	8	995	99.5				Border point -
2	Enter the random values such that to calculate commission for sales nearly greater than 1000	10	11	9	1005	100.75				Border point +
3	Enter the random values such that to calculate commission for sales nearly less than 1800	18	17	19	1795	219.25				Border point -
4	Enter the random values such that to calculate commission for sales nearly greater than 1800	18	19	17	1805	221				Border point +

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	✓	✓	✓	✓						✓			✓	✓	✓

Test Case Name :Equivalence Class for Commission Problem

Experiment Number : 5

Test data : price for lock = 45.0 , stock = 30.0 and barrel = 25.0

sales = total locks * lock price + total stocks * stock price + total barrels * barrel price

commission : 10% up to sales Rs 1000 , 15 % of the next Rs 800 and 20 % on any sales in excess of 1800

Pre-condition : lock = -1 to exit and 1< =lock < = 70 , 1<=stock <=80 and 1<=barrel<=90

Brief Description: The salesperson has rto sell at least one complete rifle per month.

Valid Classes

L1 ={ Locks :1 <= Locks <=70}

L2 ={Locks=-1}(occurs if locks=-1 is used to control input iteration)

L3 ={stocks : 1<=stocks<=80}

L4= {barrels :1<=barrels<=90}

Invalid Classes

L3 ={locks: locks=0 **OR** locks<-1}

L4 ={locks: locks> 70}

S2 ={stocks : stocks<1}

S3 ={stocks : stocks >80}

B2 ={barrels : barrels <1}

B3 =barrels : barrels >90}

Commission Problem Output Equivalence Class Testing

Weak & Strong Normal Equivalence Class

Case Id	Description	Input Data			Expected Output		Actual output		Status	Comment
		Total Locks	Total Stocks	Total Barrels	Sales	Commission	Sales	Commission		
WN1 /SN1	Enter the value within the range for locks, stocks and barrels	35	40	45	3900	640				

Weak Robustness Equivalence Class

Case Id	Description	Input Data			Expected Output	Actual output	Status	Comment
		Locks	Stocks	Barrels				
WR1	Enter the valid values for locks, stocks and barrels	10	10	10	$100			
WR2	Enter the value locks = -1	-1	40	45	Terminates the input loop and proceed to calculate sales and commission (if Sales > 0)			
WR3	Enter the value less than -1 or equal to **zero** for locks and other valid inputs	-2	40	45	Value of Locks not in the range 1..70			
WR4	Enter the value greater than 70 for locks and other valid inputs	71	40	45	Value of Locks not in the range 1..70			
WR5	Enter the value less than or equal to 0 for stocks and other valid inputs	35	-1	45	Value of stocks not in the range 1..80			
WR6	Enter the value greater than 80 for stocks and other valid inputs	35	81	45	Value of stocks not in the range 1..80			
WR7	Enter the value less than or equal 0 for barrels and other valid inputs	35	40	-1	Value of Barrels not in the range 1..90			
WR8	Enter the value greater than 90 for barrels and other valid inputs	35	40	91	Value of Barrels not in the range 1..90			

Strong Robustness Equivalence Class

Case Id	Description	Input Data			Expected Output	Actual output	Status	Comment
		Locks	Stocks	Barrels				
SR1	Enter the value less than -1 for locks and other valid inputs	-2	40	45	Value of Locks not in the range 1..70			
SR2	Enter the value less than or equal than 0 for stocks and other valid inputs	35	-1	45	Value of stocks not in the range 1..80			
SR3	Enter the value less than or equal 0 for barrels and other valid inputs	35	40	-1	Value of Barrels not in the range 1..90			

SR4	Enter the locks and stocks less than or equal to 0 and other valid inputs	-2	-1	45	Value of Locks not in the range 1..70			
					Value of stocks not in the range 1..80			
SR5	Enter the locks and barrel less than or equal to 0 and other valid inputs	-2	40	-1	Value of Locks not in the range 1..70			
					Value of Barrels not in the range 1..90			
SR6	Enter the stocks and barrel less than or equal to 0 and other valid inputs	35	-1	-1	Value of stocks not in the range 1..80			
					Value of Barrels not in the range 1..90			
SR7	Enter the stocks and barrel less than or equal to 0 and other valid inputs	-2	-1	-1	Value of Locks not in the range 1..70			
					Value of stocks not in the range 1..80			
					Value of Barrels not in the range 1..90			

Equivalence Class Testing for Output range

We could define equivalence classes for output commission range as follows,
S1 = {<locks, stocks, barrels >: **sales ≤ 1000**}
S2 = {<locks, stocks, barrels >: **1000< sales ≤ 1800**}
S3 = {<locks, stocks, barrels >: **sales > 1800**}

Case Id	Description	Input Data			Expected Output		Actual output			
		Total Locks	Total Stocks	Total Barrels	Sales	Commission	Sales	Commission	Status	Comment
OR1	Enter the value for lock, stocks and barrels where 0 < Sales <= 1000	5	5	5	500	50				
OR2	Enter the value for lock, stocks and barrels where 1000 < Sales <=1800	15	15	15	1500	175				
OR3	Enter the value for lock, stocks and barrels where Sales > 1800	25	25	25	2500	360				

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO2	✓	✓	✓	✓						✓			✓	✓	✓

Test Case Name :Decision Table for Commission Problem

Experiment Number : 8

Test data : price for lock = 45.0 , stock = 30.0 and barrel = 25.0
sales = total locks * lock price + total stocks * stock price + total barrels * barrel price
commission : 10% up to sales Rs 1000 , 15 % of the next Rs 800 and 20 % on any sales in excess of 1800

Pre-condition : lock = -1 to exit and 1< =lock < = 70 , 1<=stock <=80 and 1<=barrel<=90

Brief Description: The salesperson had to sell at least one complete rifle per month.

Input data decision Table

RULES		R1	R2	R3	R4	R5	R6	R7	R8	R9
Conditions	C1: Locks = -1	T	F	F	F	F	F	F	F	F
	C2 : 1 ≤ Locks ≤ 70	-	T	T	F	T	F	F	F	T
	C3 : 1 ≤ Stocks ≤ 80	-	T	F	T	F	T	F	F	T
	C4 : 1 ≤ Barrels ≤ 90	-	F	T	T	F	F	T	F	T
Actions	A1 : Terminate the input loop	X								
	A2 : Invalid locks input				X		X	X	X	
	A3 : Invalid stocks input			X		X		X	X	
	A4 : Invalid barrels input		X			X	X		X	
	A5 : Calculate total locks, stocks and barrels		X	X	X	X	X	X		X
	A6: Calculate Sales	X								
	A7: proceed to commission decision table	X								

Commission calculation Decision Table (Precondition : lock = -1)

RULES		R1	R2	R3	R4
Conditions	C1 : Sales = 0	T	F	F	F
	C2 : Sales > 0 AND Sales ≤ 1000		T	F	F
	C3 : Sales > 1000 AND sales ≤ 1800			T	F
	C4 : sales >1800				T
Actions	A1 : Terminate the program	X			
	A2 : comm= 10%*sales		X		
	A3 : comm = 10%*1000 + (sales-1000)*15%			X	
	A4 : comm = 10%*1000 + 15% * 800 + (sales-1800)*20%				X

Precondition : Initial Value Total Locks= 0 , Total Stocks=0 and Total Barrels=0

Precondition Limit :Total locks, stocks and barrels should not exceed the limit 70,80 and 90 respectively

Commission Problem -Decision Table Test cases for input data

Case Id	Description	Input Data			Expected Output	Actual Output	Status	Comments
		Locks	Stocks	Barrels				
1	Enter the value of Locks= -1	-1			Terminate the input loop check for sales if(sales=0) exit from program else calculate commission			
2	Enter the valid input for locks and stocks and invalid for barrels	20	30	-5	Total of locks, stocks is updated if it is within a precondition limit and Should display value of barrels is not in the range 1..90			
3	Enter the valid input for locks and barrrels and invalid for stocks	15	-2	45	Total of locks, barrels is updated if it is within a precondition limit and Should display value of stocks is not in the range 1..80			
4	Enter the valid input for stocks and barrrels and invalid for locks	-4	15	16	Total of stocks , barrels is updated if it is within a precondition limit and Should display value of locks is not in the range 1..70			
5	Enter the valid input for locks and invalid value for stocks and barrels	15	81	100	Total of locks is updated if it is within a precondition limit and **(i)**Should display value of stock is not in the range 1..80 **(ii)**Should display value of barrels is not in the range 1..90			
6	Enter the valid input for stocks and invalid value for locks and barrels	88	20	99	Total of stocks is updated if it is within a precondition limit and **(i)**Should display value of lock is not in the range 1..70 **(ii)**Should display value of barrels is not in the range 1..90			
7	Enter the valid input for barrels and invalid value for locks and stocks	100	200	25	Total of barrels is updated if it is within a precondition limit and **(i)**Should display value of lock is not in the range 1..70 **(ii)**Should display value of stocks is not in the range 1..80			
8	Enter the invalid input for lock , stocks and barrels	-5	400	-9	**(i)**Should display value of lock is not in the range 1..70 **(ii)**Should display value of stocks is not in the range 1..80 **(iii)**Should display value of barrel in not in the range 1..90			

9	Enter the valid input for lock, stocks and barrels	15	20	25	Total of locks,stocks and barrels is updated if it is within a precondition limit and calculate the sales and proceed to commission			

Commission Problem -Decision Table Test cases for commission calculation

Precondition : Locks = -1

Case Id	Description	Input Data	Expected Output		Actual Output	Status	Comments
		Sales	Commission	Values			
1	Check the value of sales	0	Terminate the program where commission is zero	0			
2	if sales value within these range(Sales >0 AND Sales ≤ 1000)	900	Then commission = 0.10*sales	90			
3	if sales value within these range(Sales > 1000 AND Sales ≤ 1800)	1400	Then commission = 0.10*1000 + 0.15*(sales - 1000)	160			
4	if sales value within these range(Sales > 1800	2500	Then commission = 0.10*1000 + 0.15*800 + 0.20 *(sales - 1800)	340			

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO3	✓	✓	✓	✓						✓			✓	✓	✓