Program 1 and 4 (Boundary Value and Equivalence Class Analysis program)

/* Design and develop a program in a language of your choice to solve the triangle problem defined as follows : Accept three integers which are supposed to be the three sides of triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary value analysis, execute the test cases and discuss the results */

```
#include<stdio.h>
int main()
{
int a,b,c,c1,c2,c3;
char istriangle;
do
{
printf("\n enter 3 integers which are sides of triangle\n");
scanf("%d%d%d", &a, &b, &c);
printf("\n a=%d\t b=%d\t c=%d", a, b, c);
        c1 = a>=1 &&  a<=10;
        c2= b>=1 &&  b<=10;
        c3= c>=1 &&  c<=10;
 if (!c1)
 printf("\n the value of a=%d is not the range of permitted value", a);
 if (!c2)
printf("\n the value of b=%d is not the range of permitted value", b);
if (!c3)
printf("\n the value of c=%d is not the range of permitted value", c);
} while(!(c1 && c2 && c3));
```

// to check is it a triangle or not

```
if( a<b+c && b<a+c && c<a+b )
istriangle='y';
else
istriangle ='n';
if (istriangle=='y')
if ((a==b) && (b==c))
printf("equilateral triangle\n");
else if ((a!=b) && (a!=c) && (b!=c))
printf("scalene triangle\n");
   else
printf("isosceles triangle\n");
else
printf("Not a triangle\n");
return 0;
}
```

Test Case Name :Boundary Value Analysis for triangle problem

Experiment Number : 1

Test Data : Enter the 3 Integer Value(a , b And c)

Pre-condition : $1 \leq a \leq 10$, $1 \leq b \leq 10$ and $1 \leq c \leq 10$ and $a < b + c$, $b < a + c$ and $c < a + b$

Brief Description : Check whether given value for a Equilateral, Isosceles , Scalene triangle or can't form a triangle

Triangle Problem -Boundary value Test cases for input data

Case Id	Description	Input Data			Expected Output	Actual Output	Status	Comments
		a	b	c				
1	Keep a and b at nominal value and vary c	5	5	1	Should display the message Isosceles triangle			
2	Keep a and b at nominal value and vary c	5	5	2	Should display the message Isosceles triangle			
3	Keep a and b at nominal value and vary c	5	5	5	Should display the message Equilateral triangle			
4	Keep a and b at nominal value and vary c	5	5	9	Should display the message Isosceles triangle			
5	Keep a and b at nominal value and vary c	5	5	10	Should display the message Not a triangle			
6	Keep a and cat nominal value and vary b	5	1	5	Should display the message Isosceles triangle			
7	Keep a and c at nominal value and vary b	5	2	5	Should display the message Isosceles triangle			
8	Keep a and c at nominal value and vary b	5	5	5	Should display the message Equilateral triangle			

9	Keep a and c at nominal value and vary b	5	9	5	Should display the message Isosceles triangle			
10	Keep a and c at nominal value and vary b	5	10	5	Should display the message Not a triangle			
11	Keep b and cat nominal value and vary a	1	5	5	Should display the message Isosceles triangle			
12	Keep b and c at nominal value and vary a	2	5	5	Should display the message Isosceles triangle			
13	Keep b and c at nominal value and vary a	5	5	5	Should display the message Equilateral triangle			
14	Keep b and c at nominal value and vary a	9	5	5	Should display the message Isosceles triangle			
15	Keep b and c at nominal value and vary a	10	5	5	Should display the message Not a triangle			

Triangle Problem Worst-Case-Test Cases (one corner of a triangle)

Case	Description	a	b	c	Expected Output	Actual Output	Status	Comments
1	Enter the **min value** for a , b and c	**1**	1	**1**	Should display the message as Equilateral triangle			
2	Enter the **min value** for 2 items and **min +1** for any one item	**1**	1	**2**	Should display the message as Not a Triangle			
3	Enter the **min value** for 2 items and **Average value** for any one item	**1**	1	**5**	Should display the message as Not a Triangle			
4	Enter the **min value** for 2 items and **Max -1** for any one item	**1**	1	**9**	Should display the message as Not a Triangle			
5	Enter the **min value** for 2 items and **Max** for any one item	**1**	1	**10**	Should display the message as Not a Triangle			
6	Enter the **min value** for 2 items and **min +1** for any one item	**1**	2	**1**	Should display the message as Not a Triangle			
7	Enter the **min+1 value** for 2 items and **min** for any one item	**1**	2	**2**	Should display the message as Isosceles			
8	Enter the **min value** for **1 items, min+1** and **Average value** for any one item	**1**	2	**5**	Should display the message as Not a Triangle			
9	Enter the **min value** for **1 items, min+1** and **max-1** for any one item	**1**	2	**9**	Should display the message as Not a Triangle			
10	Enter the **min value** for **1 items, min+1** and **max** for any one item	**1**	2	**10**	Should display the message as Not a Triangle			

11	Enter the **min value** for 2 **items, average value** for any one item	**1**	5	**1**	Should display the message as Not a Triangle			
12	Enter the **min value** for **1 items, min+1** and **average** for any one item	**1**	5	**2**	Should display the message as Not a Triangle			
13	Enter the **min value** for **1 items,** and **average** for any 2 items	**1**	5	**5**	Should display the message as Isosceles			
14	Enter the **min value** for **1 items, max-1** and **average** for any one item	**1**	5	**9**	Should display the message as Not a Triangle			
15	Enter the min value for **1 items, max** and **average** for any one item	**1**	5	**10**	Should display the message as Not a Triangle			
16	Enter the **min value** for 2 items and **max -1** for any one item1	**1**	9	**1**	Should display the message as Not a Triangle			
17	Enter the **min value** for **1 items, min+1** and **max-1** for any one item	**1**	9	**2**	Should display the message as Not a Triangle			
18	Enter the **min value** for **1 items, max-1**and **Average value** for any one item	**1**	9	**5**	Should display the message as Not a Triangle			
19	Enter the **min value** for**1 items, max-1**for 2 items	**1**	9	**9**	Should display the message as Isosceles			
20	Enter the **min value** for **1 items, max-1**and **Max value** for any one item	**1**	9	**10**	Should display the message as Not a Triangle			
21	Enter the **min value** for **2 items** and **max** for any one item	**1**	10	**1**	Should display the message as Not a Triangle			

22	Enter the **min value** for **1 items, min+1** and **max** for any one item	**1**	10	**2**	Should display the message as Not a Triangle			
23	Enter the **min value** for **1 items, max** and **Average value** for any one item	**1**	10	**5**	Should display the message as Not a Triangle			
24	Enter the **min value** for **1 items, max-1** , and **max** for 1 items	**1**	10	**9**	Should display the message as Not a Triangle			
25	Enter the **min value** for **1 items,** and **Max value** for 2 items	**1**	10	**10**	Should display the message as Isosceles			

Special Value Test Cases

Case	Description	a	b	c	Expected Output	Actual Output	Status	Comments
1	Enter the **values** for a , b and c	**5**	8	**6**	Should display the message as Scalene triangle			
2	Enter the **out of boundary value** for a and b and **normal** value for c	**11**	0	**5**	Should display the message as value of a and b not in the permitted range			
3	Enter the **negative value** for a, b and c	**-1**	-4	**-6**	Should display the message as value of a, b and c not in the permitted range			
4	Enter the **values** for a , b and c	**5**	**1**	**10**	Should display the message as Not a Triangle			

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

Test Case Name :Equivalence Class Analysis for triangle problem

Experiment Number : 4

Test Data: Enter the 3 Integer Value (a, b and c)

Pre-condition : $1 \leq a \leq 10$, $1 \leq b \leq 10$ and $1 \leq c \leq 10$ and $a < b + c$, $b < a + c$ and $c < a + b$

Brief Description : Check whether given value for a Equilateral, Isosceles, Scalene triangle or can't form a triangle

Triangle Problem - Equivalence Class Test cases

Weak and Strong Normal Equivalence class Testing

Case Id	Description	Input Data			Expected Output	Actual Output	Status	Comments
		a	b	c				
WN1/SN1	Enter the nom value for a , b and c	5	5	5	Should display the message Equilateral triangle			
WN2/SN2	Enter the valid value for a , b and c	2	2	3	Should display the message Isosceles triangle			
WN3/SN3	Enter the valid value for a , b and c	3	4	5	Should display the message Scalene triangle			
WN4/SN4	Enter the valid value for a , b and c	4	1	2	Message should be displayed can't form a triangle			

Weak Robust Equivalence Class Testing

WR1	Enter one invalid input and two valid value for a , b and c	-1	5	5	Should display value of a is not in the range of permitted values			
WR2	Enter one invalid input and two valid value for a , b and c	5	-1	5	Should display value of b is not in the range of permitted values			
WR3	Enter one invalid input and two valid value for a , b and c	5	5	-1	Should display value of c is not in the range of permitted values			
WR4	Enter one invalid input and two valid value for a , b and c	11	5	5	Should display value of a is not in the range of permitted values			
WR5	Enter one invalid input and two valid value for a , b and c	5	11	5	Should display value of b is not in the range of permitted values			
WR6	Enter one invalid input and two valid value for a , b and c	5	5	11	Should display value of c is not in the range of permitted values			

Strong Robust Equivalence class Testing								
SR1	Enter one invalid input and two valid value for a , b and c	-1	5	5	Should display value of a is not in the range of permitted values			
SR2	Enter one invalid input and two valid value for a , b and c	5	-1	5	Should display value of b is not in the range of permitted values			
SR3	Enter one invalid input and two valid value for a , b and c	5	5	-1	Should display value of c is not in the range of permitted values			
SR4	Enter two invalid input and one valid value for a , b and c	-1	-1	5	Should display value of a and b are not in the range of permitted values			
SR5	Enter two invalid input and one valid value for a , b and c	5	-1	-1	Should display value of b and c are not in the range of permitted values			
SR6	Enter two invalid input and one valid value for a , b and c	-1	5	-1	Should display value of a and c are not in the range of permitted values			
SR7	Enter all invalid inputs	-1	-1	-1	Should display value of a, b and c are not in the range of permitted values			

Test Case Name :Decision table for triangle problem

Experiment Number : 7

Test Data : Enter the 3 Integer Value(a , b And c)

Pre-condition : a < b + c , b < a + c and c < a + b

Brief Description : Check whether given value for a equilateral, isosceles , Scalene triangle or can't form a triangle

Input data decision Table

RULES		**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**	**R10**	**R11**
Conditions	C1: a < b + c	F	T	T	T	T	T	T	T	T	T	T
	C2 : b < a + c	-	F	T	T	T	T	T	T	T	T	T
	C3 : c < a + b	-	-	F	T	T	T	T	T	T	T	T
	C4 : a = b	-	-	-	T	T	T	T	F	F	F	F
	C5 : a = c	-	-	-	T	T	F	F	T	T	F	F
	C6 : b = c	-	-	-	T	F	T	F	T	F	T	F
Actions	a1 : Not a triangle	X	X	X								
	a2 : Scalene triangle											X
	a3 : Isosceles triangle							X		X	X	
	a4 : Equilateral triangle				X							
	a5 : Impossible					X	X		X			

Triangle Problem -Decision Table Test cases for input data

Case Id	Description	Input Data			Expected Output	Actual Output	Status	Comments
		a	b	c				
1	Enter the value of a, b and c Such that a is not less than sum of two sides	20	5	5	Message should be displayed can't form a triangle			
2	Enter the value of a, b and c Such that b is not less than sum of two sides and a is less than sum of other two sides	3	15	11	Message should be displayed can't form a triangle			
3	Enter the value of a, b and c Such that c is not less than sum of two sides and a and b is less than sum of other two sides	4	5	20	Message should be displayed can't form a triangle			
4	Enter the value a, b and c satisfying precondition and a=b, b=c and c=a	5	5	5	Should display the message Equilateral triangle			
5	Enter the value a ,b and c satisfying precondition and a=b and b ≠ c	10	10	9	Should display the message Isosceles triangle			
6	Enter the value a, b and c satisfying precondition and a ≠b , b ≠ c and c ≠ a	5	6	7	Should display the message Scalene triangle			