

IT-314

Software Engineering Lab-8 Testing

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Question 1

Equivalence Class Test Cases:

Test Case No	Day	Month	Year	Expected Output	Equivalence Classes
1	15	5	2000	14-05-2000	Valid date
2	1	1	2000	31-12-1999	Boundary test, new year
3	29	2	2004	28-02-2004	Leap year February
4	1	3	2004	29-02-2004	Leap year, prev date is 29-02
5	31	12	2015	30-12-2015	End of year
6	31	4	2000	Invalid Date	Invalid day for April (only 30 days)
7	31	2	2000	Invalid Date	February cannot have 31 days
8	29	2	2001	Invalid Date	Non-leap year February
9	0	5	2000	Invalid Date	Invalid day, less than 1
10	15	13	2000	Invalid Date	Invalid month, greater than 12
11	15	5	1899	Invalid Date	Invalid year, less than 1900

Question 2

Program 1

Linear Search

- **Class A1:** Array is empty (size = 0).
- **Class A2:** Array contains the value v (valid case where v is present in a[]).
- **Class A3:** Array does not contain the value v (valid case where v is absent in a[]).
- **Class A4:** Array contains multiple occurrences of v.

Input: Value v (element to search)

- **Class V1:** Value v is found in the array.
- **Class V2:** Value v is not found in the array.

Input: Array size

- **Class S1:** Array has only one element.
- **Class S2:** Array has multiple elements.

Test Case No	Input value	Array	Expected Output	Classes Covered
1	5	{}	-1	A1, V2
2	3	{3}	0	A2, V1, S1
3	7	{1,2,3,4,5,6}	-1	A3, V2, S2
4	4	{1,2,3,4,5,6}	3	A2, V1, S2
5	2	{2,2,2,2}	0	A4, V1
6	9	{5,7,9,12,9,15}	2	A4, V1
7	4	{10,11,12}	-1	A3, V2, S2
8	12	{12}	0	A2, V1, S1

Program 2

Count-Item

- **Class A1:** Array is empty (size = 0).
- **Class A2:** Array contains the value v (valid case where v is present in a[]).
- **Class A3:** Array does not contain the value v (valid case where v is absent in a[]).
- **Class A4:** Array contains multiple occurrences of v.

Input: Value v (element to search)

- **Class V1:** Value v is found in the array.
- **Class V2:** Value v is not found in the array.

Input: Array size

- **Class S1:** Array has only one element.
- **Class S2:** Array has multiple elements.

Test Case No	Input value	Array	Expected Output	Classes Covered
1	5	{}	-1	A1, V2
2	3	{3}	0	A2, V1, S1
3	7	{1,2,3,4,5,6}	-1	A3, V2, S2
4	4	{1,2,3,4,5,6}	3	A2, V1, S2
5	2	{2,2,2,2}	0	A4, V1
6	9	{5,7,9,12,9,15}	2	A4, V1
7	4	{10,11,12}	-1	A3, V2, S2
8	12	{12}	0	A2, V1, S1

Program 3

- **Class A1:** Array is empty (size = 0).
- **Class A2:** Array contains the value v (valid case where v is present in $a[]$).
- **Class A3:** Array does not contain the value v (valid case where v is absent in $a[]$).
- **Class A4:** Array contains multiple occurrences of v .
- **Class A5:** Array is sorted in non-decreasing order.

Input: Value v (element to search)

- **Class V1:** Value v is found in the array.
- **Class V2:** Value v is not found in the array.

Input: Array size

- **Class S1:** Array has only one element.
- **Class S2:** Array has multiple elements.

Test Case No	Input Value	Array	Expected Output	Classes covered
1	5	{}	-1	A1,V2
2	3	{3}	0	A2, V1, S1
3	7	{1,2,3,4,5,6}	-1	A3, V2, S2
4	4	{1,2,3,4,5,6}	3	A2, V1, S2
5	2	{2,2,2,2}	1	A4
6	9	{1,2,3,4,5,6,9,12}	6	A2,V1, S2
7	4	{10,11,12}	-1	A3, V2, S2
8	12	{12}	0	A2, V1, S1
9	8	{1,2,3,4,5,6,7}	-1	A3, V2, S2

Program 4

Input: Triangle validity

- **Class T1:** Invalid triangle (any side is greater than or equal to the sum of the other two sides).
- **Class T2:** Valid triangle.

Input: Triangle type

- **Class E1:** Equilateral triangle (all sides are equal).
- **Class E2:** Isosceles triangle (exactly two sides are equal).
- **Class E3:** Scalene triangle (all three sides are different).

Input: Side lengths

- **Class S1:** Positive integers for all sides.

Test Case No	a	b	c	Expected Output	Classes Covered
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1	1	2	3	INVALID	T1
2	5	5	5	EQUILATERAL	T2,E1
3	5	5	8	ISOSCELES	T2,E2
4	7	10	5	SCALENE	T2,E3
5	2	2	4	INVALID	T1
6	8	10	12	SCALENE	T2,E3
7	10	10	15	ISOSCELES	T2,E2
8	1	1	2	INVALID	T1
9	3	8	10	SCALENE	T2,E3
10	6	3	5	ISOSCELES	T2,E2

Program 5

Prefix Matching

Input: Length of s1 and s2

- **Class L1:** s1 is longer than s2 (impossible to be a prefix).
- **Class L2:** s1 is equal in length to s2 (potentially a prefix).
- **Class L3:** s1 is shorter than s2 (can be a prefix).

Input: String contents

- **Class C1:** s1 is empty (prefix of any string).
- **Class C2:** s2 is empty (only true if s1 is also empty).
- **Class C3:** Both strings are non-empty.
- **Class C4:** s1 is completely equal to s2 (valid prefix).

Test Case No	String s1	String s2	Expected Output	Equivalence Classes
1	"abc"	"abcde"	true	L3 (s1 shorter), C3
2	"abc"	"abcd"	true	L3 (s1 shorter), C3
3	"abc"	"abc"	true	L2 (s1 equal), C4
4	"abcd"	"abc"	false	L1 (s1 longer), C3
5	""	"abc"	true	L3 (s1 shorter), C1
6	""	""	true	L2 (both empty), C2, C1
7	"abc"	""	false	L1 (s1 longer), C2
8	"xyz"	"abcdef"	false	L3 (s1 shorter), C3
9	"abc"	"xabcde"	false	L3 (s1 shorter), C3
10	"a"	"ab"	true	L3 (s1 shorter), C3

Program 6 (Extension for Program 4)

a) Identify the Equivalence Classes for the System:

1. Valid Triangle Types:

- **E1:** Equilateral triangle ($A = B = C$)
- **E2:** Isosceles triangle ($A = B$ or $A = C$ or $B = C$)
- **E3:** Scalene triangle ($A \neq B \neq C$)
- **E4:** Right-angled triangle ($A^2 + B^2 = C^2$ or any permutation)

2. Invalid Cases:

- **I1:** Non-triangle ($A + B \leq C$ or $A + C \leq B$ or $B + C \leq A$)
- **I2:** Non-positive lengths ($A \leq 0$, $B \leq 0$, or $C \leq 0$)

b) Identify Test Cases to Cover the Identified Equivalence Classes:

Test Case No	Side A	Side B	Side C	Expected Output	Equivalence Classes
1	3.0	3.0	3.0	Equilateral	E1
2	5.0	5.0	3.0	Isosceles	E2
3	4.0	5.0	6.0	Scalene	E3
4	5.0	12.0	13.0	Right-angled	E4
5	2.0	2.0	5.0	Non-triangle	I1
6	1.0	1.0	3.0	Non-triangle	I1
7	0.0	5.0	5.0	Non-positive	I2
8	-1.0	2.0	2.0	Non-positive	I2
9	4.0	4.0	4.0	Equilateral	E1
10	0.0	0.0	0.0	Non-positive	I2

c) Boundary Condition for $A + B > C$ (Scalene Triangle):

Test Case No	Side A	Side B	Side C	Expected Output	Notes
11	2.0	3.0	4.0	Scalene	$A + B > C$
12	3.0	4.0	5.0	Scalene	$A + B > C$

Test Case No	Side A	Side B	Side C	Expected Output	Notes
13	1.0	2.0	2.0	Isosceles	$A + B = C$
14	3.0	5.0	7.0	Scalene	$A + B > C$

d) Boundary Condition for $A = C$ (Isosceles Triangle):

Test Case No	Side A	Side B	Side C	Expected Output	Notes
15	5.0	3.0	5.0	Isosceles	$A = C$
16	1.0	1.0	2.0	Non-triangle	$A + B = C$
17	4.0	4.0	2.0	Isosceles	$A = B$

e) Boundary Condition for $A = B = C$ (Equilateral Triangle):

Test Case No	Side A	Side B	Side C	Expected Output	Notes
18	2.0	2.0	2.0	Equilateral	$A = B = C$
19	0.0	0.0	0.0	Non-positive	All sides zero

f) Boundary Condition for $A^2 + B^2 = C^2$ (Right-angled Triangle):

Test Case No	Side A	Side B	Side C	Expected Output	Notes
20	3.0	4.0	5.0	Right-angled	$A^2 + B^2 = C^2$
21	6.0	8.0	10.0	Right-angled	$A^2 + B^2 = C^2$
22	5.0	12.0	13.0	Right-angled	$A^2 + B^2 = C^2$

g) Test Cases for Non-triangle Case:

Test Case No	Side A	Side B	Side C	Expected Output	Notes
23	1.0	1.0	3.0	Non-triangle	$A + B = C$
24	5.0	10.0	20.0	Non-triangle	$A + B < C$

h) Test Cases for Non-positive Input:

Test Case No	Side A	Side B	Side C	Expected Output	Notes
25	-1.0	5.0	5.0	Non-positive	Negative length
26	2.0	-3.0	2.0	Non-positive	Negative length
27	0.0	4.0	4.0	Non-positive	Zero length