

Boundary Value Testing – Triangle Problem

The triangle program accepts three integers, a, b, and c, as input. These are taken to be sides of a triangle. The integers a, b, and c must satisfy the following conditions:

1. $1 \leq a \leq 200$ (arbitrarily chosen boundary for each side)
2. $1 \leq b \leq 200$
3. $1 \leq c \leq 200$
4. $a < b + c$
5. $b < a + c$
6. $c < a + b$

If an input value fails any of the conditions 1 – 3, the program throws the exception `InvalidValueException`.

If any of the conditions 4 – 6 is not met, the program output is “NotATriangle”.

If all three sides are equal, the program output is “Equilateral”.

If exactly one pair of sides is equal, the program output is “Isosceles”.

If no pair of sides is equal, the program output is “Scalene”.

Normal Boundary Value Test Cases: $4n + 1$ test cases for a function of n variables

Boundary values {min, min+, nominal, max-, max} for each side:
{1, 2, 100, 199, 200}. Note these contain only **valid** values

Test Case #	a	b	c	Expected Output
1	1	100	100	“Isosceles”
2	2	100	100	“Isosceles”
3	100	100	100	“Equilateral”
4	199	100	100	“Isosceles”
5	200	100	100	“NotATriangle”
6	100	1	100	“Isosceles”
7	100	2	100	“Isosceles”
8	100	100	100	“Equilateral”
9	100	199	100	“Isosceles”
10	100	200	100	“NotATriangle”
11	100	100	1	“Isosceles”
12	100	100	2	“Isosceles”
13	100	100	100	“Equilateral”
14	100	100	199	“Isosceles”
15	100	100	200	“NotATriangle”

Robust Boundary Value Test Cases: $6n + 1$ test cases for a function of n variables

Boundary values {min-, min, min+, nominal, max-, max, max+} for each side:
{0, 1, 2, 100, 199, 200, 201} Note these contain **valid and invalid** values

Test Case #	a	b	c	Expected Output
1	0	100	100	InvalidValueException
2	1	100	100	"Isosceles"
3	2	100	100	"Isosceles"
4	100	100	100	"Equilateral"
5	199	100	100	"Isosceles"
6	200	100	100	"NotATriangle"
7	201	100	100	InvalidValueException
8	100	0	100	InvalidValueException
9	100	1	100	"Isosceles"
10	100	2	100	"Isosceles"
11	100	100	100	"Equilateral"
12	100	199	100	"Isosceles"
13	100	200	100	"NotATriangle"
14	100	201	100	InvalidValueException
15	100	100	0	InvalidValueException
16	100	100	1	"Isosceles"
17	100	100	2	"Isosceles"
18	100	100	100	"Equilateral"
19	100	100	199	"Isosceles"
20	100	100	200	"NotATriangle"
21	100	100	201	InvalidValueException

Worst-Case Boundary Value Test Cases: 5^n test cases for a function of n variables

Boundary values {min, min+, nominal, max-, max} for each side:
{1, 2, 100, 199, 200}. Note these contain only **valid** values

Test Case #	a	b	c	Expected Output
1	1	1	1	
2	1	1	2	
3	1	1	100	
4	1	1	199	
5	1	1	200	
6	1	2	1	
7	1	2	2	
8	1	2	100	
9	1	2	199	
10	1	2	200	
11	1	100	1	
12	1	100	2	
13	1	100	100	
14	1	100	199	
15	1	100	200	
16	1	199	1	
17	1	199	2	
18	1	199	100	
19	1	199	199	
20	1	199	200	
21	1	200	1	
22	1	200	2	
23	1	200	100	
24	1	200	199	
25	1	200	200	
26	2	1	1	
27	2	1	2	
28	2	1	100	
29	2	1	199	
30	2	1	200	
31	2	2	1	
32	2	2	2	
33	2	2	100	
34	2	2	199	
35	2	2	200	
36	2	100	1	
37	2	100	2	
38	2	100	100	
39	2	100	199	

40	2	100	200	
41	2	199	1	
42	2	199	2	
43	2	199	100	
44	2	199	199	
45	2	199	200	
46	2	200	1	
47	2	200	2	
48	2	200	100	
49	2	200	199	
50	2	200	200	
51	100	1	1	
52	100	1	2	
53	100	1	100	
54	100	1	199	
55	100	1	200	
56	100	2	1	
57	100	2	2	
58	100	2	100	
59	100	2	199	
60	100	2	200	
61	100	100	1	
62	100	100	2	
63	100	100	100	
64	100	100	199	
65	100	100	200	
66	100	199	1	
67	100	199	2	
68	100	199	100	
69	100	199	199	
70	100	199	200	
71	100	200	1	
72	100	200	2	
73	100	200	100	
74	100	200	199	
75	100	200	200	
76	199	1	1	
77	199	1	2	
78	199	1	100	
79	199	1	199	
80	199	1	200	
81	199	2	1	
82	199	2	2	
83	199	2	100	

84	199	2	199	
85	199	2	200	
86	199	100	1	
87	199	100	2	
88	199	100	100	
89	199	100	199	
90	199	100	200	
91	199	199	1	
92	199	199	2	
93	199	199	100	
94	199	199	199	
95	199	199	200	
96	199	200	1	
97	199	200	2	
98	199	200	100	
99	199	200	199	
100	199	200	200	
101	200	1	1	
102	200	1	2	
103	200	1	100	
104	200	1	199	
105	200	1	200	
106	200	2	1	
107	200	2	2	
108	200	2	100	
109	200	2	199	
110	200	2	200	
111	200	100	1	
112	200	100	2	
113	200	100	100	
114	200	100	199	
115	200	100	200	
116	200	199	1	
117	200	199	2	
118	200	199	100	
119	200	199	199	
120	200	199	200	
121	200	200	1	
122	200	200	2	
123	200	200	100	
124	200	200	199	
125	200	200	200	

Robust Worst-Case Boundary Value Test Cases: 7^n test cases for a function of n variables

Boundary values {min-, min, min+, nominal, max-, max, max+} for each side:
 {0, 1, 2, 100, 199, 200, 201} Note these contain **valid and invalid** values

Test Case #	a	b	c	Expected Output
1	0	0	0	
2	0	0	1	
3	0	0	2	
4	0	0	100	
5	0	0	199	
6	0	0	200	
7	0	0	201	
8	0	1	0	
9	0	1	1	
10	0	1	2	
11	0	1	100	
12	0	1	199	
13	0	1	200	
14	0	1	201	
15	0	2	0	
16	0	2	1	
17	0	2	2	
18	0	2	100	
19	0	2	199	
20	0	2	200	
21	0	2	201	
22	0	100	0	
23	0	100	1	
24	0	100	2	
25	0	100	100	
26	0	100	199	
27	0	100	200	
28	0	100	201	
29	0	199	0	
30	0	199	1	
31	0	199	2	
32	0	199	100	
33	0	199	199	
34	0	199	200	
35	0	199	201	
36	0	200	0	
37	0	200	1	
38	0	200	2	

39	0	200	100	
40	0	200	199	
41	0	200	200	
42	0	200	201	
43	0	201	0	
44	0	201	1	
45	0	201	2	
46	0	201	100	
47	0	201	199	
48	0	201	200	
49	0	201	201	
50				
51				
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341				
342				
343				