



□ Classes to test

- org.jfree.data.Range (15 methods)
- org.jfree.data.DataUtilities (5 methods)

• Class Range: plan

- methods:

- combine → combines 2 ranges (2 inputs Range range1, Range range2, nullable) (4 test cases)

C1 range2 null	Yes	Yes	No	No
C2 range2 null	Yes	No	Yes	No
A1 returns range2	No	No	Yes	No
A2 returns range2	No	Yes	No	No
returns null	Yes	No	No	No
returns combined range	No	No	No	Yes

TC1 TC2 TC3 TC4

- constrain → returns value within range closest to input (1 input double value) (7 test cases)



- nominal tests (1)
- boundary value tests (4)
- robustness tests (2)

- contains → returns true if input falls within range (1 input double value) (7 test cases)



- nominal tests (1)
- boundary value tests (4)
- robustness tests (2)

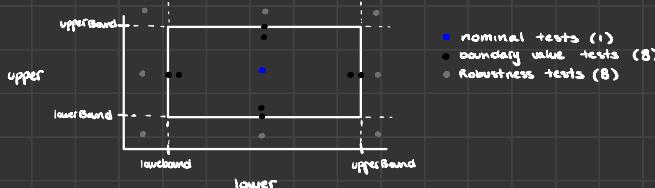
- getCentralValue → returns median for range (no inputs) → [2 test]

- getLength → returns length of range (no inputs) → [2 test]

- getLowerBound → returns lower bound (no inputs) → [2 test]

- getUpperBound → returns upper bound (no inputs) → [2 test]

- intersects → returns true if there is overlap (2 inputs double lower, double upper) (17 test cases)



- nominal tests (1)
- boundary value tests (8)
- robustness tests (8)

- expandToInclude \rightarrow expands range to include specified value (2 inputs Range range, double value) (8 test cases)



- nominal tests (1)
- boundary value tests (4)
- Robustness tests (2)

\rightarrow

1 test case null range (robustness test)

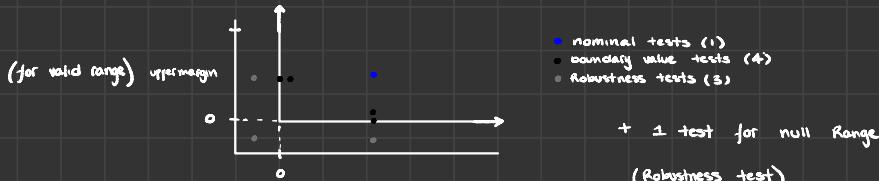
- expand \rightarrow expands range (3 inputs Range range, double lowerMargin, double upperMargin) (9 test cases)

equivalence classes

range valid or invalid

upper margin ≥ 0 and $< \infty$ (Robustness)

lower margin ≤ 0 and $< \infty$ (Robustness)



- nominal tests (1)
- boundary value tests (4)
- Robustness tests (3)

\rightarrow 1 test for null Range

(Robustness test)

- shift \rightarrow shifts range to the right \rightarrow (2 inputs Range base, double delta) (6 test cases)



- nominal tests (1)
- boundary value tests (2)
- Robustness tests (1)

\rightarrow

1 test case null range (robustness test)

We must also consider case when range crosses zero when it is not allowed (1 case)

- shift \rightarrow shifts range to the right \rightarrow (2 inputs Range base, double delta, bool allowZeroCrossing)



- nominal tests (1)
- boundary value tests (2)
- Robustness tests (1)

\rightarrow

1 test case null range (robustness test)

□ equals → checks if ranges match (1 input object obj) (3 test cases)

c1 obj is null	Yes	No	No	No
c2 obj is Range	No	No	Yes	Yes
c3 hashCode() match	No	No	No	Yes
A1 is equals	No	No	No	Yes

1 test 1 test 1 test

□ hashCode → hashes the range into integer value

tested with equals

□ toString → string representation of range (2 test cases)

case 1 Valid range should return "Range [lowerBound, upperBound]"

case 2 Invalid Range (Robustness test)