Example Loop with Multiple Exits

```
main()
{
  int i, j;
  extern int somecond;

  for (i = 0, j = 1; i < 100; i++, j += 3)
    if (j > 75 && somecond || j > 300)
      break;
}
```

When Iteration Branch Changes Direction

$$N_i = \left\lfloor \frac{limit_i - (initial_i + before_i) + adjust_i}{before_i + after_i} \right\rfloor + 1$$

branch	register	limit	relop	initial	before	after	adjust	class	N
block 2	r[9]	75	<=	1	0	3	1	known	26
block 3	r[8]	0	==	N/A	0	0	N/A	unknown	N/A
block 5	r[9]	300	>	1	0	3	1	known	101
block 7	r[10]	100	>=	0	0	1	0	known	101

Loops with Iteration Branches Using Equality Operators

```
for (i = 0; i != 100; i++)
   A;
```

(a) Bounded Loop

```
for (i = 0; ; i++) {
   if (i < 100 && somecond)
      continue;
   if (i == 50)
      break;
}
```

(b) Potentially Unbounded Loop

```
for (i = 0; i != 100; i += 3)
     A;
```

(c) Unbounded Loop

Test Programs

Name	Description or Emphasis
Integral	Evaluates a Double Integral over a Trapezoidal Region
Interpolate	Polynomial Interpolation of 500 Points
Sort	Bubblesort of 500 Integers
Symmetric	Tests If a 500x500 Matrix Is Symmetric

Best-Case Results

Name	Observed Cycles	Previous Estimated Cycles	Previous Ratio	Current Estimated Cycles	Current Ratio
Integral	12,050,092	8,049,618	0.668	12,033,618	0.999
Interpolate	6,485,878	143,064	0.022	6,479,865	0.999
Sort	19,966	19,950	0.999	19,950	0.999
Symmetric	171	171	1.000	171	1.000

Worst-Case Results

Name	Observed Cycles	Previous Estimated Cycles	Previous Ratio	Current Estimated Cycles	Current Ratio
Integral	15,427,332	20,542,118	1.332	15,437,618	1.001
Interpolate	25,468,904	50,702,358	1.991	25,478,906	1.000
Sort	7,672,281	15,251,603	1.988	7,672,292	1.000
Symmetric	2,013,116	4,001,133	1.988	2,013,117	1.000