

# Weakest Precondition

Finde für alle Code-Ausschnitte der Form  $\{ \text{Precondition} \} S \{ \text{Postcondition} \}$  die schwächste Vorbedingung. Bei mehreren Zeilen: Arbeite dich von unten nach oben und setze auch die Zwischenbedingungen, die zu erfüllen sind. Schreibe generell OR für "oder" und AND für "und". Es handelt sich überall um ints ohne Over-/Underflow.

```
{?}  
  x = y * y;  
{x > 4}
```

```
{ |y| > 2 }
```

```
{?}  
  y = x + 3;  
  z = y + 1;  
{z > 4}
```

```
{ x > 0  
  y = x + 3;  
{ y > 3  
  z = y + 1;  
{ z > 4 }
```

```
{?}  
  y = x + 1;  
  z = y - 3;  
{z == 10}
```

```
{ x == 12  
  y = x + 1;  
{ y == 13  
  z = y - 3;  
{ z == 10 }
```

```
{?}  
  if (x < 5)  
    y = x * x;  
  else  
    y = x + 1;  
{y >= 9}
```

```
{ (x <= -3) OR (x >= 3 AND x < 5) OR (x >= 8) }
```

```
{?}  
  x = 6  
{x > 5}
```

```
{ true }
```

```
{?}  
  w = 2 * w;  
  z = -w;  
  y = v + 1;  
  x = min(y, z);  
{ x < 0 }
```

```
{ v < -1 OR w > 0  
  w = 2 * w;  
{ v < -1 OR w > 0  
  z = -w;  
{ v < -1 OR z < 0  
  y = v + 1;  
{ y < 0 OR z < 0  
  x = min(y, z);  
{ x < 0 }
```

```
{?}  
  x = y + z  
  x = y * y  
{ x > 0 }
```

```
{ y != 0  
  x = y + z  
{ y != 0  
  x = y * y  
{ x > 0 }
```

```
{?}
  x = a + 1;
  sum = x + a;
{sum > 5}
```

```
{ a > 2 }
  x = a + 1;
{ x + a > 5 }
  sum = x + a;
{sum > 5}
```

```
{?}
  a = 5;
  x = a + b;
{x >= 5}
```

```
{ b >= 0 }
  a = 5;
{ a + b >= 5 }
  x = a + b;
{x >= 5}
```

```
{?}
  if (x != y)
    x = y;
  else
    x = y + 1;
{x != y}
```

```
{ x == y }
```

```
{?}
  x = y;
  x = x + 1;
{x > 0}
```

```
{ y > -1 }
  x = y;
{ x > -1 }
  x = x + 1;
{x > 0}
```

```
{?}
  x = x - 2;
  z = x + 1;
{z != 0}
```

```
{ x != 1 }
  x = x - 2;
{ x != -1 }
  z = x + 1;
{z != 0}
```

```
{?}
  x = 2 * y;
  z = x + y;
{z > 0}
```

```
{ y > 0 }
  x = 2 * y;
{ x + y > 0 }
  z = x + y;
{z > 0}
```

```
{?}
  if (x > y)
    min = y;
  else
    min = x;
{min <= x && min <= y}
```

```
{ true }
```

```
{?}
  if (x != 0)
    z = x;
  else
    z = x + 1;
{z > 0}
```

```
{ x >= 0 }
```