3.18 Short circuit evaluation

A logical operator evaluates operands from left to right. **Short circuit evaluation** skips evaluating later operands if the result of the logical operator can already be determined. The logical AND operator short circuits to false if the first operand evaluates to false, and skips evaluating the second operand. The logical OR operator short circuits to true if the first operand is true, and skips evaluating the second operand.

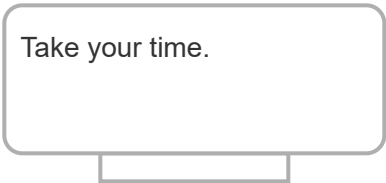**PARTICIPATION ACTIVITY** 3.18.1: Short circuit evaluation: Logical AND.

■ **1** **2** ▶ ☑ 2x speed

```
// Read minutes and seconds
if ((minutes < 1) && (seconds < 10)) {
   // Print "Few seconds remaining!"
}
else {
   // Print "Take your time."
}
...
```

	operand1	operand2	result
minutes: 1 seconds: 5	(1 < 1) false	-	false

Take your time.

The first operand evaluates to false, so the logical AND result is false regardless of the second operand. Short circuit evaluation skips evaluating the second operand.

Feedback?

Table 3.18.1: Short circuit evaluation.

Operator	Example	Short circuit evaluation
operand1 && operand2	true && operand2	If the first operand evaluates to true, operand2 is evaluated.
	false && operand2	If the first operand evaluates to false, the result of the AND operation is always false, so operand2 is not evaluated.

| `operand1 \|\| operand2` | `true \|\| operand2` | If the first operand evaluates to true, the result of the OR operation is always true, so operand2 is not evaluated. |
| | `false \|\| operand2` | If the first operand evaluates to false, operand2 is evaluated. |

Feedback?

PARTICIPATION ACTIVITY   3.18.2: Determine which operands the program evaluates.

1) `(x < 4) && (y > 3)`

What value of x results in short circuit evaluation, which skips evaluating the second operand?

- ◉ 6
- ○ 2
- ○ 3

Correct

(6 < 4) is false, so the expression evaluates to false regardless of the result of (y > 3).

2) `(y == 3) || (x > 2)`

What value of y results in short circuit evaluation, which skips evaluating the second operand?

- ○ 2
- ○ 4
- ◉ 3

Correct

(3 == 3) is true, so the expression evaluates to true regardless of the result of (x > 2).

3) `(y < 3) || (x == 1)`

What value of y does not result in short circuit evaluation, such that both operands are evaluated?

- ◉ 3

Correct

The OR operation is not short circuited because (3 < 3) is false. The second operand is evaluated to determine the result.

○ 1

○ 2

4) `(x < 3) && (y < 2) && (z == 5)`

   What values of x and y do not result in short circuit evaluation, such that all operands are evaluated?

   ○ x = 2, y = 2

   ◉ x = 1, y = 0

   ○ x = 4, y = 1

   ○ x = 3, y = 2

   Correct

   (1 < 3) is true, so the second operand is evaluated. (0 < 2) is also true, so the last operand is evaluated to determine the result.

5) `((x > 2) || (y < 4)) && (z == 10)`

   Given x = 4, y = 1, and z = 10, which comparisons are evaluated?

   ○ (x > 2), (y < 4), and (z == 10)

   ◉ (x > 2) and (z == 10)

   ○ (x > 2) and (y < 4)

   Correct

   (4 > 2) is true, so the OR operator evaluates to true regardless of the result of (y < 4). Thus, the first operand of the AND operation is true, and (z == 10) is evaluated to determine the final result.

   Feedback?