3.16 Conditional expressions

If-else statements with the form shown below are so common that the language supports the shorthand notation shown.



A conditional expression has the form condition ? exprWhenTrue : exprWhenFalse.

All three operands are expressions. If the **condition** evaluates to true, then **exprWhenTrue** is evaluated. If the condition evaluates to false, then **exprWhenFalse** is evaluated. The conditional expression evaluates to whichever of those two expressions was evaluated. For example, if x is 2, then the conditional expression (x == 2) ? 5 : 9 * x evaluates to 5.

A conditional expression has three operands and thus the "?" and ":" together are sometimes referred to as a **ternary operator**.

<u>Good practice</u> is to restrict usage of conditional expressions to an assignment statement, as in: y = (x == 2) ? 5 : 9 * x;. Common practice is to put parentheses around the first expression of the conditional expression, to enhance readability.

PARTICIPATION ACTIVITY

3.16.2: Conditional expressions.



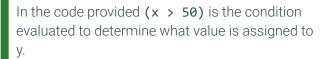
Convert each if-else statement to a single assignment statement using a conditional expression, using parentheses around the condition. Enter "Not possible" if appropriate. ..

```
1) if (x > 50) {
    y = 50;
}
else {
    y = x;
}

y = (
    x > 50
    50 : x;
```

Correct





Check

Show answer

Correct



x is evaluated and assigned to y when (x < 20) is true. 20 is evaluated and assigned to y when (x < 20) is false.

Check

Show answer

$$y = (x < 100) ? 0 : x;$$

Show answer

4) if (x < 0) { x = -x; } else {</pre>

Check

x = (x < 0) ? -x : x;

Check

X = X;

Show answer

5) if (x < 0) { y = -x; } else { z = x; }</pre>

Not possible

Correct

$$y = (x < 100) ? 0 : x;$$

 \emptyset is evaluated and assigned to y when (x < 100) is true. x is evaluated and assigned to y when (x < 100) is false.

Correct

$$x = (x < 0) ? -x : x;$$

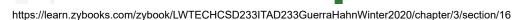
-x is evaluated and assigned to x when (x < 0) is true. x is evaluated and assigned to x when (x < 0) is false.

Correct

Not possible

The if branch assigns y, while the else branch assigns z, so this cannot be converted to a





Check

Show answer

conditional expression.

Feedback?

CHALLENGE ACTIVITY

3.16.1: Conditional expression: Print negative or positive.



Create a conditional expression that evaluates to string "negative" if userVal is less than 0, and "non-negative" otherwise. Ex: If userVal is -9, output is:

-9 is negative.

```
1 #include <iostream>
2 #include <string>
3 using namespace std;
4
5 int main() {
      string condStr;
6
      int userVal;
7
8
9
      cin >> userVal;
10
11
      condStr = (userVal < 0)?"negative":"non-negative";</pre>
12
      cout << userVal << " is " << condStr << "." << endl;</pre>
13
14
15
      return 0;
16 }
```

Run

All tests passed

✓ Testing: -9

Your output -9 is negative.

✓ Testing: 0

Your output 0 is non-negative.

✓ Testing: 44

3.16. Conditional expressions 44 is non-negative. Your output Feedback? CHALLENGE 3.16.2: Conditional assignment. **ACTIVITY** Using a conditional expression, write a statement that increments numUsers if updateDirection is 1, otherwise decrements numUsers. Ex: if numUsers is 8 and updateDirection is 1, numUsers becomes 9; if updateDirection is 0, numUsers becomes 7. Hint: Start with "numUsers = ...". 1 #include <iostream> 2 using namespace std; 4 int main() { 5 int numUsers; 6 int updateDirection; cin >> numUsers; 8 9 cin >> updateDirection; 10 11 /* Your solution goes here */ numUsers = (updateDirection ==1)? ++numUsers:--humUsers; 13 cout << "New value is: " << numUsers << endl;</pre> 14 15 16 return 0; 17 } All tests passed Run ✓ Testing with numUsers initially 8, updateDirection = 1 Your output New value is: 9 ✓ Testing with numUsers initially 75, updateDirection = 0

Your output

Feedback?

New value is: 74