3.3 Detecting ranges using logical operators (general)

Students:
Section 3.4 is a part of 2 assignments: CSC108 CH03.1-3.10 C3A

Includes: CA
Due: 03/30/2023, 11:59 PM EST

This assignment's due date has passed. Activity will still be recorded, but will not count towards this assignment (unless the due date is changed). See this article for more info.

3.4 Detecting ranges with branches

Relational operators

A **relational operator** checks how one operand's value relates to another, like being greater than.

Some operators, like `==`, involve two characters. A programmer cannot arbitrarily combine the `<`, `>`, and `=` symbols; only the shown two-character sequences represent valid operators.

Table 3.4.1: Relational operators.

Relational operator	Description	Example (assume a is 3)
`<`	`a < 5` means a is less than 5	`a < 4` is true `a < 3` is false
`>`	`a > 5` means a is greater than 5	`a > 2` is true `a > 3` is false
`==`	`a == 5` means a is equal to 5	`a == 4` is true `a == 3` is true `a == 2` is false
`>=`	`a >= 5` means a is greater than or equal to 5	`a >= 2` is true `a >= 3` is true `a >= 4` is false

Feedback?

PARTICIPATION ACTIVITY 3.4.1: Evaluating equations having relational operators.

Indicate whether the expression evaluates to true or false.
x is 5, y is 7.

1) `x == 5`

- True
- False

2) `y == 7`

- True
- False

3) `(x <= y)` a valid expression?

- Yes
- No

4) `(x >= y)` a valid expression?

- Yes
- No

Feedback?

PARTICIPATION ACTIVITY 3.4.2: Creating expressions with relational operators.

Type the operator to complete the desired expression.

1) numDogs is greater than 10

`numDogs  10`

Check Show answer

2) numCars is greater than or equal to 5

`numCars  5`

Check Show answer

3) numCars is 5 or greater

`numCars  5 :`

Check Show answer

4) centiscum is a negative number

`centiscum  0`

Check Show answer

Feedback?

Detecting ranges with if-else statements

Programmers commonly use the sequential nature of the multi-branch if-else arrangement to detect ranges of numbers. In the following example, the second branch expression is only reached if the first expression is false. So the second branch is taken if *userAge* > 16 is false (so 16 or greater) AND *userAge* < 25, meaning *userAge* is between 16 - 24 (inclusive).

PARTICIPATION ACTIVITY 3.4.3: Using the sequential nature of multi-branch if-else for ranges: Insurance prices.

Reset (is saved)

```
import sys
import math
import numpy as np
import scipy.stats
import scipy.linalg
import sklearn.linear_regression
import sklearn.cluster

print("Enter your age: ")
userAge = int(input())
print("Annual price: ")
insurancePrice = int(input())

if (userAge < 16) :
    insurancePrice = 0.75 * insurancePrice
elif (userAge < 25) :
    insurancePrice = 1.25 * insurancePrice
else :
    insurancePrice = 0.95 * insurancePrice

print("Insurance price: ", insurancePrice, sep=" ")
exit()
```

Memory

16	userAge
2500	insurancePrice

Enter your age: 17
Annual price: 92500

Insurance price: 69375.0

27 > 16 T
27 < 25 F
27 > 40

Captions

1. The user enters 27 for their age, which is stored in memory as the variable *userAge*. The multi-branch if-else first checks if *userAge* is less than 16, which is false.
2. Since the first condition is false, the multi-branch if-else checks if *userAge* is less than 25, which is false.
3. The next branch checks if *userAge* is less than 40, which is true. The else if's statements execute and the variable *insurancePrice* is set to 2350 in memory.

Feedback?

PARTICIPATION ACTIVITY 3.4.4: Ranges and multi-branch if-else.

Type the range for each branch. Type ranges as 25 - 29, or type 30+ for all numbers 30 and larger.

```
int numAccts;

if (numAccts < 25) {
  ...
}
else if (numAccts > 50) {  // 2nd branch range: _____
  ...
}
else if (numAccts >= 30) {  // 3rd branch range: _____
  ...
}
else {                      // 4th branch range: _____
  ...
}
```

1) 2nd branch range:

Check Show answer

2) 3rd branch range:

Check Show answer

3) 4th branch range:

Check Show answer

4) What is the range for the last branch below?

```
int numTimes;

if (numTimes < 0) {
  ...
}
else if (numTimes > 100) {
  ...
}
else {  // Range: _____
  ...
}
```

Check Show answer

Feedback?

PARTICIPATION ACTIVITY 3.4.5: Complete the multi-branch if-else.

1) Second branch: *userNum* is less than 200

```
int userNum;
if (userNum < 100 ) {
  ...
}
else if (                    ) {
  ...
}
else { // userNum >= 200
  ...
}
```

Check Show answer

2) Second branch: *userNum* is positive (non-zero)

```
int userNum;
if (userNum < 0 ) {
  ...
}
else if (                    ) {
  ...
}
else { // userNum is 0
  ...
}
```

Check Show answer

3) Second branch: *userNum* is greater than 105

```
int userNum;
if (userNum < 100 ) {
  ...
}
else if (                    ) {
  ...
}
else { // userNum is between
       // 100 and 105
  ...
}
```

Check Show answer

4) If the final else branch executes, what must *userNum* have been? Type "unknown" if appropriate.

```
int userNum;

if (userNum >= 0.5 ) {
  ...
}
else if (userNum >= 1.1) {
  ...
}
else { // userNum if this executes?
  ...
}
```

Check Show answer

5) Which branch will execute? Valid answers: 1, 2, 3, or none.

```
int userNum = 5000;

if (userNum < 5) {
  // Branch 1
}
else if (userNum < 4000) {
  // Branch 2
}
else if (userNum < 1000) {
  // Branch 3
}
```

Check Show answer

Feedback?

CHALLENGE ACTIVITY 3.4.1: Detect ranges using branches.

Jump to level 1

Start

Type the program's output

```
#include <iostream>
using namespace std;

int main() {
  int inputVal;

  cin >> inputVal;

  if (0 < inputVal < 10) {
    cout << "Yes" << endl;
  }
  else {
    cout << "No" << endl;
  }

  return 0;
}
```

Input
0

Output
Y
N

1

Check Next

Feedback?

CHALLENGE ACTIVITY 3.4.2: Basic if-else expressions.

Jump to level 1

Start

Complete the if-else statement to output "More than 10" if the value of *userVal* is greater than 10. Otherwise, output "10 or less".

Ex: if the input is 12, then the output is:

```
More than 10
```

```
#include <iostream>
using namespace std;

int main() {
  int userVal;

  cin >> userVal;

  if (/* Your code goes here */) {
    cout << "More than 10" << endl;
  }
  else {
    cout << "10 or less" << endl;
  }

  return 0;
}
```

1 2

Check Next level

Feedback?

CHALLENGE ACTIVITY 3.4.3: Working with branches.

Jump to level 1

Start

Weight *catCount* is read from input. If *catCount* is less than 16, then output "Not enough cats". End the output with a newline.

Click here for examples

```
#include <iostream>
using namespace std;

int main() {
  int catCount;

  cin >> catCount;

  /* Your code goes here */

  return 0;
}
```

1 2 3 4

Check Next level

Feedback?

CHALLENGE ACTIVITY 3.4.4: Working with ranges.

Jump to level 1

Start

When the input integer variable *outfitCount* is:

- less than 6, output "Small suitcase".
- between 6 inclusive and 12 inclusive, output "Mid-sized suitcase".
- greater than 12, output "Need more than one suitcase".

End with a newline.

Click here for examples

```
#include <iostream>
using namespace std;

int main() {
  int outfitCount;

  cin >> outfitCount;

  /* Your code goes here */

  return 0;
}
```

1 2

Check Next level

Feedback?

How was this section? Provide section feedback

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Completion details

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